Army aircraft
mishap prevention
data

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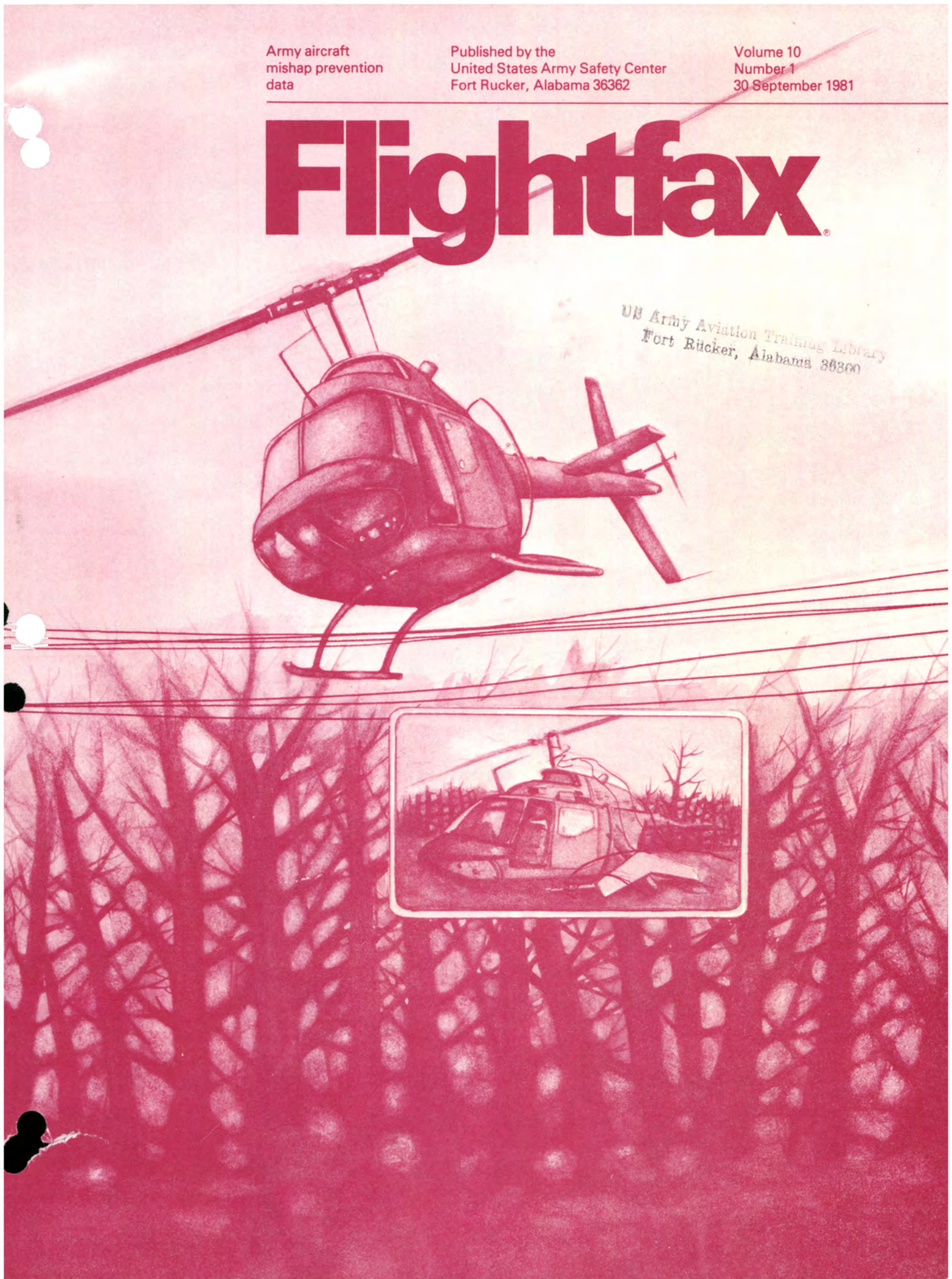


# Wire strikes are no fun

Wire strikes are an interesting phenomena. Although they have been occurring ever since we've been flying, they gained recognition as a major worldwide aviation safety problem with the adoption of terrain flight as a method for minimizing exposure to threat antiaircraft weapons. Today we know that we must train for combat the way we plan to fight and we know that the closer we get to the enemy the lower we must fly. This tactic lessens the risk of being killed by the enemy but increases our exposure to obstacle hazards such as wires. The latter risk we are willing to accept in order to minimize the former. With this in mind, it is apparent that we must do whatever we can to decrease the possibility of losing our aviation assets to obstacles, without sacrificing training realism.

Over the years we have tried to tackle the wire strike problem in two basic ways. The most obvious way and certainly the most important has been in the area of wire strike prevention. Through the various media, FLIGHTFAX, AVIATION DIGEST, posters, films, video tapes, etc., we have tried to make commanders and individual aviators aware of the wire strike problem. We have publicized statistics, mishap reviews, typical conditions, and a seven-point wire strike prevention program, which will be discussed in detail later. Some major commands have also published and emphasized the wire strike problem. With all the educational efforts and publicity, we still have not eliminated wire strikes although we have seen some success, as shown in table 1. If we went back even further to 1965, when Army pilots were involved in an all-time high of 61 wire strike mishaps, we would see a steady decrease to 23 in 1973.

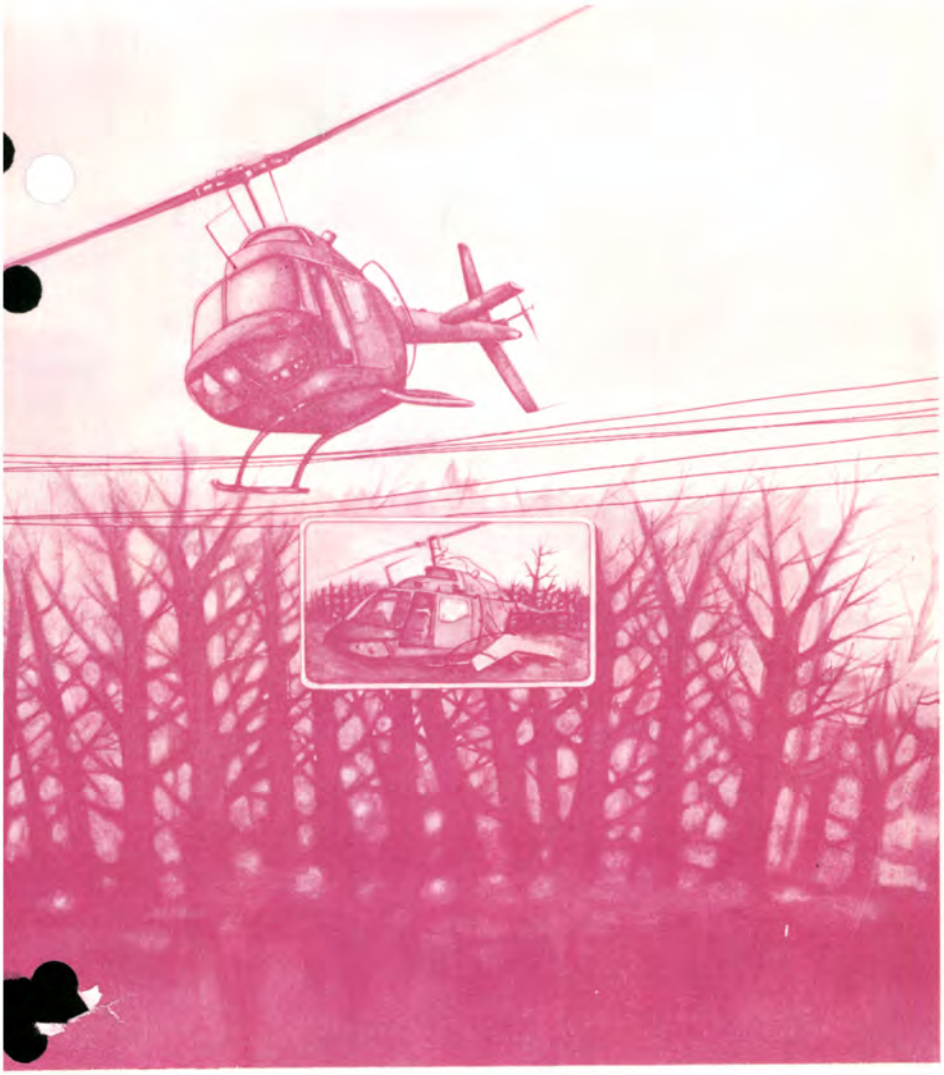
Our other major effort has been in the area of improving the tolerance of our aircraft to withstand wire strikes. Although there was some initial resistance, we were able (with the assistance of some other agencies) to establish the need for a wire strike protection system (WSPS) to improve the tolerance of tactical aircraft to wires and in so doing to gain support of the user. While there are still doubters who believe our money could be better spent on other developments, we are happy to hear that bolting of the WSPS on OH-58s in Germany began in September. Delivery of the WSPS kits for the OH-58C is scheduled for April 1982. Kits for the UH-1 should be delivered in May 1982. Development of the AH-1S WSPS is progressing rapidly, with flight testing to be conducted in January 1982. These kits are expected to be delivered sometime in FY 83. Hopefully, the UH-60 WSPS development will progress equally as fast since the cost of one UH-60 lost to the wires could probably equip the entire fleet.

While the WSPS should have a positive inpact on overall readiness and the number of aircraft lost to wire strikes, it is not a panacea. If we want to insure maximum combat effectiveness, we must **prevent** mishaps, especially those associated with wire or obstacle strikes. Let's first review some of the factors about wire strikes that we've known for some time.

- Human error is almost always involved in wire strike mishaps. The exception would be those wire strikes that occur after an in-flight materiel-related emergency. Other factors such as fatigue often contribute to the human error.

- Naturally, most wire strikes occur below 50 feet agl, although some have occurred above 150 feet.

- Most wire strikes occur during cruise flight.



- It is virtually impossible to locate all wires by an aerial reconnaissance over unfamiliar terrain.

- Wire strikes seldom occur at takeoff/landing points when surrounding wires are marked.

- Pilots in units with strong command supervision and intolerance to violations of flight discipline are less likely to become involved in wire strike mishaps.

- Even though wires may not be seen, their presence should be expected along roads and railroad tracks; between hills, poles, structures; and between poles and structures. Even when only a single pole in open country is spotted, wires may be present.

- The position of the sun, types of wires, time of day, and existing atmospheric conditions can drastically affect the crew's ability to detect wires. A change in one or more of these variables can be a deciding factor as to whether wires can be readily spotted, seen with difficulty, or not seen at all. Even large powerlines suspended from a tower can be virtually impossible to see on a clear day if other adverse environmental conditions exist.

- The more crewmembers actively engaged in spotting wire hazards on any given flight, the less the risk of wire strike.

With the knowledge of the factors described above and the cooperation of commanders and aviators, it should be pretty easy to design an effective wire

*(continued on next page)*

# Wire strikes

strike prevention program. Several years ago, the Safety Center published a seven-point program to prevent wire strikes. This was the first step of an Army-wide campaign to make people realize there was, and is, a serious wire strike problem. We now must be sure no one forgets it. Table 1 shows wire strike statistics by calendar year since 1974. Hopefully, the trend will continue to go down and we believe it can if tactical units will seriously consider and enforce the following seven points.

1. SOPs and directives. Insure SOPs and directives relative to terrain flight reflect the safest procedures possible for the types of missions being flown. Detailed responsibilities for the pilot at the controls, pilot not at the controls, and other crewmembers should be specified.

2. Supervision. Provide adequate supervision to insure pilots adhere to established policies. All missions, including quick reaction missions, should be planned and all aircrews should know the plan. Supervisors should then insure that the flight is flown as planned and that deviations are a result of operational necessity and not a breakdown of professional flight discipline.

**TABLE 1.—Wire Strikes**

| | | Type Aircraft | | | | Injuries | | |
|---|---|---|---|---|---|---|---|---|
| Year | Total | UH-1 | OH-58 | AH-1 | Other | Inj | Fat | Cost |
| 1974 | 20 | 5 | 5 | 7 | 3 | 8 | 3 | $ 1,411,863 |
| 1975 | 20 | 10 | 7 | 3 | 0 | 8 | 7 | 837,310 |
| 1976 | 21 | 7 | 10 | 3 | 1 | 11 | 3 | 1,623,743 |
| 1977 | 30 | 10 | 16 | 2 | 2 | 6 | 10 | 4,294,518 |
| 1978 | 24 | 7 | 12 | 5 | 0 | 2 | 6 | 1,835,904 |
| 1979 | 23 | 11 | 10 | 2 | 0 | 15 | 3 | 1,677,788 |
| 1980 | 16 | 5 | 7 | 3 | 1 | 3 | 1 | 642,952 |
| 1981* | 13 | 1 | 10 | 2 | 0 | 7 | 1 | 485,022 |
| Total | 167 | 56 | 77 | 27 | 7 | 60 | 34 | $12,809,100 |

*1 January through 31 August 1981

3. Hazard maps. Wires and other obstacles that pose a significant threat to terrain flight should be accurately depicted on hazard maps. In areas such as Europe where the prominence of wires would unduly clutter the map, major wire hazards and wires that are located in unlikely areas should be plotted and aircrews made aware of other unplotted wire locations such as along roads, railroads, etc. When it is possible for all wires to be plotted without compromising the usefulness of the map, then by all means they should be.

4. Wire marking. Wires around all potential takeoff and landing sites on and off military reservations should be marked whenever possible. Certainly, all wires around frequently used landing sites should be marked. Units using tactical communications lines strung above the ground should be advised that these lines

can be a hazard to Army aircraft and should be conspicuously marked. While pilots should know when to expect wires, environmental conditions can sometimes make them virtually impossible to see. Markers can greatly simplify this task.

5. Minimize contour flying. Virtually all wire strikes occur during terrain flight in the contour mode or on takeoff or landing. The most serious mishaps occur during contour flight. Low level is generally above the wire environment and NOE speeds are usually slow enough to allow crews to react and avoid wires. It follows then that minimizing time in the contour mode can reduce wire strikes. In addition to this, it is imperative that crews exercise maximum vigilance whenever landing in and taking off from an unfamiliar area. Likewise, they cannot be complacent about going into or out of places they know. Wires can be constructed in a matter of minutes or hours and when in place they are ready to attack.

6. Maximum crew coordination. When flying in a wire environment, maximum coordination among all crewmembers is needed in searching for wires. During terain flight, the pilot's full attention should be to flying. Navigation, setting radio frequencies, and monitoring instruments should be a function of the other crewmembers. If the pilot at the controls must direct his attention away from flying, then he either needs to land or climb to a higher altitude above the obstacle environment. If not, experience has shown there is a good chance he will hit something (the ground, a tree, some wires, etc.).

7. Terrain flight airspeed should be tailored to the environmental conditions. This airspeed must be such that a pilot will be able to identify and react to an unforeseen obstacle in his flight path in time to avoid hitting it. A general rule is that the closer to the ground a flight is to be flown, the slower the airspeed should be. While speed greatly affects reaction distance, another factor in determining the appropriate airspeed is the environmental conditions affecting forward visibility, i.e., precipitation, fog, haze, glare from the sun, darkness, etc. Assuming good visibility, if two aircraft are approaching wires and one is at 80 knots while the other is at 40 knots, the pilot of the faster aircraft will need to spot the wires at a distance of more than 1,650 feet to react and avoid them. The pilot of the slower aircraft will have ample time to react if he sees them at 600 feet.

Some aviators may not be impressed with the wire threat, the statistical data, or the seven-point prevention program. We all too often say it always happens to the other guy, never to me. Fortunately, there are a lot of "other guys" still out there walking around, but there are also some who are not. If you have any doubts about wire strikes, search out someone who has had one. You will find such a person at almost every installation and most of them realize they were lucky and came within a few inches of being not so lucky. If, as an individual aviator, you get nothing more out of this article than the following, we have accomplished something: **Slow down as you go down and use all crewmembers to help look for the wires.**

Point of contact at the Safety Center for wire strike matters is Major Kenton, AUTOVON 558-3901/3913. ■

# Mishap briefs

**uh1** **Class C mishaps** ☐ (H series) Aircraft was landed to a hover at hospital helipad. As copilot repositioned aircraft closer to ambulance, aircraft landed on helipad light, bending skid tube and shoe. ☐ (H series) Crew had been firing door guns during training mission. Enroute to airfield, lid came off ammunition box on left side. Lid flew back and hit outboard side of tail rotor blade.

**Class E mishaps** ☐ (H series) Pilot noticed slight binding in tail rotor pedals during final approach. Caused by failure of tail rotor grip bearings. ☐ (H series) Master caution and hydraulic lights came on. Caused by failure of pressure switch.

**ah1** **Class E mishaps** ☐ (S series) Aircraft passed close to two UH-1 aircraft during landing. Pilots' doors had not been secured and were damaged by rotorwash. ☐ (S series) Pilot could not move collective lever during prestart check of emergency hydraulic pump. Bearing was frozen by dust and sand. Dust deflectors were not installed. ☐ (G series) As collective was lowered to initiate final approach to landing, aircraft vibrated and yawed, and loud noise was heard. Caused by internal failure of 42-degree gearbox. ☐ (TH-1S) Fuel quantity gauge dropped to zero. Caused by failure of pressure transmitter.

**ch47** **Class E mishaps** ☐ (A series) Rotor tachometers fluctuated and then dropped to zero. Caused by failure of tachometer generator. ☐ (B series) Pilot was told during runup that fluid was leaking from aft transmission area. Caused by broken hydraulic line inside hydraulic cooler fan. ☐ (B series) No. 1 engine oil pressure went to 60 psi during runup. Caused by failure of oil pump. ☐ (B series) Pilot smelled smoke and noticed No. 1 transformer rectifier indicating .5. Caused by thermal runaway of battery.

**ch54** **Class E mishap** ☐ (A series) No. 1 servo system was turned off during test flight procedural check. When check had been made, pressure could not be restored. Caused by failure of hydraulic manifold.

**oh58** **Class E mishaps** ☐ (A series) Pilot felt high frequency vibration after takeoff. Tail rotor trunnion bearing caps were worn and loose, and oil was being discharged from teflon bearing area of trunnion. ☐ (C series) Igniter points popped when battery switch was turned on. Caused by failure of starter switch. ☐ (C series) $N_2$ dropped to 96 percent and $N_1$ to 79 percent during landing. Caused by failure of power turbine governor.

**c12** **Class E mishaps** ☐ (A series) No. 1 engine oil pressure gradually decreased during climb. During descent for landing, oil pressure dropped. Caused by cracked oil filter housing and valve assembly. ☐ (C series) No. 1 engine oil pressure would not go above 75 psi at 100 percent torque during line-up check. Caused by sticking oil pressure relief valve. ☐ (A series) No. 2 engine $N_1$

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **5** |
| | June | 2 | 4 | June | **6** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | August | **5** | **3** |
| | September | 3 | 1 | 1-30 Sep | **1** | **0** |
| | Total for Year | 37 | 26 | Total to Date | **43** | **26** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

tachometer went to zero during flight. Cause by sheared tachometer generator shaft.

**t42** **Class E mishaps** □ No. 1 engine oil temperature was noted above red line during runup. Caused by broken ground wire on temperature bulb. □ Total electrical failure occurred during IFR flight. Caused by failure of No. 2 alternator. **This is the second time this has occurred this year. The first time, the aircraft was flying in IMC at night on a PAR approach.**

**u21** **Class E mishaps** □ (RU-21H) Heater would not work during flight and pilot aborted mission because of cold temperature in cockpit. Caused by failure of heater vane fan. **Cold weather is with us again. Check those heaters.**

# Maintenance

**uh1** **Class C mishap** □ (H series) Cargo hook malfunctioned during flight, releasing electrical test set. Test set was destroyed on ground impact.

**Class E mishap** □ (H series) During MOC for installation of super shaft, pilot heard strange sound and shut down engine. Inspection of shaft area revealed no deficiencies. High egt was noted on second start, and particle separator was removed and checked. Rag was found in engine inlet guide vanes and fabric pieces were seen in bleed air band. After crew chief had detected chafing condition in upper baffle between transmission and particle separator, baffles and particle separator were removed. Because of a delay in replacing baffles and particle separator, crew chief decided to put a rag around the outside of the air inlet section to prevent foreign objects from getting into the engine. Super shaft was being installed during the same time the baffles and particle separator were removed. When baffles and particle separator were replaced, crew chief failed to remove rag. Baffles and particle separator were inspected by TI and signed off. When pilot started aircraft, rag was pulled into engine compressor section. □ (H series) Pilot heard grinding noise during takeoff to hover, and aircraft yawed to right. Maintenance personnel had not installed bearing retainer plate during phase inspection, causing bearing to slide out of tail rotor crosshead. This resulted in reduction in amount of pitch that could be applied to tail rotor. □ (H series) Transmission oil pressure went to zero and master caution and transmission oil pressure lights came on during sling load operations. Load was released and aircraft landed. Transmission pressure line quick disconnect was not fully seated. □ (H series) Crew smelled hydraulic fluid and crew chief noticed hydraulic fluid leaking from transmission area. Hydraulic pressure line was chafed on transmission oil line.

**ah1** **Class E mishap** □ (G series) Transmission oil pressure light came on and oil pressure gauge fluctuated. Transmission oil line to oil cooler was loose at oil cooler, causing loss of oil.

**oh58** **Class E mishaps** □ (A series) $N_2$ bled to 95 percent during pickup to hover, and low rpm audio sounded. Linear actuator had been replaced during prior maintenance. Actuator was mounted to middle hole in bellcrank assembly rather than top hole as previously adjusted/mounted. This caused out-of-rig condition in droop compensator control assembly. □ (A series) Master caution and transmission chip detector lights flickered during flight. When mast was removed, self-locking nut was found lying at bottom of transmission. Nut did not come from mast but was an additional one that may have been dropped in transmission and never retrieved. Chips were coming from nut and transmission gears. □ (A series) Master caution, warning, and caution panel lights flashed on and off during flight. Malfunction of battery was caused by overcharge. Voltage regulator was not adjusted correctly.

**ov1** **Class C mishap** □ (D series) Aircraft was test flown for engine change. On shutdown, noise was heard from No. 1 engine. Inspection revealed damage to intake. Caused by pair of pliers left in intake.

## Messages received

- Safety-of-flight maintenance notice concerning inspection of AH-1 pitch link tube (AH-1-81-27, 141420Z Sep 81).
- USAGMPA message 142000Z Aug 81 concerning fog oil. Product should flash above 320° F., but it flashes below room temperature. Product as tested is a mixture of JP4 and kerosene and is not safe to use as is. Product should be restricted from issue and use until further disposition instructions are provided.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# Three strikes and you're out!

**Despite its appearance, helmet did its job—and did it well.**

The helmet shown here was being worn by the pilot of an OH-58 when he was struck by a main rotor blade. It happened like this:

The aircraft was at an altitude of about 700 feet agl when the crew heard a banging type noise and decided to land and investigate the cause. The PIC initiated an approach to a planted field, but because of sloping terrain, terminated his approach at a hover and repositioned the aircraft to a less sloping area—one that sloped less than 5 degrees.

On landing, the pilot exited the aircraft and inspected both sides of it before walking **upslope** a short distance beyond the main rotor blade tip path. As he returned to the aircraft, the tip of one blade struck his helmet. Going down on one knee, he removed his helmet to determine the extent of his injuries. Meanwhile, the PIC repositioned the aircraft a safe distance away to prevent the possibility of additional injury to the pilot. He then frictioned the controls and examined the pilot's bleeding head before evacuating him for treatment. In this instance, the helmet bore the brunt of the blow. The only injury the pilot sustained was a scalp laceration believed to have been caused by helmet fragments.

This pilot was fortunate. In essence, he had two strikes called against him. The first, when he departed and then approached the aircraft from the **upslope** side; and the second—a literal one—when the blade tip hit his helmet. These two strikes, in turn, serve a dual purpose. They remind us of man's fallibility and the relative ease with which human error can occur; and they point out the effective protection a helmet can afford. But for your own safety, don't rely solely on the helmet—also use your "head" to prevent this as well as other types of accidents.

As everyone knows, baseball is a game played by the rules and judged by the rules. We'd do well to remember that the same holds true for flying. And of course, nobody needs to tell us what it means when an umpire yells, "Strike three!" ■

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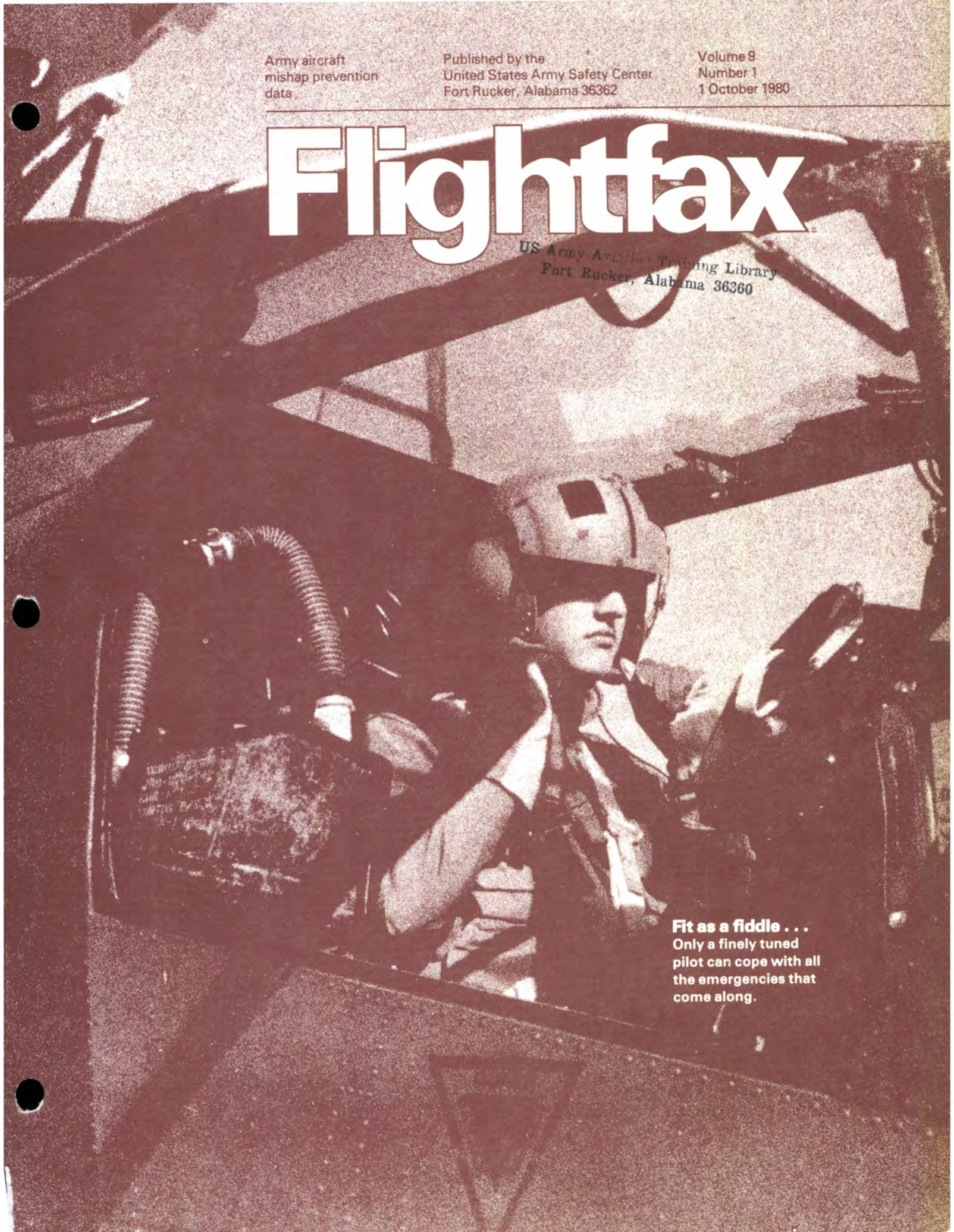


**Fit as a fiddle . . .**
**Only a finely tuned pilot can cope with all the emergencies that come along.**

# Fit as a fiddle?

Under absolutely ideal conditions, a pilot is as finely tuned as a violin. The trouble is, a pilot is human just like everybody else and humans get out of tune. And it doesn't take a broken leg or a heart attack to put a person out of whack.

A pilot gone slightly sour needs a tuning job immediately. If he doesn't get one, he may land somewhere besides the strip he was aiming for, or plunge three counties into complete darkness by dragging down several miles of high-tension wire.

When such events take place, many people converge on the scene to launch an investigation. The aircraft is pieced back together, witnesses are questioned, and weather charts are consulted. If he happens to be available, the pilot has his brains thoroughly picked. Every stone for miles around is turned at least once. And all too often the investigators can only pack up their statistics and move on, dolefully muttering "pilot error."

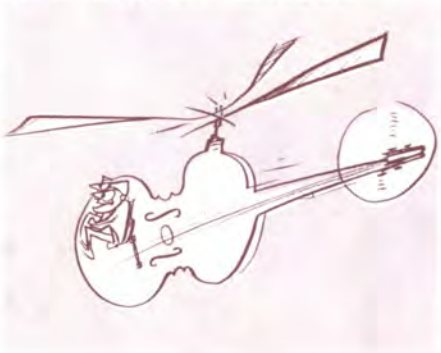
Pilot error? There is more here than meets the eye. The investigators know that as well as anyone else. The term is a large one and covers certain mysteries of human behavior.

Is simple ignorance pilot error? An error can be committed only by a person trained to know better. Experts sometimes refer to this kind of error as the "human factor" behind mishaps; **everything** the pilot did or failed to do that led to the crash. And **why.** The **why** is often the mysterious part. Many times the pilot can't say **why** himself. If he could, he wouldn't have crashed in the first place. But here is the cold truth: A person who has performed a simple action the right way hundreds of times suddenly does it exactly backwards. An old hand who could fly a barn door if he really put his mind to it fouls up on final and strips the landing gear from his aircraft. What goes on here?

## Out of tune

One answer is that mishaps involving the human factor occur when the human machine at the controls is not functioning the way it should. It's out of tune, running a little rough, developing a ping. Nothing really wrong and nothing that can't be easily fixed; but ripe for the conditions investigators have to label "pilot error."

The medics, the commander, the instructor, the other pilots in the outfit can easily spot a person in the clutches of Asian flu, whooping cough, or the 7-year itch. No trouble at all. Pilots with such ailments are kept on the ground until cured. But spotting the person just slightly out of whack, ready for one of those sudden reversals of form that confuse everybody, is not quite so simple. He may be out of tune physically, emotionally, or both, and the naked eye sees nothing. He may act cheerful as a chipmunk and yet be gnawed on by marital problems or the state of a sick child. Or be ready to blow his top because the in-laws are running him into the ground and still look as serene as a poker player with four aces.



The human being is a complicated critter and some emotional disturbances are brought on by causes so deep a pilot doesn't even know they're there. All of us are constructed out of such a mess of instincts, fears, anxieties, resentments, frustrations, reactions, and desires that it's a wonder we operate at all; or have sense enough to roll over. But we do and we usually make out all right. Still, if one of these inner anxieties gets out of hand, maybe without our even being conscious of the same, we can be in for trouble.

## Unnatural act

Take this matter of flying. For all of us, it's an unnatural act. Man is a creature of the land, designed to operate on the surface

of the earth. He may get used to being airborne in time but will never be fully at home aloft. What's hard to face up to is that most people share a touch of natural fear or apprehension about being up there with the birds.

Older pilots know this uneasiness is just something that has to be lived with. Placed in proper perspective, it turns into healthy caution, a respect for the peculiar problems of flying. They also know this uneasy feeling can assume such proportions it clouds a man's judgment. So far as the Army knows, few recorded mishaps can be laid directly to downright fear of flying, but there is no way of telling how many young pilots right now are repressing an abnormal apprehension that may someday bring them to grief. The uneasiness turns into the freezing kind of fear that causes the sudden reversal or brings on the one false move that upsets all the right moves a person has been trained to make.

A sudden emergency can turn repressed fear into catastrophic results. So the inexperienced pilot trying to sit on an outsized sense of fear needs to do a little leveling. He ought to ask himself why he became a pilot in the first place. After all, there's nothing shameful in the simple fact that some people are no more suited to flying than others are to playing the tuba. **No person ought to fly unless, deep down, he really wants to.** The pilot who basically dislikes flying but insists on sticking with it is very likely to be the one who pushes the wrong button, yanks the wrong lever, or just plain chokes up when the going gets rough. He's not a coward, just a person in the wrong line of work.

Nobody wants Army pilots to turn themselves into do-it-yourself flight surgeons or psychologists. Nevertheless, a capacity for mature self-appraisal is a valuable asset, a very important part of which is knowing when the time has come to go to somebody else for aid and comfort.

A curious truth is that the strong, silent fellow is very often the first one to fly all to pieces or find his blood pressure shooting way out of sight because he feels it's a weakness to get something off his chest.

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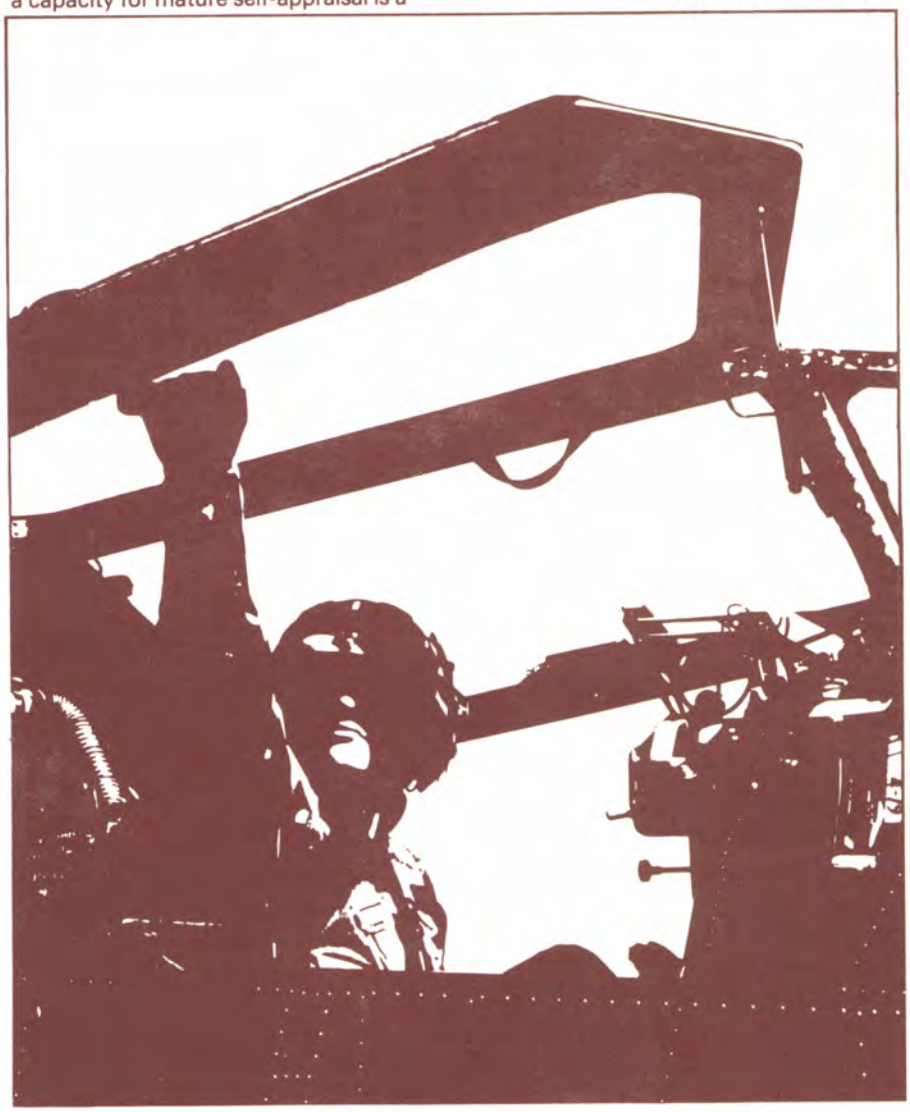

# Fit as a fiddle?

The very first person someone troubled in body or spirit ought to turn to is his or her own mate. Unfortunately, some Army pilots have no mates and many who do find themselves separated from their better halves by thousands of miles. But unless you are completely isolated, there are friends, fellow crewmembers, roommates, and others within earshot. While you may consider these poor substitutes for a mate, they can and most will lend a sympathetic ear, **but only if you tell them.**

A person needs somebody he can tell his woes to. Worry causes confusion. Confiding usually brings relief. With a load off his mind, a pilot's efficiency in the air goes up sharply.

## Stop and look

All of us have days when it just doesn't pay to get up. What to do on those days? Sit tight, take a couple of deep breaths, and face the fact that this is not going to be your day. Apply the brakes. Extra caution is strictly in order.

Since everybody is different from everybody else, there is no exact yardstick by which human beings can measure just how far off the mark they are. The person whose day started off badly can only check the way he feels now against the way he **usually** feels and act accordingly. The point is to stop and take a long, cool look at the situation.

Even feeling too good can be bad. Has your mean, rich uncle in Seattle finally cashed in his chips and left you loaded? Have the powers-that-be recognized your merit and come through with a well-deserved promotion? Cause for rejoicing, sure, but keep a firm grip on yourself.

Complacency or inattention, whether caused by weal or woe, can lurk behind the error that lies behind the mishap. Nobody can put his finger on precisely how many crackups are caused by letting high spirits cloud the judgment, but it is a safe guess that some of them are. Everybody admires the person who whistles while he works. The trick is not to let the whistling take up more attention than the job at hand.

What pilots eat, or fail to eat, is another factor behind pilot error mishaps. The carelessness of some folks, young and old, never ceases to amaze the doctors. What a person takes in, of course, is directly related to his efficiency as a human being.

The human body is a machine that works on the energy manufactured from the food it consumes. A body needs fuel just as an aircraft does and it has to be the right octane too. Nobody ever attempted to fly an aircraft fueled with dishwater and old ground-up rubber boots. Still, some people who laugh at that idea don't give much thought to what kind of fuel they consume themselves. They either eat too much, too little, or improperly. If they happen to be Army pilots, they're sure candidates for that pilot error label.

The human body works on the glycogen stored in the liver and produced by glucose, a first cousin of lactose, or blood sugar. Carried by the blood, glucose—or blood sugar—is a highly desirable item to have floating around in one's insides. In fact, if blood sugar level drops below a certain point, anybody is in trouble—**anybody.**

When the little man from outer space asks for the boss of your flying machine, there's only one answer. As an Army pilot, you're it. You're the one with what the commercial airlines people call "pilot responsibility." Your passengers and their families, your life, and the happiness of your household are strictly in **your** hands. One small clip can bring tragedy to a great many people.

The longer a person flies, the more emergencies will come along to test his abilities. Only a finely tuned, responsible person can cope with them all as they arise. ■

# Mishap review

## Synopsis

As the AH-1S was being maneuvered to a simulated firing position, the crew spotted "enemy" infantry elements 25 meters to their left. The aircraft was being hovered at treetop level with a forward speed of about 5 knots. While a pilot with only 30 hours in the AH-1S, flying from the rear seat, engaged the infantry element, the tail rotor hit a tree. The aircraft yawed right and landed hard.

## History of flight

The mission required aircrews to train with armor elements during a free play exercise. Five aircraft were to participate.

After 1 ½ hours of terrain flight operations, the AH-1 crew was directed to move into a simulated firing position and prepare to engage the enemy. After crossing a dirt road atop a knoll, the newly rated Cobra pilot, who was flying the aircraft from the rear seat, saw ground troops and equipment which belonged to the opposing forces about 25 meters to the left. The pilot slowed the aircraft, which was moving forward at about 5 knots, and simulated engaging the ground troops with the 20 mm turret gun which was slaved to his helmet sighting system. The main rotor system was above the 40- to 45-foot trees, and the fuselage was below the tops of the trees.

During the simulated engagement, the crew heard a chattering sound and felt the aircraft vibrate. The vertical stabilizer and tail rotor had hit a tree. The pilot increased collective slightly and applied left pedal while checking his cockpit instruments, which were indicating normal. The Cobra began to slowly turn to the right. The pilot and PIC tried to compensate for the right turn with left pedal.

Realizing the pedal control input was ineffective, the PIC rolled the throttle to the flight idle position and tried to cushion the aircraft onto the ground. During the descent, the main rotor blades hit a tree to the right front of the aircraft. The aircraft touched down hard, slightly nose high. The tail boom fractured and the 90-degree tail rotor gearbox separated. The pilot sustained a minor shoulder injury.

## Crewmember experience

The 32-year-old PIC had almost 1,400 rotary wing hours, with almost 400 in AH-1s. The 22-year-old pilot had more than 800 rotary wing hours, with more than 50 hours in AH-1s.

## Commentary

The hard landing occurred after antitorque control was lost because of a tree strike while the aircraft was being operated NOE at treetop level. The aircraft fell the last 15 feet because of insufficient rotor rpm. Rotor rpm was low because the collective control was not reduced when the throttle was retarded to flight idle to compensate for the loss of antitorque control. Rotor rpm was further degraded by the main rotor blades repeatedly hitting a tree during the descent.

The pilot inadequately divided his attention on ground troops and flying the aircraft. His attention was channelized on the troops located 90 degrees to his left while slowing the aircraft. The tail rotor was allowed to hit the tree without the pilot recognizing that the aircraft was either drifting left and descending, or the nose was turning right.

The ground at the impact site sloped to the west at an angle of 2 to 3 degrees. This could have led the pilot to descend and decelerate at the same time as he tried to keep the aircraft masked in the trees.

The pilot's limited experience may have contributed to his failure to correctly judge the distance of the tree to the tail rotor. During the postaccident checkride, objects that he estimated to be 8 to 12 feet left of the tail rotor were actually 4 to 8 feet away.

Relatively inexperienced pilots should not be placed in the pilot position of an AH-1S for demanding NOE missions, unless it is understood that the more experienced pilot (PIC) will not use the TSU while conducting the mission. It is felt that when the aircraft is being operated in the NOE environment with an inexperienced pilot that the PIC must continually monitor the aircraft and its position. The PIC can not properly perform his duty as PIC if he is looking through the TSU.

Unit commanders should establish training and evaluation programs to better prepare pilots to safely perform crew duties from the rear seat of the AH-1S. ■

# Followups

## Additional information on mishap briefs previously published

**uh1** **Class A mishap** in 19 Mar 80 issue (8031) ☐ Aircraft, returning from MAST mission and flying about 75 feet agl, hit powerline. Main rotor push-pull tubes were severed, and aircraft became uncontrollable and crashed, coming to rest inverted. Pilot was probably operating at low altitude to assure visual meteorological conditions because aircraft was restricted from instrument flight (pilot's attitude indicator was inoperative). Variance of altitude by 200 feet and repeated warnings by the other crewmembers of low altitude indicate pilot was not properly monitoring flight altitude.

**ah1** **Class A mishap** in 7 May 80 issue (8035) ☐ Power loss occurred during tactical low-level flight. Pilot autorotated to open field and aircraft was damaged during landing. Power loss was caused by stripped fuel control gear shaft internal splines in fuel control drive shaft contact area, which were caused by severe fretting. Cause for severe fretting and ultimate stripping has not been established. Pilot did not enter autorotation until he placed the governor auto/emer switch in the emergency position in an unsuccessful attempt to regain engine rpm. This action caused a significant loss of rotor rpm, altitude, and airspeed, resulting in very low rotor rpm at termination of autorotaton.

**ch47** **Class A mishap** in 12 Mar 80 issue (8029) ☐ During maintenance test flight for installation of No. 1 engine, combining transmission phasing arm attaching bolt sheared, allowing internal phasing mechanism to decouple. This failure resulted in loss of power to forward main transmission and subsequent meshing of forward and aft rotor systems. Aircraft crashed in wooded area.

**oh58** **Class A mishap** in 16 Apr 80 issue (8034) ☐ Pilot initiated 90-degree right pedal turn while hovering out of ground effect over top of ridgeline. When pilot applied left pedal to stop turn, aircraft continued to spin to right uncontrollably due to loss of antitorque effectiveness. Aircraft hit ground while still spinning. A definite cause for this mishap could not be determined. ■

## New AR covering accident reporting now in effect

The new, revised AR 385-40, Accident Reporting and Records, became effective 1 October 1980. This AR implements the new aviation mishap reporting criteria and the new, revised DA Forms 285 and 285-1. Copies of the revised AR are available from the Baltimore Publications Center. Copies of the revised DA Forms 285 and 285-1 must be requisitioned from the St. Louis or Baltimore publication distribution points.

The revised 385-40 makes provisions in par. 5 (a) of the PRAM to include the type of event in addition to the mishap classification, specifically for Classes D and E. The types of events, whichever are applicable, to be shown after the mishap classification are precautionary landing, forced landing, human factors event, aborted takeoff, multiple aircraft event, misappropriated aircraft, drone aircraft, cargo personnel handling equipment and storage event, and contractor aircraft mishap. This information is needed for analytical purposes.

The new AR 385-40 also requires, at paragraph 8, that the degree of injury be identified. Pending receipt of a copy of the revised regulation, the following should be used for that purpose: fatality, permanent total disability, permanent partial disability, lost workday case—days away from work, injuries greater than first aid but not involving days away from work, i.e., restricted activity, or none. These descriptions are also to be used when filling out the applicable portion of the DA Forms 2397-1 and 2397-11.

Requisition the new AR and DA reporting forms now. All accident reporting after 1 October must be in accordance with the new regulation. ■

# Selected mishap briefs

**uh1** **Class C mishap** ☐ (H series) HIT checks had been completed, and maintenance test pilot was preparing to move aircraft to parking area. With aircraft still light on skids, pilot looked at egt gauge for a final check and then looked outside aircraft. Aircraft attitude seemed to be right skid low, with aircraft rolling to right. Pilot assessed the situation as dynamic rollover and abruptly lowered collective. Aircraft landed hard. Slope in area was less than 3 degrees.

**Class E mishaps** ☐ (H series) Total hydraulics failure occurred during flight. Caused by leaking right lateral servo. ☐ (H series) Engine rpm dropped to 6000 during takeoff and would not recover. Caused by failure of overspeed governor. ☐ (H series) Pilot noticed feedback in cyclic control and heard unusual noise. Skin had separated from main rotor blade. ☐ (H series) Engine would not maintain 6600 rpm after level-off. Caused by failure of VIGV actuator. ☐ (H series) Master caution and hydraulic lights came on. Caused by faulty hydraulic pressure switch. ☐ (H series) Main rotor blade was not turning when $N_1$ reached 15 percent. Start was aborted. Caused by failure of input quill assembly.

**ah1** **Class E mishaps** ☐ (S series) During practice autorotation, pilot applied excessive initial collective pitch at 20 feet agl. IP took control, but aircraft landed hard.☐ (G series) Crew encountered unforecast low ceilings and visibility, and mission was aborted. ☐ (G series) Master caution light came on. Caused by defective engine oil pressure switch.

**ch47** **Class E mishaps** ☐ (A series) Hydraulic fluid was seen spraying from companionway. No. 2 flight boost warning light came on after aircraft was landed. No. 2 SAS line was broken at SAS filter. ☐ (C series) Flight engineer noticed heat buildup in vicinity of ramp and saw hydraulic fluid leaking from hydraulic oil cooler fan. Machine bolt that mounts impeller fan failed, causing oil cooler fan assembly to fail.

**ch54** **Class E mishap** ☐ (A series) Rotor speed increased to 110 percent during approach. Postlanding inspection revealed bearing had failed, allowing bevel gear shafts to become disengaged in $N_2$ gearbox.

**oh6** **Class C mishap** ☐ Antitorque control was lost during landing, and aircraft landed hard.

**oh58** **Class A mishap** ☐ (A series) Aircraft was flying above a road at contour altitude and airspeed. As aircraft crested a hill, it hit a jeep coming from the opposite direction. Tail boom and tail rotor hit jeep and tail rotor blades separated. Control was lost, aircraft crashed, and pilot was killed. 8068

**Class E mishaps** ☐ (A series) $N_2$ fluctuated and then decreased below 95 percent during hover for takeoff. Caused by governor failure. ☐ (A series) Master caution light came on during landing. Caused by failure of fault panel. ☐ (A series) Transmission oil pressure light came on. Caused by failure of pressure switch.

**c12** **Class E mishap** ☐ (A series) During flight, pilot noticed No. 2 engine inboard left rear cowling was open. Aircraft was landed and cowl lock secured.

**t42** **Class E mishaps** ☐ No. 2 alternator circuit breaker popped and battery charge light came on. Caused by failure of No. 2 engine starter. ☐ Battery charge light would not go out and left alternator would not carry electrical load. Caused by failure of left alternator. ☐ Fuel began siphoning from left main fuel cell during flight. Fuel cap was not properly seated.

**u21** **Class C mishap** ☐ (A series) Aircraft hit bird, denting leading edge of wing 3 inches inboard of main fuel tank filler cap.

**Class E mishaps** ☐ (A series) Flaps stuck in down position. Caused by failure of flap motor. ☐ (RU-21H) As aircraft was climbing through 14,000 feet, airspeed indication dropped to 50 knots and then fluctuated between 40 and 100 knots. Pilot lowered nose and then realized pitot static system was malfunctioning. Aircraft was landed. Ice had formed on pitot tube, causing erratic airspeed indications. Heating element of pitot tube had failed. ☐ (RU-21H) Pilot saw fuel siphoning from left wing fuel cap during takeoff. Cap had been improperly secured.

## Maintenance

**ch54** **Class E mishap** ☐ (A series) Flight engineer saw smoke in No. 2 engine area. After aircraft was landed, hydraulic fluid was seen smoking on engine exhaust cover. Threads were stripped on manifold. Jam nut was too tight.

**oh58** **Class E mishap** ☐ (A series) Master caution and segment light came on during approach. Special oil sample analysis revealed particle on magnetic plug, which

*(continued on next page)*

# Mishap briefs

appeared to be chrome plating flake from screwdriver.

**u21** **Class E mishap** ☐ (A series) Gear would not retract during takeoff. Caused by incorrectly adjusted landing gear safety switch.

**c7** **Class E mishap** ☐ First indication of landing gear malfunction was red light in gear handle and no green safe light for right main gear. Visual check revealed gear was resting on gear doors that were partially open about 4 to 9 inches. Normal gear extension procedures were used at 150 knots. Left main gear and nose wheel extended, and right main gear remained on gear door. Gears were retracted and extended again at 170 knots. Left main gear and nose wheel extended normally, and right main gear doors were forced open by the increased air load. Safe indication was verified by visual check and aircraft was landed. Left and right main landing gear uplock roller bracket (inboard) push rod had been removed and replaced with outboard push rod. The parts are not interchangeable, being about 1 inch different in length. This caused inboard main gear door to malfunction. Drop and retraction test had not been made.

## Urgent changes

The following urgent changes have been released:

- Change 4, dated 11 Aug 80, to TM 55-1520-235-CL.
- Change 12, dated 20 Aug 80, to TM 55-1520-214-23.
- Change 13, dated 11 Aug 80, to TM 55-1520-235-10.
- Change 8, dated 24 Jul 80, to TM 55-1520-228-10.
- Change 12, dated 24 Jul 80, to TM 55-1520-235-10.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Note for OH-58 pilots

The OH-58A and C operators manuals have been changed (change 8 and 12 respectively) to include an emergency procedure (par. 9-25.1) for loss of tail rotor effectiveness. It is recommended that all OH-58 pilots become intimately familiar with this emergency procedure. USASC has requested that USAAVNC develop associated training/tasks to prepare the OH-58 pilot to better understand, cope with, and recover from loss of tail rotor effectiveness. ■

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# OH-58 low hydraulic pressure warning

What should you do when the hydraulic pressure caution light on your OH-58 comes on in flight? An elementary question? Possibly, but don't be too sure.

The OH-58 Operators Manual for both the A and C models is quite specific as to the action the pilot should take when the light illuminates in flight and the forces necessary for control movement increase. But what if only the caution light comes on? Should you set the aircraft down at the first suitable area you spot? Should you make a precautionary landing at the nearest airfield? Or, after determining that the controls are functioning normally, should you disregard the light and log the discrepancy in the DA Form 2408-13 after you complete your flight to your intended destination? Presently, the operators manual provides no specific guidance concerning this particular situation. Yet, your choice of action can possibly make a big difference in the outcome of your flight.

A recent precautionary landing not only brought this matter to light but also surfaced some maintenance deficiencies in the process.

The occurrence itself was an uncomplicated one. Briefly, the pilot of an OH-58C found it difficult to move the collective pitch control shortly after takeoff. So he returned to the airfield and landed. Inspection revealed the cause to be loss of hydraulic pressure as a result of contaminated fluid and hydraulic pump failure.

However, the significance of this precautionary landing lies in the events that preceded it. These began when the hydraulic pressure caution light came on and stayed on—several days before the flight in question. After performing a routine check, maintenance personnel assumed the problem to be a defective hydraulic pressure switch. This assumption was based, in part, on the fact that control operation was normal and no evidence of leakage or loss of hydraulic fluid existed. As a result, an entry to the effect that the hydraulic pressure segment light stayed on continuously was made on the -13, and the aircraft was continued in operation on a red diagonal status until a replacement switch could be obtained.

Pilots who subsequently flew the aircraft assumed that the problem was a defective switch and did not question the validity of the red diagonal status symbol. The end result was that the aircraft remained in operation until the hydraulic system failed.

On looking back, we can see that a red X symbol should have been used to indicate the status of the aircraft. This symbol was in order because of the potential seriousness of the problem.

When control operation is normal, yet the caution light remains on, the indication is that the problem is associated either with incipient hydraulic system failure or with the warning circuit itself. If the light

actually indicates impending hydraulic system failure, the aircraft should obviously be restricted from further flight. But even if the cause lies within the warning circuit, the aircraft should not be flown. A continuously burning light cannot warn the pilot of any hydraulic problem that might develop during flight. In either case, the possible threat to safety posed by the undetermined cause is sufficient to warrant the use of a red X symbol. In the past, failure to use correct symbols has resulted in numerous mishaps, including fatal ones.

Following the entry of a red X status symbol, maintenance personnel should have determined the cause by using normal troubleshooting procedures. The discrepancy should then have been cleared before the aircraft was released for flight.

But just as the mechanic has a responsibility in this matter, so does the pilot. While the operators manual presently does not address this particular condition, it does stipulate in the "engine runup" paragraph that the hydraulic pressure caution light should be OUT. A logical approach in this instance would have been for the pilot to have consulted with maintenance personnel. Had this been done, the status symbol would probably have been changed to a red X.

Although hydraulic system failure in the OH-58 does not normally pose as serious a threat to safety as it would in some other type aircraft, it can result in mishaps. Much depends on the pilot's mission and the phase of flight when hydraulic failure occurs. For example, sudden stiffness or feedback in the controls during some critical NOE maneuver could produce a tail rotor strike, or worse. Therefore, in situations such as this one, it's a good idea for the pilot to question maintenance, know what effects a particular condition can have on the aircraft, and then make a rational decision as to whether or not the aircraft should be flown.

Not only should the pilot insure he reads and understands the effects of any writeups in the -13 but also any that may be found in the DA Form 2408-14 (Uncorrected Fault Record). Some delayed corrective actions could possibly put a pilot on the spot.

A check of the -14 of a twin-engine fixed wing aircraft, for example, showed that the No. 2 engine fire warning light would periodically illuminate during flight. By itself, the condition could cause the pilot some concern—not knowing for certain whether the light came on as a result of the circuit problem or whether the engine was actually on fire. However, it was the -14 entry that immediately followed this one that "put the frosting on the cake." It stated that the engine fire extinguishing agent was exhausted.

As pointed out, present emergency procedures do not address the problem of the hydraulic pressure caution light illuminating in the OH-58 while controls continue to function normally. The Army Safety Center has submitted a DA Form 2028, recommending that the procedures listed below be incorporated in the operators manuals for both the OH-58A and C models. In essence, these procedures instruct the pilot to take the following action:

1. Land as soon as practical at an area that will permit a run-on landing (approximately 5 knots groundspeed).

2. Just prior to initiating approach, turn the hydraulic boost switch to the OFF position.

In addition, the following **warning** is to be heeded:

To prevent variations of hydraulic pressure from adversely affecting aircraft control, **do not return the hydraulic boost switch to the on position.**

One final thought: As a pilot, be sure you know what uncorrected problems exist aboard the aircraft you are to fly and understand the effect, if any, these problems can exert on you. Then, act accordingly. ■

# Use your checklists

Checklists may sometimes seem to be a pain, especially when you've been operating a particular type of aircraft day in and day out for months, or maybe years; but you'd better make sure you keep on using them—even if you can recite every step verbatim.

Engines have failed because fuel quick disconnects were improperly secured, and flight controls have been rendered immovable because external gust locks were not removed before flight. These are just two examples of many that have resulted in serious mishaps—some catastrophic—in the past. Yet, in each of these instances, the use of a checklist during preflight would have prevented the mishap.

Recently, a major portion of an OH-58 oil cooler fairing assembly separated from the aircraft. Curiously, loss of the fairing was not noted until the aircraft was hovered into the parking area. It is suspected the assembly was not completely secured before flight, and a large section was torn from the aircraft. The damage cost for this mishap was nearly $1,000. However, in this instance, the price was low compared with what it could have been in terms of personnel and equipment had the fairing struck either the main or tail rotor blades.

Another recent example involved an OH-6 pilot who was in a hurry to complete engine operational checks on a number of aircraft. When he began his fifth runup of the morning, he felt aircraft vibrations and he shut down the engine. Inspection revealed the tail rotor cover, which was the same color as the tail rotor blades, had not been removed.

Two other recent mishaps occurred when the engines of UH-1 aircraft were started while tiedowns were still attached to the main rotor blades.

In one case, the aircraft was being readied for preflight by the crew chief who, by habit, left the main rotor tiedown installed while he took a fuel sample. This particular tiedown had a 3/8-inch rope streamer and was overlooked during preflight inspection.

During the 1 ½ hours the aircraft was flown, the pilot noted what he thought to be a lateral vibration. On landing, he found the rope tiedown still attached to the main rotor blade. Following inspection for damage, the aircraft was grounded.

In the second instance, the aircraft was started with the aft tiedown hanging on the main rotor blade. The tiedown struck the tail rotor, causing a 3-inch tear to one tail rotor blade and a 1-inch dent in the tail boom.

These are just a few examples of recent mishaps that have resulted from improper preflight inspections. Not only are they expensive, but sooner or later, you can bet that a serious mishap will occur if corrective measures are not taken to insure preflight inspections are properly accomplished.

And the solution is short, simple, and clear. It is found in AR 95-1, Section II (Operational Standards), page 3-3, paragraph 3-13 and subparagraph 3-13b. These state the following:

". . . The unit commander will ensure that . . . operators' and crewmembers' checklists are used for all preflight, ground runup, and shutdown checks."

Any questions?

# Shortfax

## Alignment of CH-47 automatic speed trim system

The speed trim system is used to program the aircraft rotor heads for different sections of the flight envelope. To maintain maximum stability of the aircraft, these heads are positioned at different angles automatically during the course of flight through acceleration and deceleration. More simply, the rotor is at one angle for 60 knots airspeed and quite a different angle for 120 knots. Understandably, the angle for 120 knots will cause stress problems if the aircraft is really flying at 60 knots. For safety reasons a manual operation feature is incorporated should a system failure occur.

Some avionics maintenance personnel are attempting to align or program the CH-47 speed trim system while the aircraft is in flight. This procedure has been developed in the field by technicians for several different reasons, i.e., lack of proper TMDE, expediency, etc., but it cannot be condoned. Under no circumstances should the CH-47 speed trim system be aligned in flight. Due to equipment limitations, it is possible to overprogram the system and put undue stress on the aircraft. In addition, verification of actual control settings cannot be made while airborne. For proper alignment, refer to TM 11-1520-209-20.

**—from U.S. Army Communications and Electronics Materiel Readiness Command**

## Water purification tablets

Message 241925Z Sep 80, from U.S. Army Medical Materiel Agency, Fort Detrick, MD, identifies the following water purification tablets (NSN 6850-00-985-7166) as unsuitable for issue and use. These tablets should be destroyed.

| Lot number | Retest date |
|---|---|
| 120-4723-221 | Feb 80 |
| 1311-702 | Oct 80 |
| 1311-705 | Aug 80 |

Message 241924Z Sep 80, from USAMMA, states the Defense Personnel Support Center advises that the lots of water purification tablets listed below were tested and found suitable for issue and use provided the unit has a good wax closure and shows no evidence of physical deterioration. A retest date of two years is etablished for the following lots.

| Lot number | Retest date |
|---|---|
| 1311-701 | Oct 82 |
| 1311-711 | Oct 82 |
| 1311-712 | Oct 82 |
| 1311-714 | Oct 82 |
| 1311-715 | Oct 82 |
| 1311-716 | Oct 82 |
| 1311-718 | Oct 82 |
| 1311-720 | Oct 82 |
| 1311-728 | Oct 82 |
| 2849-581 | Sep 82 |

## Army approves tool accountability project

The Army has approved a standard tool control program designed to increase tool accountability for individual mechanics. The Army program builds upon successful tool control programs developed by the British Navy and Air Force and adapted by the United States Navy and Air Force. It is currently being implemented by a reconfiguration of the standard aviation mechanic's toolkit.

Under the Army tool control program, toolboxes are being reconfigured as composite toolkits. Each tool is placed in a specific slot molded to its shape in a plastic inlay. A mechanic can then tell at a glance if a tool is missing.

Individual tools are being marked with tape which is color-coded to a specific mechanic's toolkit. A misplaced tool can thus be matched by its tape color to the toolkit of its user. Seldom-used tools are being stored in a central control area and issued to mechanics as needed, thereby reducing the accountability problem, and at the same time, reducing the number of tools required in the toolkit.

If use of the program with the aviation mechanic's toolkit proves successful, it will be extended to other Army toolkits.

**—from ARMY LOGISTICIAN**

# Selected mishap briefs

**uh1** **Class C mishaps** ☐ (M series) After completing firing mission, aircraft hit top of tree, breaking right chin bubble and damaging ADF sensing antenna cover. ☐ (H series) Aircraft hit wire during final approach at 75 feet agl, breaking windscreen and greenhouse.

**Class E mishaps** ☐ (H series) KY-28 module vibrated off mount and jammed between antitorque tail rotor pedals and cockpit floor. Pilot reduced collective and throttle and landed. Security of KY-28 was not checked before flight. ☐ (H series) Collective was reduced from 25 pounds torque to 20 pounds torque during approach. Aircraft yawed 10 to 20 degrees left and then right. Yawing continued for 5 seconds, collective was further reduced, and yawing stopped. $N_2$ rpm momentarily decreased from 6600 to 6000. Postlanding inspection revealed P-3 air line had failed just past the elbow where the braided hose is swaged underneath the stainless steel collar. Air line leak caused bleed band actuator to cycle. ☐ (H series) Crew heard squeal from transmission area. Hydraulic and master caution lights came on, and hydraulics failed. Running landing was made. Failure of right cyclic servo irreversible valve seals caused hydraulic fluid to be pumped out of weep hole.

**uh60** **Class E mishap** ☐ Aircraft, carrying sling load, accelerated to 105 knots. Pilot felt load begin to oscillate, slowed aircraft, and felt two distinct thumps. Sling load was placed on ground and aircraft landed. Two holes were found in bottom of aircraft about 6 feet aft of cargo hook.

**ah1** **Class E mishaps** ☐ (S series) Crew heard unusual noise from behind pilot's station, aircraft began to vibrate, and tail rotor pedals became stiff. Power and forward cyclic were applied to maintain airspeed above 50 knots, and running landing was made at airfield. Caused by failure of No. 1 hydraulic pump. ☐ (S series) Aircraft shuddered violently at 105 knots and 500 feet agl. Aircraft continued to shudder until approach was terminated at hover. When aircraft was moved to level ground for landing, shudder returned. Caused by loose counterweight in blade. ☐ (S series) Transmission oil bypass light came on. Caused by failure of transmission oil pressure switch.

**ch47** **Class E mishaps** ☐ (C series) No. 1 engine torque needle spun continuously during runup and would not stabilize. Caused by failure of torquemeter power supply. ☐ (C series) During SAS functional check, pilot noticed cyclic moving laterally in both directions. Caused by malfunction of stick boost actuator. ☐ (C series) Heater fuel line leak was noticed during runup. Caused by deteriorated rubber lining in fuel line. ☐ (C series) Crew chief saw hydraulic fluid leaking from No. 1 boost manifold during flight. Caused by cracked O-ring in manifold.

**oh58** **Class A mishap** ☐ (A series) Aircraft was on autorotative flying qualities demonstration flight. Contact was lost, and aircraft was found wrecked near shore line. Pilot and copilot were killed. Indications are that main and tail rotor blades departed aircraft before impact. 8110

**Class E mishaps** ☐ (A series) Pilot, on joint air attack training mission, felt something strike aircraft. Three 105mm rounds had burst within 100 meters of aircraft, and tear was found in skin below passenger door. Pilot did not insure area was clear. ☐ (A series) Aircraft had been operating in military training area at NOE altitudes. Postflight inspection revealed about 60 feet of tow wire wrapped around mast. Further inspection revealed tow wire inside inner ring of swashplate. Training area had obviously not been adequately policed. ☐ (A series) $N_2$ gauge fluctuated during flight. Caused by bad pin in cannon plug attaching $N_2$ tachometer to lead wire.

**c12** **Class E mishaps** ☐ (A series) Right bleed air annunciator light came on. Caused by failure of shutoff valve. ☐ (C series) Postflight inspection revealed fuel leaking from forward edge of left wing at outboard nacelle. Caused by failure of fuel pressure switch. ☐ (C series) No. 2 engine oil pressure went to zero on final approach. Caused by failure of pressure transducer.

**ov1** **Class E mishaps** ☐ (D series) Pilot was making short field/minimum run landing during evaluation flight. On touchdown, pilot applied aft stick, raising nose of aircraft off runway, and simultaneously applied full reverse power. Nose gear touched down hard, causing tire to rupture. IP anticipated pilot's actions by placing his hand aft of power levers. However, he was unable to restrict move into reverse because of the force with which the pilot

applied reverse thrust. ☐ (D series) No. 2 engine oil pressure fluctuated during flight. Caused by malfunction of engine oil pressure gauge.

**t42** **Class E mishaps** ☐ Landing gear relay popped and gear had to be hand-cranked down. Aircraft was put on jacks and gear recycled 10 times with no problems. Mechanic hand-cranked gear and felt slight binding. Landing gear actuator was removed and diassembled. Handcrank was bent and worm gear bushing was broken, causing actuator to intermittently bind. Indications are handle was nct properly stowed at some time and was engaged when motor was used to lower gear. This would have caused bushing to be damaged and handle to be bent. ☐ Aircraft was making approach to landing under GCA control in actual weather conditions at night. No. 1 alternator became inoperative because of broken wire. Electrical load being placed on second alternator exceeded capacity of alternator, causing it to drop off line, resulting in total electrical failure. Copilot secured flashlight and directed it on critical instruments during final stages of flight. Pilot continued GCA and aircraft was landed with no damage.

**u21** **Class C mishap** ☐ (A series) Nose gear did not fully retract during takeoff. Aircraft was landed at airbase with main gear retracted and nose gear partially retracted. Props, flaps, landing gear, and underside of aircraft were damaged. Nose landing gear actuator failed.

**Class E mishap** ☐ (A series) Right engine would not develop takeoff power. Caused by failure of fuel control.

# Maintenance

**uh1** **Class C mishap** ☐ (H series) Engine was flushed by maintenance personnel because of recent flight in salt water environment. Pilot then began normal maintenance operational check on aircraft. During engine runup procedures, pilot advanced throttle to engine idle position and completed required checks. Pilot then began advancing throttle toward full open position. At about 5500 rpm, pilot heard explosion, saw smoke coming from rear of aircraft, and noticed engine instruments dropping. Throttle was closed and battery switch turned off. Engine was destroyed by screwdriver, which was apparently not removed following maintenance operations.

**ah1** **Class E mishap** ☐ (G series) Collective became stiff during takeoff and could not be lowered below 25 psi torque. Pilot made running landing, using throttle to control altitude. Caused by incorrect torque on collective uniball.

**oh58** **Class E mishaps** ☐ (A series) Engine noise and $N_2$ decreased shortly after takeoff. Collective was lowered and aircraft autorotated to dirt road. Caused by backed-off fuel nozzle. ☐ (A series) Turbine tachometer needle fluctuated during landing. Caused by loose cannon plug on $N_1$ gauge.

**u3** **Class E mishap** ☐ When gear was extended for landing, green light did not come on. Gear was cycled several times. Aircraft was flown by control tower, and gear appeared to be down and locked. Aircraft was landed without incident. Right landing gear switch was found to be slightly out of rig.

**t42** **Class E mishap** ☐ Nose gear position indicator gave faulty indication during landing. Gear position was verified down with nose gear mirror and visual check by tower personnel. Landing was made without incident. Caused by improper adjustment of control cable to nose gear position indicator. *(continued on next page)*

# Mishap briefs

**u21** **Class E mishap** ☐ (A series) Pilot noticed oil streaming from No. 1 engine cowl after takeoff. Engine oil pressure started to fluctuate. Pilot shut down engine and made single-engine landing. Oil cap was not installed. Crew chief had taken oil sample from engine while aircraft was on the ground at airfield and did not secure oil cap. Pilots did not make preflight inspection as required in operators manual for stop-over flights.

## Messages received

• Safety-of-flight message concerning UH-60A tiedown assemblies (UH-60A-80-38, 141235Z Nov 80). Summary: Improper installation can allow tiedown assemblies to slip off the retaining bolt. These assemblies are used for transportability and rapelling. Contact: Dennis Schumacher, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight technical message on M5 dispersing system (GEN-80-27, 142010Z Nov 80). Summary: Operations using M5 dispersing system may be resumed after actions listed in message have been accomplished. Contact: Ray Boland, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight technical message concerning inspection and replacement of nuts on tail rotor drive shaft clamps on EH-1/UH-1 and TH-1/AH-1 helicopters (AH-1-80-24, UH-1-80-16, 172010Z Nov 80). Summary: Certain nonslotted self-locking nuts have been authorized for use on tail rotor drive shaft clamps in addition to the slotted self-locking nut. When units receive these nuts, they should replace nuts identified as discrepant. Contact: W. W. Lake, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Maintenance notice advising maintenance personnel of CH-47 pitch link bearing wear limits (CH-47-80-14, 191545Z Nov 80). Pitch links are being unnecessarily removed because technical manuals still contain outdated bearing wear tolerance of 0.006 inch. The new value is 0.01 inch.

• Maintenance notice concerning AH-1 tail rotor drive shaft bearings (AH-1-80-25, 211505Z Nov 80). Message emphasizes the importance of daily inspection of tail rotor drive shaft installation.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# Mishap review

## Synopsis

While operating at night from an unlit, unmarked, snow-covered, tree-lined field site, the pilot of an OH-58A allowed his aircraft to drift backwards and hit a tree. The aircraft was flown out of the tree, spun right 720 degrees, and landed hard.

## History of flight

The mission was a night navigation training flight consisting of five OH-58As. The aircraft were to depart the snow-covered landing zone at 5-minute intervals. Because of starting problems, the aircraft scheduled as No. 2 became the last aircraft to take off.

The pilot preflighted the aircraft, using a white light flashlight to inspect the pillow block reservoirs. He used a Cyalume light (green chemical safety light) for the rest of the preflight. After getting in the aircraft, the pilot checked the landing light by turning it on and off.

The pilot had the aerial observer remove the copilot's cyclic stick and place it in the passenger compartment. The stowage clip on the pedestal was broken.

Four of the aircraft took off. The pilot of the fifth OH-58 hovered his aircraft backwards away from the tree line—about 50 feet— and made a right pedal turn to align with the takeoff direction. He made a before-takeoff hover check at about 3 feet. Completing the check, he increased the collective to make an out-of-ground-effect hover check. During this procedure, the cyclic control moved left and aft and the aircraft began to drift to the rear. The pilot repositioned the cyclic forward in an attempt to level the aircraft and stop rearward movement. The aircraft continued to move backwards until the tail rotor hit a tree.

The pilot centered the cyclic control, and the aircraft moved forward out of the trees. The aircraft turned right despite the application of left pedal. After two 360-degree turns, the pilot rolled the throttle off, allowed the aircraft to settle, and used collective pitch to cushion the landing. The aircraft landed hard on the left skid, which collapsed, and then spun to the right. The pilot and aerial observer were not injured.

## Crewmember experience

The 26-year-old pilot had almost 1,000 rotary wing hours, with more than 800 hours in OH-58As.

## Commentary

The pilot became disoriented and failed to perceive the rearward drift of the aircraft into the trees. The attempted takeoff was in violation of the unit's tactical SOP which stated that tactical lighting would be used during tactical operations. Although the unit had adequate tactical lighting, it was being used on fixed helipads, so there was no lighting at the field site.

The SOP also required daily surveys of the unit's tactical site, including inspection of landing pads and parking areas, while the unit was in the field. Had the surveys been conducted, the absence of tactical lighting should have prompted the commander or his representative to take appropriate corrective actions before beginning night operations.

The pilot's use of a white lens flashlight and Cyalume light during preflight and the turning on and off of the landing light resulted in loss of night vision. While still experiencing this visual handicap, the pilot hovered over a slightly sloping field and became disoriented. The Army Aeromedical Research Laboratory recommends the Cyalume light not be used if the users or observers are expected to maintain optimum night vision sensitivity.

The pilot permitted his aerial observer to remove and improperly stow the copilot's cyclic stick. The cyclic stick could not be stowed in its proper place because the stowage clips were broken. The pilot had the observer disconnect the cyclic stick at the electrical connector and place it unsecured on the floor of the rear passenger compartment. Removal of the copilot's cyclic stick can cause the pilot's cyclic to creep slightly aft. Disconnecting the electrical connector results in a loss of the pilot's force trim. These factors, combined with the loss of night vision, caused the pilot to fail to perceive his rearward movement. ■

# Nine receive Broken Wing Award

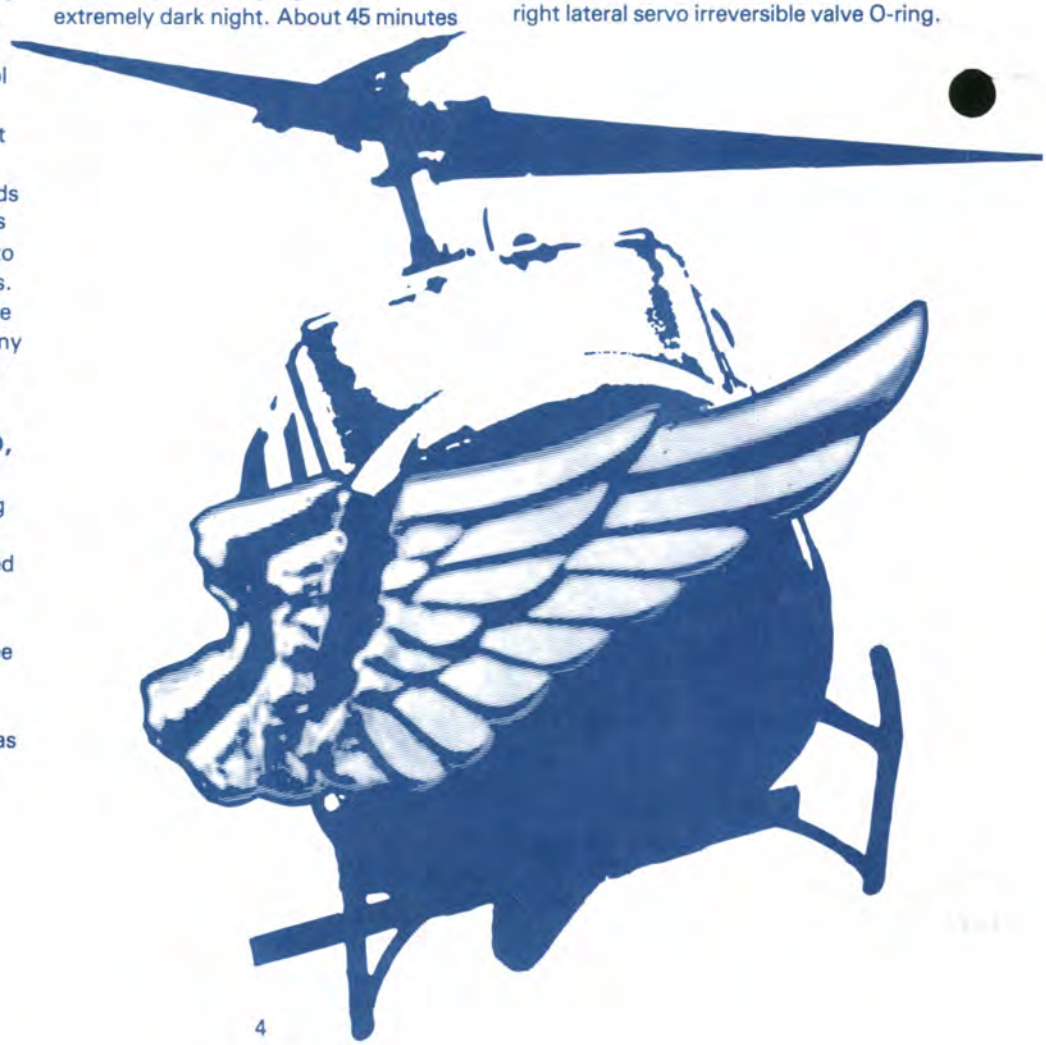
The Broken Wing Award is given to aircraft crewmembers who demonstrate a high degree of professional aviation skill while actually recovering an aircraft from an in-flight failure or malfunction necessitating an emergency landing. Requirements for the award are spelled out in AR 672-74, dated 15 May 1979.

Nine aviators received the Army Aviation Broken Wing Award from July through September 1980.

• **CW3 Dwain D. Hartwick, DOFT, Army Aviation Center, Fort Rucker.** CW3 Hartwick was the instructor pilot on a TH-1G night training flight. While being radar positioned for a GCA, the student pilot noticed the cyclic was resisting lateral movement. Hartwick took control and declared an emergency. By using both hands and bracing his body against the seat, he established a shallow right turn toward the runway. With both hands on the cyclic and with the student pilot's help, Hartwick made a running landing to the runway, touching down at 100 knots. The decision to hold 100 knots was made because it was not known what effect any changes in speed or attitude might have on their marginal control.

• **CW3 Ronald J. Ketter, Company D, 149th Aviation Battalion, Tulsa, Oklahoma.** As CW3 Ketter was piloting a UH-1M over a town, fatigue failure of the tail rotor blade created an unbalanced condition. The tail rotor assembly and gearbox separated from the vertical fin. Ketter immediately corrected a 50-degree left roll and nose-high condition with cyclic input. He began an autorotative descent. He was then told the engine was still running, and he tried to rejoin the needles and bring in power to fly to a more suitable landing site. The aircraft then started to yaw severely to the right. Altitude was becoming critical and Ketter decided to reenter autorotative descent to a city street. Several altitude and heading changes had to be made to avoid powerlines and trees. The UH-1 touched down above translational lift and slid 120 feet before coming to rest with no further damage.

• **CW2 Stanley R. Menze, DOFT, Army Aviation Center, Fort Rucker.** CW2 Menze was the instructor pilot on a UH-1H night training flight. It was an extremely dark night. About 45 minutes into the flight, the master caution and hydraulic pressure lights came on and the controls stiffened. The emergency procedure for hydraulics failure was completed, and the aircraft was turned toward an airport for a running landing. An extreme left cyclic hardover then occurred, and Menze decided to land as soon as possible. Cyclic pressure from the hardover required maximum effort from Menze and the student pilot to control pitch, attitude, and left roll rate. Right turns were impossible. Hardover continued throughout the landing in a small field surrounded by tall trees. The emergency was caused by failure of the right lateral servo irreversible valve O-ring.



• **CW4 Billy H. Miller, Detachment 1, Company A, 149th Aviation Battalion, Austin, Texas.** CW4 Miller was the instructor pilot in the No. 4 aircraft in a flight of four returning to home field because of rapidly dropping ceiling and heavy rainshowers. The engine of Miller's OH-58 quit while the flight was over a densely populated area. Miller took control, made a 90-degree right turn, and extended his glide to land in a vacant schoolyard. The school was surrounded by 30-foot trees and power and telephone wires.

• **1LT William D. Miller, B Troop, 4th Squadron, 7th Cavalry, APO SF 96358.** Lieutenant Miller was flying the No. 5 aircraft in a formation flight of six OH-58As. The rpm audio sounded and $N_2$ decreased to 96 percent. The aircraft was directly over a mountain ridgeline. Miller lowered collective slightly to regain rpm. Rpm did not recover so Miller substantially lowered collective and told flight lead he was losing power and going down. $N_2$ continued to decay to well below operating limits. Miller turned the aircraft to the left and then back to the right to line up with the only suitable landing area, while simultaneously lowering collective full down and rolling the throttle to flight idle to continue the autorotation. Some wires and three terraced fields were cleared, and the aircraft was landed with no damage in a level area. Inspection revealed failure of $N_2$ governor assembly.

• **Arthur W. Roberts, DAC, DIO, Fort Eustis.** Mr. Roberts was making an engine topping check as part of a UH-1H maintenance test flight. Airspeed was 80 knots and torque 45 pounds. The compressor suddenly stalled. Roberts lowered the collective to reduce power and the compressor stalled again. There was a loud bang and the engine failed. Roberts entered autorotation and selected what appeared to be a clear area which would allow him to land into the wind. At about 800 feet, he saw wires strung across his intended landing area. Realizing he could not avoid the wires, he turned left towards a field which was smaller but free of obstructions. He had very little altitude left and still needed to clear some 100-foot trees in the flight path. Roberts tried to conserve rotor rpm by clearing the trees as closely as possible. The main part of the aircraft cleared the trees, but the right horizontal stabilizer and tail rotor hit some extended branches. The landing was completed with no further damage.

• **CW2 Wayne L. Spell, Aviation Company, 4th Aviation Battalion, Fort Carson.** CW2 Spell was on an OH-58A service mission over mountainous terrain. Just as he crossed over a ridgeline, his engine quit. Spell lowered collective and entered autorotation. As there were no suitable landing areas available, he turned right and flew down a narrow valley, hoping to find an open area. As he came around a bend, he saw a small open area to the right. Spell turned toward the open area and aligned the aircraft to land upslope. Collective was increased slightly to get over 100-foot trees surrounding the area and then lowered to regain rotor rpm. The landing area had a 12-degree upslope, and the cross tubes, transmission mounts, and tail boom were damaged during the landing. Winds were gusting to 25 knots and density altitude was 10,000 feet.

• **CW3 Richard L. Williams, Company D, 24th Aviation Battalion, Hunter AAF, Georgia.** CW3 Williams was flying an OH-58A over a forested area. During a gradual left turn, total power loss occurred, and the aircraft yawed to the left. Williams lowered collective to enter autorotation and turned right to land on a small dirt road lined by trees. Main rotor blade clearance was about 2½ feet on each side. Engine failure was caused by a fitting on the governor reset pressure line between the accumulator and fuel control backing off.

• **WO1 Danny Boyd Winn, 62d Aviation Company, 11th Aviation Battalion, APO NY 09039.** WO1 Winn was flying in the right seat of a UH-1H, performing pilot duties, when he noticed a slight drop in engine and rotor rpm. A sudden power loss then occurred and the rpm needles split. Unable to join the needles, Winn rolled the throttle to engine idle and initiated a left bank to avoid a steeply sloped and wooded valley directly in front of the aircraft. A plowed field about 40 degrees off course was selected as the touchdown point. The pilot-in-command, who was in the left seat, placed the governor switch in the emergency position and slowly opened the throttle. The crew was convinced they had a low-side governor failure. Advancing the throttle slowly to the full open position had a negative effect, resulting in no engine response and the needles remaining split. While rolling the throttle open, Winn started his deceleration, holding a nose-high attitude because the landing area sloped upward. The UH-1 touched down on soft ground and slid about 3 feet. ■

# Selected mishap briefs

**uh1** **Class C mishap** □ (H series) Main rotor blades hit tree during flight, denting both blades.

**Class E mishaps** □ (H series) Left boost pump light came on during flight. Four minutes later, right boost pump and engine fuel pump caution lights came on. Fuel pressure indication dropped to zero and $N_1$ decreased. Autorotation was established to forced landing area. Engine $N_1$ stabilized at 65 percent just before touchdown. Power was restored and all caution lights went out. Landing was completed with power. Pilot said fuel gauge indicated 125 pounds at time of mishap. When aircraft was inspected by maintenance personnel, fuel gauge indicated 5 to 15 pounds. □ (H series) While hovering to parking pad, unit trainer in left seat, and at the controls, called for after-landing checklist. Pilot in right seat reached over and turned off transponder. As he withdrew his hand, his glove or flight suit sleeve caught emergency governor switch, placing governor in emergency mode. Unit trainer noted increase in engine sound, slight yaw, and increase in altitude, and immediately reduced throttle, thinking he had high side governor failure. Aircraft was stabilized and landed using manual throttle. Crew noticed governor switch in emergency position after landing. □ (H series) Low fuel warning light came on during flight. Caused by inadequate preflight planning and improper groundspeed computations while en route.

**ah1** **Class C mishap** □ (G series) Postflight inspection revealed damage to both main rotor blades. Pilots had no indication of damage during flight.

**Class E mishaps** □ (TH-1G) Forward fuel boost light came on during hover. Caused by failure of fuel pressure switch. □ (G series) Postflight inspection revealed crack in exhaust diffuser mount. □ (G series) IP suspected tree strike during NOE flight and landed. Main rotor blades were dented. □ (S series) When pilot tried to increase airspeed above 100 knots, he noticed cyclic would not move forward and that it was displaced 2 to 3 inches to right. Crew could find no obstructions in cockpit area. Running landing was made.

**ch47** **Class E mishaps** □ (C series) Loud noise was heard in rear of aircraft during takeoff, followed by vibrations. During final approach for landing, No. 2 engine PTIT rose to 900° C. Indications are No. 2 engine variable inlet guide vane failed, allowing guide vane contact with first stage of engine compressor. □ (C series) No. 1 engine failed during takeoff. Engine had ingested inlet guide vanes. □ (C series) Crew chief noticed leak in combining gearbox area during ramp check. Caused by crack in 90-degree elbow fitting. □ (C series) As aircraft was repositioning from active runway to landing pad at high hover, rotorwash blew up piece of metal matting used to control erosion. Matting hit underside of aircraft and tore hole in fuselage.

**oh58** **Class E mishaps** □ (A series) During runup, engine accelerated rapidly without increased throttle. Caused by failure of fuel control assembly. □ (A series) Hydraulics were turned off during runup check. After completion of check, hydraulics could not be restored. Caused by failure of hydraulic solenoid valve. □ (A series) As pilot lowered collective during landing, transmission oil pressure light came on. Caused by failure of oil pressure switch.

**th55** **Class E mishaps** ☐ Aircraft vibrated severely during hover. Caused by defective main rotor dampers. ☐ Smoke in cockpit was caused by defective alternator and broken alternator belt.

**c12** **Class E mishaps** ☐ (A series) Aft right side of upper forward engine cowling on No. 2 engine came up during flight. Aircraft was returned to airfield and landed. Left rear lockdown had backed off about one turn. ☐ (A series) No. 2 engine oil pressure rose to 200 psi just before takeoff. Caused by failure of oil pressure sending unit.

**ov1** **Class C mishap** ☐ (D series) Right entrance hatch opened while aircraft was on photo run, breaking plexiglass window and damaging stabilizer and deicer boots. Technical observer had not properly secured hatch before takeoff.

**Class E mishaps** ☐ (D series) Maintenance personnel noticed hydraulic fluid leaking from right main landing gear as aircraft was taxiing. Caused by failure of brake assembly. ☐ (D series) Pilot received unsafe gear-down indication during landing check. Emergency blowdown system was used and aircraft landed. Caused by failure of down-lock switch.

**t28** **Class A mishap** ☐ YAH-64 was on experimental test flight with T-28 providing chase coverage. Aircraft were flying one-half mile offshore. T-28 pilot was told to end mission. About this time, midair collision occurred. Pilot of T-28 bailed out and sustained minor abrasions. YAH-64 crewmembers were killed. 8111

**u8** **Class E mishaps** ☐ (F series) Pilot noticed No. 1 engine oil pressure was reading 20 psi during final check before takeoff. Caused by excessively worn main bearings, requiring engine change. ☐ (F series) Pilot noticed 1000 rpm drop on right magneto during runup. Primary lead on right magneto had chafed against cowling and grounded out magneto.

**u21** **Class E mishaps** ☐ (A series) Slight stream of liquid was seen coming from vicinity of left wing fuel cap during flight. Aircraft was landed, and it was discovered that fuel was seeping from forward edge of panel surrounding fuel cap. Cap was secure. Fuel had seeped through 40-gallon fuel cell and was pooled in wing cavity. ☐ (RU-21H) Heater stopped during flight and pilot aborted mission because of extreme cold in cockpit. Caused by failure of ignition assembly.

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishaps** □ (H series) Postflight inspection revealed oil streak near 42-degree gearbox. Further inspection showed gearbox oil filler cap was not properly secured. Crew chief had added oil to gearbox the previous day and had improperly secured cap. □ (M series) No. 2 hydraulic and master caution lights came on as aircraft was loading passengers. Loss of hydraulic fluid from No. 2 system was caused by chafing of No. 2 hydraulic pressure line with particle separator bleed line.

**ch47** **Class E mishap** □ (C series) All instrument lights and fire warning lights began flashing during test flight. SAS control was intermittently lost. APU was started and emergency descent and landing were made. Hydraulic line was found shorting on No. 1 generator terminals.

**c12** **Class E mishap** □ (D series) When gear handle was placed down during approach, gear extended about 8 inches and stopped. Emergency gear extension procedure was followed and aircraft was landed. Caused by loose wire from landing gear handle to gear limit switch. Loose wire was caused by improperly installed screw at factory. Screw was installed without lock washer.

### Messages received

- Maintenance notice concerning AH-1 tail rotor drive shaft bearing (AH-1-80-25, 211505Z Nov 80). Message reemphasizes importance of daily inspection of tail rotor drive shaft installation.
- Maintenance notice concerning inspection of AH-1 pitch link tube (AH-1-80-26, 261545Z Nov 80).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# Flightfax®

## Last FLIGHTFAX this year

This is the last issue of FLIGHTFAX you will receive this year. The next issue will be dated 14 January 1981 and will include briefs for the period 5 December 1980-1 January 1981. The personnel of the Army Safety Center wish you a Merry Christmas and a Safe and Happy New Year.

# Followups

## Additional information on mishap briefs previously published

**uh1** **Class A mishap** in 5 Mar 80 issue (8028) ☐ IP lost control of aircraft during demonstration of unauthorized maneuver (simulated antitorque failure at a hover). Right skid hit ground and aircraft rolled on right side.

**Class A mishap** in 21 May 80 issue (8038) ☐ During approach to hover, IP lost directional control and rotor and engine rpm deteriorated. IP was forced to set aircraft down on uneven terrain while in accelerating right spin. After impact, aircraft rolled to right and came to rest partially inverted. IP did not know that the altitude, temperature, and aircraft weight would require more than the power available, possibly because of inadequate aircraft performance planning, lack of recent training, and overconfidence.

8040

**Class B mishap** in 4 Jun 80 issue (8040) ☐ Pilot allowed aircraft to descend and hit tree during night flight. Pilot did not completely crosscheck his instruments while searching for an LZ in conditions of minimal illumination and light rain. Immediately after the tree strike, aircraft entered heavy rainshower and was flown to airfield and landed. Pilot did not ask for copilot's assistance in monitoring altitude because he was confident he could divide his attention between the flight instruments and outside references.

**Class A mishap** in 16 Jul 80 issue (8048) ☐ Aircraft crashed during maintenance test flight. Spring pin in fuel control failed because of stress corrosion, resulting in loss of engine power. Transmission displaced in flight, allowing main rotor blade to sever tail boom. Exact cause of transmission displacement and stress corrosion could not be determined.

**Class B mishap** in 30 Jul 80 issue (8052) ☐ During landing in LZ, aircraft touched down on forward edge of large hole obscured by tall grass. Copilot, flying from right seat, reduced power and aircraft tipped backward. Copilot then overreacted with a series of excessive flight control inputs, which caused aircraft to spin. When aircraft came to rest, tail rotor hit tree and separated. At some point during the sequence of events, PIC grabbed flight controls without telling copilot, probably resulting in overcontrol. Copilot had successfully completed two previous troop lifts into other unimproved areas and had just seen four aircraft using the same landing area. As a result, he did not anticipate the presence of a depression or other problems during the landing.

**Class A mishap** in 20 Aug 80 issue (8058) ☐ While aircraft was at hover, it yawed left, nosed up, and rolled on right side. Pilot probably allowed nonrated technical observer to hover aircraft, and unqualified TO did not make necessary control movements.

8058

**ah1** **Class B mishap** in 30 Jul 80 issue (8053) ☐ Pilot heard loud bang and grinding noise in flight and autorotated to sloping terrain. Aircraft slid forward on touchdown, yawed left, and came to rest on right tow pod. Failure of second-stage power turbine blade was caused by casting defects near leading edge.

**ch47** **Class B mishap** in 18 Jun 80 issue (8044) ☐ No. 1 engine exploded during approach to hilltop. Aircraft landed at bottom of hill without further damage. Engine analysis revealed a capscrew was not removed from engine/transmission interface during assembly. This caused a misalignment of the quill shaft and the power output shaft which resulted in torsional cyclic loading on the power output shaft. When the power output shaft failed, the engine went into an uncontrolled overspeed condition and disintegrated.

**Class A mishap** in 6 Aug 80 issue (8056) ☐ Departure route from airfield placed helicopter at density altitude and gross weight condition that exceeded its capabilities. Pilot had not computed a performance planning card and was not aware of the power available versus power required for the conditions because performance planning data relating to current configuration had not been provided. Aircraft crashed in box canyon, killing copilot and injuring the other crewmembers. Pilot had only flown the aircraft in its present mission configuration (ferry fuel tank system installed) three or four times and these were maintenance test flights. Copilot had never before flown the helicopter in its configuration.

8056

8054

**Class B mishap** in 27 Aug 80 issue (8060) ☐ Aircraft was placed in decelerative attitude while landing behind another CH-47. Closure rate was greater than anticipated, causing pilot to attempt a more abrupt stop than planned. Nose-high attitude was attained and aft rotor blades hit ground. Pilot was a qualified PIC and usually flew in left seat. Unfamiliarity with right seat sight picture and crosscheck of flight instruments and controls from that position may have contributed to failure of pilot to notice aircraft was exceeding attitude and flight control ground limitations.

**oh58** **Class B mishap** in 30 Jul 80 issue (8054) ☐ Aircraft, flying at 100 knots and 100 feet agl, lost power because of failure of labyrinth seal in engine. Forced landing was made to downsloping terrain. Aircraft bounced and main rotor blades flexed down and servered tail boom.

**t42** **Class B mishap** in 20 Aug 80 issue (8059) ☐ Loud noise was heard during takeoff and aircraft settled to ground and skidded off right side of runway. Landing gear had inadvertently retracted. Gear selector knob retaining set screw was missing. Gear selector knob could be rotated freely on its spindle and could be cycled from down to up position without overriding locking mechanism. ■

# Selected mishap briefs

**uh1** **Class C mishap** □ (H series) During engine start at 25% $N_1$, pilot realized main rotor was still tied down. Pilot shut engine down, but blade was loosely tied and started turning. Weighted end of blade tiedown hit red tail rotor blade, denting blade and breaking tip of FM antenna.

**Class E mishaps** □ (H series) Aircraft vibrated severely, loud banging sound was heard, and flames were seen coming from engine exhaust. Pilot turned to land in open field and engine failed. Pilot lowered collective and landed. □ (H series) Engine oil pressure dropped to 7 psi during landing. Engine oil temperature went from 70° to 100°, and master caution and engine oil pressure lights came on. Indications are engine oil pump failed. During hot end inspection of engine, cone from combustion cam liner was found wedged between support for liner. Four blades were rubbing on second-stage gas producer nozzle. □ (H series) Postflight inspection revealed three strands of cable on rescue hoist were broken in area of striker disc and actuator guide.

**Aviation-related mishap** □ As mechanic was moving maintenance stand in hangar, stand hit and punctured chin bubble of aircraft.

**ah1** **Class C mishap** □ (S series) IP was demonstrating, from back seat of aircraft, night hover technique, using tree as a reference at high hover. Aircraft drifted left and main rotor blade hit tree. Blade was torn in two places. Night vision devices were not being used. Visibility was continually changing during training period because the moon was rising and there was some dust in the air.

**Class E mishaps** □ (S series) Fuel boost light came on during hover. Caused by failure of pressure switch. □ (TH-1G) When manual throttle operations were completed, governor would not return to automatic metering. Caused by failure of overspeed governor solenoid. □ (TH-1G) Rpm increased to 6850 in flight. Caused by failure of linear actuator.

**Aviation-related mishaps** □ Two soldiers, after weekend duty, drank an unknown amount of alcohol. Both individuals then drove a 2½-ton truck in circles around an AH-1 parked inside a hangar. As one soldier was driving the truck, he ran into the helicopter. The other soldier then got in and backed the truck into a wall. □ Aircraft was being moved on ground handling wheels from inside hangar to ramp. As aircraft passed over door track of hangar, right skid flexed, causing ground handling wheels to come off. Skid tube was damaged when it landed on door track.

**ch47** **Class E mishaps** ☐ (C series) Rotor tachometer failed during flight. Caused by failure of tachometer generator. ☐ (C series) No. 1 engine oil pressure exceeded operating limits during landing. Caused by failure of oil pressure transmitter. ☐ (C series) Several caution lights came on during runup. Utility hydraulic line running to aft left handling gear swivel lock had failed, causing loss of fluid and pressure. ☐ (B series) No. 1 engine chip detector light came on. Caused by failure of engine transmission chip detector assembly.

**oh58** **Class C mishaps** ☐ (A series) As aircraft was entering traffic pattern, large bird went under aircraft and hit lower portion of vertical fin, tail boom, and one tail rotor blade. ☐ (A series) IP announced simulated forced landing at hover/taxi, and student tried to decelerate. IP took control and landed level but with insufficient rotor rpm, causing spike knock.

**Class E mishaps** ☐ (A series) Fuel filter light came on. Caused by failure of pressure switch. ☐ (A series) Oil splashed on windshield during runup. Caused by failure of main rotor hub assembly seal. ☐ (A series) Pilot aborted two attempts to start aircraft because of hang starts. On third attempt, pilot aborted start again and thought he reduced throttle to off position. When told flames were coming from exhaust, pilot motored starter until he noticed temperature at 1,000° C. He then rolled throttle to off position and continued motoring starter to cool down engine. Pilot incorrectly interpreted throttle at off position instead of flight idle position. ☐ (A series) During termination of autorotational landing, pilot applied abrupt aft cyclic just before touchdown. IP took control, applied forward cyclic, and increased collective to cushion landing. Because of close proximity to the ground, low rotor rpm, and slow control responses, aircraft touched down tail low with rotor rpm at about 210-220, resulting in spike knock.

**Aviation-related mishap** ☐ Aircraft was put on ground handling wheels and tow bar was connected. As tow vehicle pulled forward, ground handling wheels bogged down and tow ring pulled through right skid. Tow ring did not have correct washer installed on outside of skid tube.

**th55** **Class E mishaps** ☐ Severe vibrations in flight were caused by defective main rotor dampners. ☐ Defective servo fuel injector caused excessive exhaust smoke during hover/taxi.

**ov1** **Class E mishaps** (B series) Smoke entered cockpit and lights flickered. Circuit breaker popped and all secondary lights went out. Caused by shorted-out lower console variable resistor. ☐ (D series) Right main gear did not indicate down for landing. Emergency gear was activated and aircraft was landed. Wire to down-lock switch was cut by operation of gear coming up.

**t42** **Class E mishap** ☐ Landing gear vibration occurred following landing on asphalt strip. Caused by flat spot on one main landing gear tire.

**u21** **Class E mishap** ☐ (A series) Pilot saw fuel siphoning from left wing tank during takeoff. Aircraft had just been repainted and excess paint prevented proper seal of fuel cap.

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class C mishap** □ (H series) Maintenance test pilot was running up aircraft for test flight. Metal screw from base of No. 1 FM antenna worked loose and fell into tail rotor. Screw hit tail rotor and was thrown into windscreen of parked UH-1, breaking windscreen.

**Class E mishaps** □ (H series) Loud squeal was heard from hydraulic pump area during final approach, followed by control stiffness. Hydraulic-off landing was made. Loss of hydraulic fluid was caused by improper flange seat on T fitting connector. □ (H series) Smoke was seen coming from battery vents during rapid refueling operation. Caused by improperly set voltage regulator.

**ch47** **Class E mishaps** □ (C series) Flight engineer felt high frequency vibration in vicinity of No. 2 engine support during flight. Caused by three cracked discs on No. 2 engine and two cracked discs on No. 1 engine drive shaft flex packs at riveted bolts. Indications are bolts on flex packs were improperly torqued during factory installation. □ (C series) During takeoff, crew chief saw smoke in aft part of aircraft around ramp area. Loose vent line from No. 2 engine allowed smoke to vent into aircraft.

### Messages received

• Safety-of-flight message concerning one-time inspection and treatment of all OH-6 and OH-58A/C helicopter governors and fuel controls used on T63-A-5A, T63-A-700, and T63-A-720 gas turbine engines (OH-6-80-07 and OH-58-80-11, 262200Z Nov 80). Summary: Solid film lubricant application procedures and areas of application are precisely defined in this message. Revised instructions should prevent an overapplication or a misapplication of the lubricant. Contact: David Giratos or Doug Danforth, TSARCOM, AUTOVON 693-0396, commercial 314-263-2423.

• Safety-of-flight message concerning one-time inspection of all OV-1B, OV-1C, OV-1D, and RV-1D series aircraft for chafing of propeller reversing wires (OV-1-80-13, 262205Z Nov 80). Summary: An aircraft recently had a failure of one propeller to reverse on landing. The gust lock rollers had completely chafed through the reversing wire in the bundle in the center pedestal. When pilot tried to reverse propellers, only one propeller reversed, causing aircraft to run off runway. Inspection of other aircraft revealed similar chafing of the reversing wires in the same area, but to a lesser extent. This message provides instructions for an inspection of the reversing wire bundle in the center pedestal for evidence of chafing by the gust lock rollers and provides instructions for replacing the wires and installing spiral wrap to protect the wire bundle. Contact: Robert Clark, TSARCOM, AUTOVON 693-2106, commercial 314-263-2106.

• Safety-of-flight message concerning one-time inspection of OH-6A tail rotor assemblies (OH-6-80-08, 052230Z Dec 80). Summary: This message requires a one-time inspection to locate and replace some improper bushings used with the bolt which secures the metal tail rotor blade. The improper bushings do not have sufficient radius or countersink on the inside diameter at the flanged end to clear the radius on the bolt head. Continued operation with the improper bushing can cause the bolt to fail. No failures have been reported but the improper bushings have been found installed. Contact: Richard Smith, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# Stacom

## Emergency procedures

The necessity for total familiarity with emergency procedures (chapter 9 of the operators manual) was highlighted by a recent mishap involving an AH-1S (MOD). The pilot was flying at 100 feet agl and 100 knots when his aircraft had an engine failure.

At the time of the emergency, the flight was being conducted under day VFR conditions and the aircraft was over a large open area affording the aviator an excellent forced landing situation.

The pilot correctly identified his problem as an engine failure, but proceeded to waste valuable time and rotor rpm in a futile attempt to salvage the situation by placing the governor AUTO/EMER switch in the emergency position. His course of action did not produce additional engine rpm inasmuch as his problem was not the governor but the engine, as he had initially determined.

By now, he was running out of time, altitude, and rotor rpm, since he had not lowered the collective when he attempted to troubleshoot the problem. The ground came up at him much faster than it was supposed to and the touchdown was made with very low rotor rpm. As a result, the transmission and main rotor system rocked about the pylons excessively and caused extensive damage.

A check of the Height Velocity Diagram (figure 9-3, AH-1S (MOD) Operators Manual) indicates that the aircraft was operating in the "caution" area when the engine failed. It is evident that any delay in implementing the proper emergency procedure is critical to a successful autorotative landing.

Paragraph 9-13, TM 55-1520-234-10, **engine failure, 0-120 KIAS**, states: "The height-velocity diagram depicts combinations of airspeed and height above the ground where a successful straight-in autorotation may be made from level or hovering flight in the event of an engine failure. It is **imperative** that the techniques described in the subparagraph be followed to achieve the capability shown in the height-velocity diagram. Delay in recognition of the failure, **improper technique** or excessive maneuvering to reach a suitable landing area reduces the probability of a safe touchdown. Flight conducted within the avoid area exposes the helicopter to a high probability of damage despite the best efforts of the pilot."

Paragraph 9-10, TM 55-1520-234-10, **engine failure and autorotation**, states: "When a loss of engine power is detected, it is necessary to decrease the collective pitch and apply right pedal immediately in order to avoid a reduction in rotor rpm and to maintain a constant heading."

The dash 10 leaves no doubt that at low altitude/low airspeed the proper course of action is a straight-ahead autorotation. Emergency procedures outlined in the operators manual are not advisory; they are directive in nature, and any deviations are attempted at the aviator's own risk. ■

(continued on next page)

# Stacom

## Safety-of-flight messages

While all SOF messages look alike, they are not, and the impact on the aviation community and aircraft operation as a result of the various types of messages is vastly different.

The new AR 95-18, Safety of Flight Messages (SOF), 1 May 1980, contains some significant elements which should be of interest to professional Army aviators. Some pertinent extracts are:

The U.S. Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) and the U.S. Army Safety Center (USASC) are responsible for issuance of all SOF messages. The release of SOF messages will be approved by the Aviation Logistics Office, ODCSLOG, HQDA.

There are four types of SOF messages and the buzz words Emergency, Operational, Technical, and Maintenance Notice produce a unique impact on the commander, the maintenance officer, the ASO, the trainer, and the operational aviator. The four types of messages are:

1. **Emergency.** Immediately grounds a fleet of aircraft, or portion thereof, when a hazardous condition exists that has the potential for a catastrophic mishap.

2. **Operational.** May ground aircraft for operational reasons to correct hazardous conditions in aircraft operation to include flight procedures, limitations, or policy.

3. **Technical.** May effect noncatastrophic grounding of aircraft for materiel or maintenance conditions. Technical SOF messages may include:

a. Corrective actions not involving a configuration change.

b. Modifications in accordance with an urgent MWO.

c. One-time inspection in accordance with an urgent MWO.

d. Long-term replacement of safety-related items which require continuous monitoring.

4. **Maintenance Notice.** Will not ground aircraft or direct accomplishment of a task. This type SOF message may only be used to announce pending changes to publications, procedures, or maintenance policy.

For more complete information and data on SOF messages, consult your copy of the 1 May 1980 AR 95-18. ■

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

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CY 80 index in this issue

# Mishap review

## Synopsis

A UH-1H on a night flight crashed when the pilot became spatially disoriented. The aircraft was destroyed, and both crewmembers sustained minor injuries.

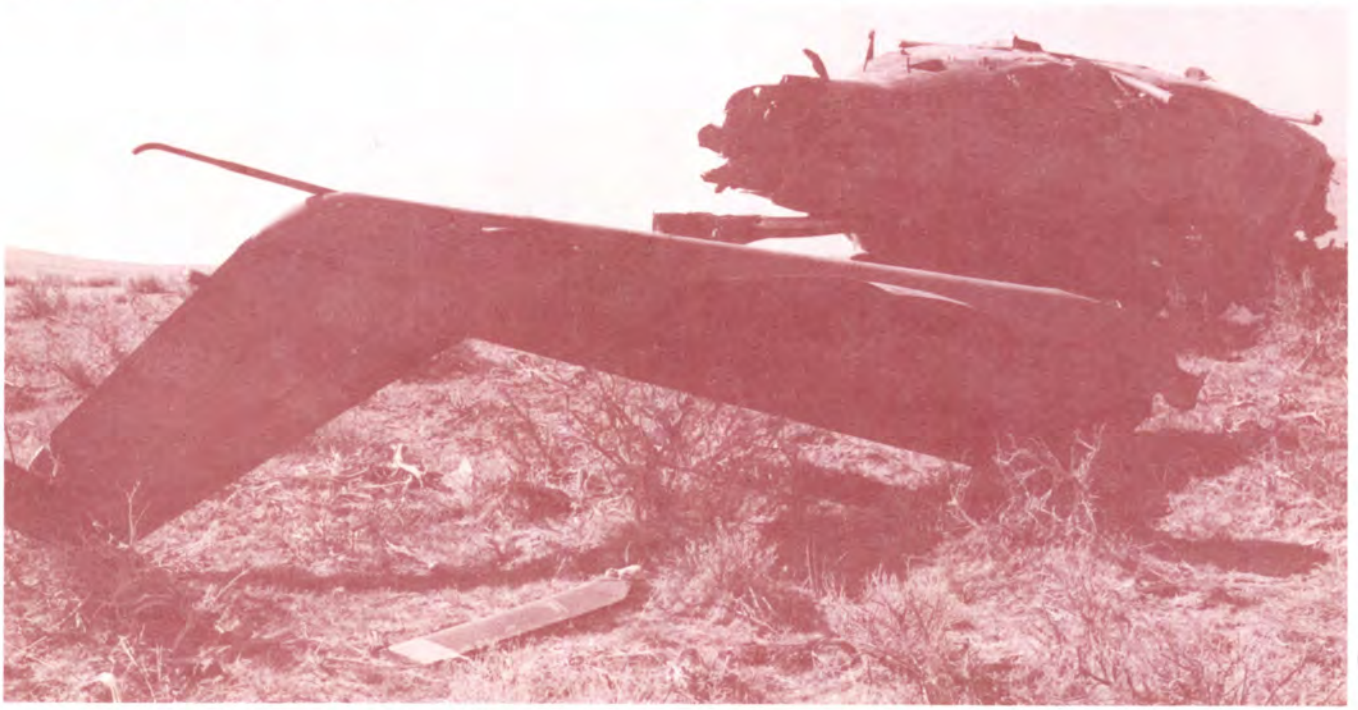
## History of flight

The unit was asked to provide a medical evacuation helicopter for a night parachute jump. The aviator who was to fly as pilot-in-command had flown similar missions before and was familiar with the operational aspects of the mission and the area of operation. The PIC decided to sit in the left seat and the pilot in the right. Preflight and runup checks were made partially from memory and partially from the checklist.

The pilot hovered the aircraft from the parking position on the ramp and made the takeoff, while the PIC handled radio communications. About 10 minutes into the flight, the pilot turned the controls over to the PIC, who flew to the mission site and established a left orbit behind the command and control OH-58. Orbital altitude was between 1,500 and 3,300 feet agl.

After about 30 minutes of orbiting, the pilot again assumed control. The orbit was then changed to the right. About this time, another OH-58 passed through the area. The Huey PIC began talking on his UHF radio to the pilot of the OH-58. The OH-58 pilot told the PIC his radio was weak. The PIC then devoted the remainder of the flight to trying to rectify the radio problem, although it was not necessary to the mission. He became totally preoccupied with the radio and did not monitor the flight instruments for some time.

The drop zone safety officer called the UH-1 pilot to find out how long they could remain on station. The pilot became preoccupied with the clock, trying to verify flying time remaining before they would have to return to home base. As



the pilot was preoccupied with the clock, the aircraft passed through a phase of orbit facing some mountains and providing a very limited horizon. There were no ground lights from which to easily maintain visual attitude reference. The pilot finally spotted the lights of the an Army depot, but they immediately disappeared.

Realizing he was at an extremely low altitude, the pilot pulled collective pitch expecting to gain altitude. Instead of gaining altitude, he reduced the sink rate to near zero. The tail stinger hit the ground, breaking the tail boom. The skids then hit and broke off, and the transmission, rotor head, and tail boom separated. The fuselage came to rest inverted.

The pilot lost his helmet halfway through the crash sequence because his chin and nape straps were loose. Both pilots remained strapped in their seats during the crash and exited with minor injuries.

## Crewmember experience

The 36-year-old PIC had more than 800 rotary wing flight hours, with more than 500 in UH-1Hs. The 29-year-old pilot had more than 1,100 rotary wing hours, with almost 600 in UH-1Hs.

## Commentary

The pilot, who did not have a current instrument rating, became preoccupied with the aircraft clock, failed to maintain adequate flight altitude, developed spatial disorientation, and flew the aircraft into the ground. The PIC was preoccupied with the UHF radio and did not insure aircraft control was maintained. He did not monitor the flight instruments or set a specific altitude or airspeed for the pilot to maintain.

Mission planning was inadequate, and the checklist was not relied on during the preflight. The pilot was not briefed by the PIC on what was expected of him before or during the flight. They had flown together only once before and neither was aware of the other's habits, expectations, or level of performance at night. ■

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# Selected mishap briefs

**uh1** **Class A mishap** ☐ (H series) Tail rotor blade hit tree as aircraft was flying about 70 feet agl. Tail rotor and 90-degree gearbox separated and aircraft crashed. One fatality and six injuries. 8112

**Class C mishaps** ☐ (H series) Aircraft had touched down and slid about 20 feet during hydraulics-off landing when aft cross tube failed, causing forward cross tube to spread excessively. Skid cuffs and aft cross tube retaining strap were damaged. ☐ (H series) As aircraft was flying about 200 feet agl, bird hit and cracked left windshield.

**Class E mishaps** ☐ (H series) $N_1$ and $N_2$ needles would not split during 180-degree autorotation. Caused by failure of free-wheeling clutch in transmission input quill assembly. ☐ (H series) Aircraft on IFR flight plan in VMC encountered unforecast winds of 45 knots and deteriorating weather. Pilot received vectors for traffic spacing, causing low fuel condition. Pilot decided to cancel IFR flight plan, land under VMC, and send for fuel truck to refuel aircraft. ☐ (H series) Unusual vibration was detected during runup. Test pilot performed series of low rpm hover checks, pylon mount checks, and 360-degree hovering turns to isolate problem. Postflight inspection revealed cracked clevis in rigid link from swashplate to synchronized elevator linkage. ☐ (H series) After 30 minutes of flight, engine oil temperature rose from 90° C. to 98° C. and stabilized. Caused by failure of thermal bypass valve. ☐ (H series) Black smoke was seen coming from engine during flight. Caused by melted combustion chamber deflector. Fuel control automatic governor probably failed, allowing excess fuel into combustion section and causing chamber deflector to melt. ☐ (H series) When throttle was increased to flight idle during engine start, pilot noticed high frequency vibration and noise. Caused by failure of $N_1$ turbine. ☐ (H series) Aircraft yawed and rpm decreased. Postlanding inspection revealed failure of fuel control low side governor.

**uh60** **Class E mishap** ☐ Stabilator began to fail in all phases of flight, and aircraft was landed. Three wires had chafed on bulkhead.

**ah1** **Class E mishaps** ☐ (S series) As pilot was hovering aircraft upslope over loose snow, he became disoriented by blowing snow and skids hit ground. Pilot applied collective and overtorqued aircraft to 60 psi. Low airspeed and altitude were contributing factors. ☐ (S series) Transmission oil bypass light came on. Caused by failure of bypass pressure switch. ☐ (TH-1G) Excessive feedback was felt in controls during hover/taxi. Caused by failure of left lateral servo. ☐ (TH-1G) Aft fuel boost pump light came on. Caused by failure of fuel boost pump. ☐ (S series) Engine fuel pump light came on. Caused by defective fuel control. ☐ (S series) Engine oil bypass light came on during termination of autorotation. Ball valve on engine oil line at oil cooler was cracked. Ball valve on transmission oil line at oil

cooler was also cracked. Another aircraft in the unit had the same problem. ☐ (TH-1G) Antitorque pedals became stiff during flight. Caused by failure of silent chain.

**ch47** **Class C mishap** ☐ (C series) Aircraft picked up six fuel blivets and was at stable hover with load about 50 feet off the ground. Lateral vibration developed and increased to the point where aircraft control was becoming impossible. Load was released and power reduced. Vibration stopped after load was released. Vibration was probably caused by malfunction of rotor blade dampner due to fluid level and/or extremely cold weather.

**Class E mishaps** ☐ (C series) No. 2 engine oil low light came on. Caused by excessive oil consumption due to worn turbine engine bearing seals. ☐ (C series) No. 1 engine transmission hot light came on. Caused by electrical short in temperature plug wires. ☐ (B series) Flight engineer saw steady stream of hydraulic fluid coming from utility hydraulic filter. Caused by split packing. ☐ (C series) During hot refueling operation, flight engineer saw smoke coming from aft transmission area. Entire cargo compartment was filled with smoke. Oil line to thrush bearing worked loose and oil leaked on generator, causing smoke. ☐ (C series) During ramp check, flight engineer noticed oil bubbling out of seam in combining gearbox. Several loose bolts were found where oil sump bolts to combining gearbox. ☐ (C series) CH-47 was lead aircraft in flight of five. Unforecast heavy snowstorm reduced visibility, and flight landed in field, remaining overnight until weather conditions improved. ☐ (C series) Crew smelled hot oil fumes, and smoke entered cargo compartment. Postlanding inspection revealed accessory gearbox valve was stuck open, causing hydraulic fluid to overheat. This caused packing and utility pump to fail. Hydraulic fluid sprayed on generators, causing smoke.

**oh58** **Class C mishap** ☐ (A series) As pilot was flying about 75 feet agl, he felt aircraft descending and heard low rpm audio. Instruments showed $N_1$ rapidly decreasing below 20 percent and $N_2$ decreasing below 30 percent. Pilot entered autorotation with right turn to only available landing area. Greater than normal decelerative attitude to stop forward flight and avoid trees caused aircraft to touch down hard. Main rotor blade flexed down and cut through tail rotor drive shaft cover. Engine failure was caused by contaminated fuel.

**Class E mishaps** ☐ (A series) On downwind leg of traffic pattern, IP noticed $N_2$ rpm stabilized at 104 percent and tried to beep rpm down with increase-decrease switch. Switch was ineffective and IP took controls for power-on landing. During final portion of approach, $N_2$ rpm increased between 104 precent and 105 percent. Linear actuator had stuck in full open position, probably because of freezing moisture. ☐ (A series) Transmission hot light came on during landing. Caused by loose connection on transmission sending unit. ☐ (A series) Crew heard loud squeal from hydraulic pump, followed by complete hydraulic failure. Hydraulic light came on and controls stiffened. Running landing was made. Hydraulic pressure tube between filter and pressure relief valve was cracked, allowing loss of hydraulic fluid. ☐ (A series) Transmission hot light came on during landing. Wire from transmission temperature sensing bulb to transmission oil hot light had separated at in-line splice. ☐ (A series) Pilot heard noise from tail section during shutdown. Caused by failure of No. 1 drive shaft bearing. ☐ (C series) Transmission oil hot light came on. Caused by clogged engine cooler inlet and ducts.

**c7** **Class E mishaps** ☐ No. 1 engine ran rough as rpm and manifold pressure decreased. Caused by failure of drive shaft. ☐ Passenger heard unusual noise and told crew. Aircraft was returned to airfield. Rear mounting

*(continued on next page)*

# Mishap briefs

bracket on vertical stabilizer had failed in flight, allowing antenna wire to slap fuselage. □ Passenger air stair door came open immediately after takeoff. Door warning light came on, and slight jar was felt by crew. Flight attendant improperly secured door.

**ov1** **Class E mishaps** □ (D series) Left main gear indicator showed down when gear was up. Caused by failure of left down lock switch. □ (D series) Right brake pedal went all the way down when pilot applied pressure on landing rollout. IP opened hatch and saw brake fluid was coming from brake. Caused by deteriorated preformed packing on brake assembly. □ (D series) Right main gear indicator showed unsafe gear condition. Pilot cycled gear five times without result. Emergency procedure was followed and landing was made. Caused by inoperative gear indicator. □ (D series) Pilot smelled smoke during takeoff. Caused by failure of No. 2 engine.

**u21** **Class C mishap** □ (H series) Caution light for open cabin door came on during flight. Pilot and copilot visually checked door from their seats and door appeared secure. Pilot then moved back to door to verify that it was secure. Door opened, pulling pilot out of aircraft. Pilot became caught in stair handrail outside aircraft and sustained broken right arm. Copilot declared emergency and landed at airport.

**Class E mishaps** □ (A series) When power was reduced for descent, No. 1 power lever was frozen at 1,000 pounds torque. Outside air temperature was -12° C. at cruising altitude. Ice apparently formed in throttle cable and stopped movement of throttle. □ (D series) As gear began to retract during takeoff, screeching noise was heard in vicinity of copilot's floor. Gear stopped in mid travel. Red lights in gear handle remained on. Gear was manually extended, and aircraft was landed. Caused by failure of spur gear in gearbox to landing gear motor assembly.

## Maintenance

**uh1** **Class E mishaps** □ (H series) As aircraft was hovering on maintenance test flight, individual on ground motioned for pilot to shut down. JP4 was pouring out of fuel filters. Mechanic had installed wrong O-ring on main fuel filter. □ (M series) As pilot was landing from hover, No. 1 hydraulic system failed and antitorque pedals locked. Aircraft started to turn to right, but pilot was able to land with no damage. Hydraulic hose assembly in transmission compartment was chafed. Hose assembly was incorrectly positioned. □ (H series) Engine oil temperature rose to 110° C. during hover. Oil cooler fan was not functioning properly because bleed air was leaking from improperly maintained bleed air line. Aircraft heater had been removed and disconnected line was not properly capped. □ (H series) Excessive feedback in tail rotor pedals was caused by out-of-adjustment tail rotor control cable.

**uh60** **Class E mishap** □ Flames were seen coming from APU exhaust during start. Caused by improperly installed start fuel nozzle.

**ah1** **Class E mishaps** □ (S series) Transmission oil pressure fluctuated and temperature increased during landing. Oil was leaking from transmission oil line. Line was not properly tightened. □ (G series) Aircraft yawed and loud popping sound was heard during runup. Flames were seen coming from tailpipe. Variable inlet guide vanes were out of rig, causing two compressor stalls. □ (S series) Master caution and engine oil pressure lights came on during final approach. Engine oil pressure gauge was reading zero psi and engine oil temperature began increasing. Power-on landing was made. Engine oil return line had disconnected at quick disconnect at reservoir. Line had been disconnected during maintenance and was incorrectly reinstalled. Quick disconnect pins apparently did not seat and line disengaged during flight.

**ch47** **Class E mishaps** □ (C series) No. 2 engine fire light came on. Sensing element was rubbing against engine cowling and was chafed. Element was incorrectly positioned. □ (C series) As aircraft was landed, flight engineer noticed right side of aircraft by No. 2 engine was covered with oil. Flight engineer had not correctly installed oil line after taking engine oil sample.

**oh58** **Class C mishap** □ (A series) Blade tracking stick hit main rotor blades, wrinkling blade tip caps.

**Class E mishaps** □ (C series) As $N_2$ reached 55 percent during engine start, $N_1$ decayed. Engine-out caution light came on and all other systems decayed.

Inspection revealed air in fuel lines, which was caused by system not being correctly bled. □ (A series) During hovering autorotation, engine could not be retarded to idle with throttle. IP took controls and landed. Inspection revealed loss of direct mechanical linkage to $N_1$ fuel control. Cotter pin was not installed, allowing nut and washer to back off. Bolt vibrated out, allowing tube assembly to disconnect from engine control lever. Engine had been installed 8.8 hours before mishap. On prior daily inspection, crew chief had found a nut lying on engine deck. He looked around the engine and could not identify a missing nut, so he discarded the nut he had found.

**ov1** **Class E mishap** □ (D series) Pilot felt airframe vibrations and heard popping noises from No. 2 engine. Technical observer saw flames coming from No. 2 exhaust stack. Pilot returned to base and landed. Caused by dirty compressor section.

**u8** **Class E mishap** □ (F series) When gear was selected down, right main did not show down indication and gear warning horn sounded. Aircraft flew low over an SIP, another pilot, and several mechanics. Definite determination of gear position could not be made. Manual extension caused gear to lock. Caused by out-of-adjustment landing gear actuator spring.

**u21** **Class E mishap** □ (A series) Pilot noticed airspeed indicators were not working during takeoff roll. Pitot and static airlines were connected to pilot's airspeed indicator backwards.

## Messages received

• Safety-of-flight message concerning UH-60A main rotor hub assembly damper installation (UH-60A-80-42, 091605Z Dec 80). Summary: A special inspection is required to check damper bolts for wear. To insure torque on bolts remains within the prescribed limits, whenever the bolts are removed or replaced, a followup torque check is necessary. This SOF message lists required inspections. Contact: Frank Hunleth, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight message concerning UH-60A life limited components (UH-60A-80-43, 081610Z Dec 80). Summary: Message updates table 1-5 of TM 55-1520-237-23-2. Contact: Dennis Schumacher, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight message concerning one-time inspection of CH-47 chip detector circuits (CH-47-80-15, 172340Z Dec 80). Summary: The purpose of this inspection is to assure functional operation of CH-47 chip detector circuits. Recent occurrences of internal transmission failures emitting heavy metallic contamination have not been detected until oil pressure loss was evident. In each of these occurrences the chip detector system was inoperative. An inoperative chip detector circuit can be attributed to inadequate functional test procedures in the TMs. Changes to TMs

*(continued on next page)*

# Mishap briefs

will be made. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight maintenance notice concerning changes to operating procedures for CH-47 aircraft with T55-L-11 engines (CH-47-81-01, 051330Z Jan 81). Summary: Testing on an instrumented CH-47C with T55-L-11 series engine has shown the peak temperature in the power turbine bearing package occurring after shutdown can be reduced significantly if the engine is operated at ground idle for a period of 2 minutes prior to shutdown. This temperature reduction will contribute to longer bearing and engine life with fewer maintenance actions and removals. Contact: Robert Lawyer, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

• Maintenance notice concerning inspection of horizontal pins on all CH-54A aircraft (CH-54-80-03, 102100Z Dec 80).

• Maintenance notice concerning removal of TBO from T53-L-701, T53-L-701A, and T53-L-703 engines, OV-1 and AH-1 aircraft (AH-1-80-27, OV-1-80-14, 091605Z Dec 80).

• Maintenance notice concerning OH-58C primary directional control system (OH-58-80-12, 222100Z Dec 80).

## Urgent changes

The following urgent changes have been released:

• Change 14, dated 20 Nov 80, to TM 55-1520-235-10.

• Change 9, dated 20 Nov 80, to TM 55-1520-228-10.

• Change 3, dated 20 Nov 80, to TM 55-1520-228-CL.

• Change 5, dated 20 Nov 80, to TM 55-1520-235-CL.

• Change 6, dated 6 Oct 80, to TM 55-1520-210-10.

• Change 7, dated 6 Nov 80, to TM 55-1520-210-10.

• Change 1, dated 7 Nov 80, to TM 55-1520-220-10.

• Change 23, dated 15 Nov 80, to TM 55-1520-219-10.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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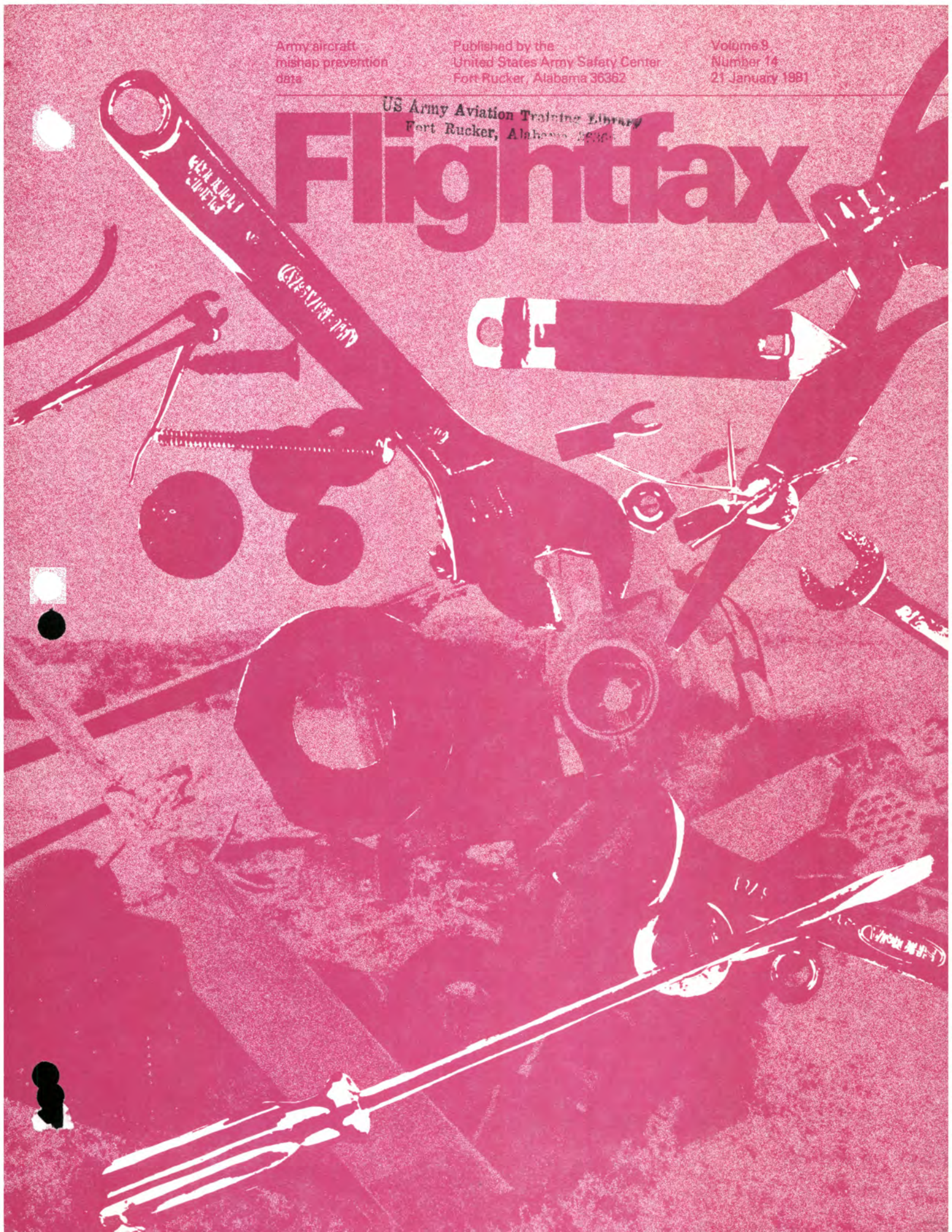
# Flightfax



# FOD is picking up

FOD—foreign object damage—was once one of aviation's minor problems. Over the years the problem has built up. Various things—loose change, nuts and bolts, stray tools—have been jamming controls and other moving parts since before Lindbergh's day. During World War II, pilots swore that little men called Gremlins went around at night distributing foreign objects the way Santa Claus hands out gifts at Christmas—only with different purposes in mind. And since the helicopter came along, blades have been chewed up by everything from turkey buzzards to ham sandwiches.

Then along came the turbine engine. Overnight the situation changed from bad to worse. If you were to make up a list of all the foreign objects which have interfered with turbines' innards from time to time you would have a list long enough to fill a mail order catalogue. Sand, gravel, loose change hauled out of mechanics' pockets along with their handkerchiefs, assorted military insignia, straw and hay, tools, flashlight batteries, nuts and bolts, and what do **you** have loose around you right now a turbine or rotor **won't** eat?

The point to be noted about FOD is that the foreign object involved doesn't have to be the size of a basketball or a pair of overalls to interfere with a turbine's digestive system. That fishhook you have in your tackle box might not be big enough to handle anything above the size of a minnow. Try sticking it in your ear if you want to see what even a small object in the wrong place can do.

FOD is a source of reduced efficiency which can pile up faster than snowdrifts in a North Dakota blizzard. When foreign objects cause turbines to run high fevers, you wind up with more maintenance piled on already overworked mechanics and more aircraft sitting around out of commission. What is more important, operational missions have to be curtailed or reduced, meaning that some poor soul somewhere else goes without the air support he desperately needs.

It's like that old story about the king who lost the battle because his horse lost his shoe—and the shoe dropped off because it needed a nail. This might be called FOD-in-reverse. Nobody ever has discovered what happened to the nail, but one thing's for sure: It wasn't where it was **supposed** to be when it was needed.

A foreign object which lodges where it is **not** supposed to be at a critical moment can be just as costly. A lot of people get involved.

Sounds pretty grim, doesn't it? It's a problem, all right, and a major one at that. But if you're the courageous type who will agree that sticking your head in the sand is no way to fend off attacking lions, you'll go along with the theory that **any** problem can either (a) be eliminated or (b) reduced to manageable proportions if it is handled the right way. Medical pioneers long ago demonstrated this when they set out to eliminate various unpleasant ailments such as beriberi, yellow fever, and polio. If they had sat around muttering about how tough things were there wouldn't be much of a population problem today.

We might as well start on a solution by being honest. Until some bright lad comes up with an Instant Automatic Handy-Dandy Foreign Object Eliminator it's a problem we will always have in some degree, the way some people have football knees or tennis elbows.

It's a sure fact the dangers you **know** about are the ones you can **do** something about. Once everybody in Army aviation is aware of how lethal FOD can be, what kind of a problem it really is, and what to **to do about it**, its size as a problem will shrink considerably.

## All hands alert

Check that **everybody**, folks. FOD is one problem which every person in an aviation unit can have a hand in (a) causing or (b)

**Screwdriver found in wreckage of AH-1G.**

solving. Even if the table of organization called for a special FOD officer, section, or platoon, foreign objects could still creep in and snuggle up inside turbines unless the entire unit is on the alert. Let's take a look at some of the openings which foreign objects can take advantage of when collective backs are turned.

- Grease on a mechanic's shoes picks up bits of gravel which in turn is deposited on a walkway where the turbine can get at it.
- Litter—paper cups, oily rags and the like—is allowed to accumulate along ramps and runways where wind blows it onto the flight line.
- A mallet is left in an intake by a forgetful mechanic.
- Loose objects accumulate in cockpits (a paper clip can do the job nicely if it hides in the right place).
- Foreign objects are introduced into parking areas by snow removal operations.
- Panel markers anchored in mud or loose sand.

**Rag lodged in carburetor induction elbow assembly.**

- Buckets—don't laugh, it's happened—wooden blocks and similar unsecured items in baggage compartments.

And so on and so on. If you put one person to work on the problem he'd end up climbing the walls at the funny farm.

Basically, it's a matter of good housekeeping, a happy arrangement under which every member of the household takes pride in keeping the pad straight. If Mom spends all day cleaning up while Pop sits in front of the TV set rolling empty cans under the sofa and sprinkling ashes on the rug, and Fido is shedding hairs on the best chairs, the joint is going to look like a devastated area no matter how hard she works.

The same goes for Army aviation. When everybody has the kind of pride his job demands—pride in the unit and its record and pride in himself as a professional—rooting out foreign objects before they can do the damage becomes an automatic reflex, like swatting flies.

The all-out assault on FOD is a team effort, like any good military operation. The trouble is that in any operation, like furniture moving, some unfortunate person always is handed the heavy end of the load. Some poor soul has the job of sweeping up after the parade has gone past.

As far as FOD is concerned, the maintenance people get the task of

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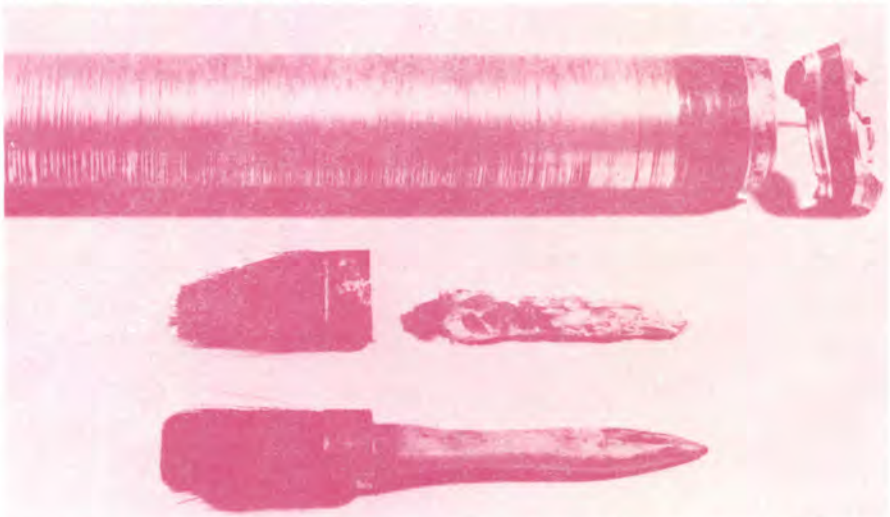

**Sheared tail rotor drive shaft caused by paint brush. New brush is shown with brush that caused damage.**

# FOD

carrying the ball about the same proportion of times as the running back on a pro football team. The mechanics, supervisors, inspectors, and the rest of the experts charged with the job of keeping aircraft hale and hearty work in areas where foreign objects are spawned and where they are likely to do the most damage. So it falls on them to get rid of potential FOD down where it usually begins.

What's sadder to relate, maintenance personnel not on the alert can bring on FOD the way Typhoid Mary used to spread germs around the land like a cropduster. Anybody who doesn't pay proper attention to his job in Army aviation sooner or later will cause trouble for somebody else. And bringing on FOD is the easiest and surest way to do it.

Take tools, for example. Needle nose pliers left where they can fall into engines or jam controls. Oily rags and paper served up to hungry turbines like TV snacks. Mallets, hammers, and a hundred or so other kinds of gadgets lying around loose in cockpits and other areas they'd no business being in.

**Nut found in oil inlet cavity**

Sloppy? You can say that again. What is worse, it's unprofessional, and the Army has about as much use for a bumbling amateur as the Philadelphia Eagles.

## Toolbox sense

One mark of the sure professional in any trade is the respect he has for his tools. Where would Joe the Safecracker be today if he was in the habit of leaving his drills behind at the scene of the crime? In Sing Sing, that's where. If you ever consult a surgeon and he starts patting his pockets and mumbling about a lost scalpel you'd do well to hunt up another sawbones.

When they put you under for the operation, you want to feel it is being performed by a real pro, even if it's only for an ingrown toenail. Pilots, aircrewmembers, and passengers aboard Army aircraft feel the same way about maintenance personnel. It doesn't help their state of mind if they have to keep wondering if **their** mechanic was some absentminded knucklehead with 10 thumbs.

**Hammer found in UH-1 drive shaft tunnel cowling.**

Absentminded knuckleheads are about as numerous in Army aviation as dinosaurs in downtown Chicago. But how about those needle nose pliers and those oily rags? They are solid evidence that maintenance goofs do occur, that some people aren't always performing like the real pros they've been trained to be. We'll grant there can be reasons—fatigue, haste, pressure, overwork and all the rest. But you can't tell that to a turbine trying to spit up a pair of pliers.

One sign of a real pro is the solid organization he brings to his work. A golf pro organizes the clubs in his bag the same way every time he goes out on the course. A football coach organizes his bench to avoid sending in the waterboy instead of the quarterback.

A professional aviation mechanic's toolbox is a model of organization. In the

**During a safety survey of an airfield, these objects were policed up from the ramp and helipads where aircraft were in operation.**

first place, it helps him get the job done faster and more efficiently, with less wear and tear on his nervous system. As far as FOD is concerned, the toolbox is a model **before** the job begins and **after** it is over. Everything is where it should be—in the box or in actual use. No needle nose pliers will ever get a turbine in trouble if they are accounted for, in their proper slot, and under lock and key when the aircraft goes out to the flight line.

Toolbox inventory is one of the heaviest weapons maintenance personnel have in the front-line war on FOD. For one thing, it helps them sleep better at night. Generally, when an aircraft crashes because a tool is left where it shouldn't be, nobody knows who was responsible. Except for one person.

## One big family

The toolbox inventory is mostly a matter of individual responsibility and sound training, like the use of any personal equipment.

But a properly trained unit can develop the kind of pride the FOD war calls for—and here the maintenance personnel in the front lines of the battle are joined by everybody from the commander on down. Take the case of an aircraft cockpit. As somebody has neatly put it, a cockpit is a pilot's place of business and the maintenance people are his office managers. It's a team, a family relationship, and when it works properly it's the kind of family marriage counselors like to dream about.

A pilot has a right to raise sand if he comes to work to find enough rubbish strewn around to start a rummage sale. The maintenance person has an equal right to feel a little tired, and to mutter bad words under his breath, if **he** arrives at a cockpit which looks like the floor of a dime store lunch counter after the noon rush. It's a two-way street.

**In FOD-conscious units this doesn't happen.** A pilot who realizes what a foreign object can do to his controls, his engine or his rotors, keeps everything—ham sandwiches, canteens, map cases, extra jackets—as shackled as a chain-gang convict to keep them out of trouble. And the mechanic—well we know how a professional FOD-hating mechanic feels about things being out of place.

It's a two-way street **outside** the aircraft as well. Your FOD-trained unit is always keenly aware that (a) just about anything movable qualifies as a potential foreign object and (b) as a general rule somebody put it or left it where it is. Those paper cups and bottle tops and the assorted litter beside the runway didn't grow there all by themselves. Some Sloppy Joe dropped them there. And while he might be a crack mechanic or a red hot pilot when he's wide awake, he doesn't know much about FOD. Or he has forgotten. Or he doesn't care. In any case, he's not the kind of professional Army aviation has to have.

Well, so okay, maybe the paper cup blew there. Maybe the other litter fell off a passing truck. Why is it **still** there? Whose responsibility is it to pick it up, anyway? Everybody's. You see it first, you pick it up. And if you find a cotter pin, bolt, or nut near an engine, don't discard it until you have closely checked to see where it came from.

Foreign object damage, like just about everything else which can go wrong in the Army, is almost always preventable. And, like just about everything else, the ounce of prevention is so simple you find yourself wondering why everybody doesn't practice it faithfully all the time.

Alertness, professional pride, individual and unit responsibility—these are the tools to do the trick. If an aircraft has been maintained by a tool-conscious crew which has wound up the job by a thorough inside and out once-over for potential foreign objects, if the aircrew has every movable item secured, if the runways and ramps are cleaner than a Dutch housewife's kitchen—then your FOD worries are largely over. They are over, that is, if this sort of housekeeping is standard unit procedure that goes on night and day every day in the year. ■

**Safety wire found in engine gearbox assembly.**

# Selected mishap briefs

**uh1** **Class E mishaps** □ (H series) Crew noticed unusual stiffness of cyclic control movement in right forward quadrant. Outside air temperature was -14° C. Aircraft had been subjected to several days of variation between freezing and subfreezing temperatures. Inspection revealed that external accumulation of ice around right cyclic servo valve caused control stiffness. □ (H series) Aircraft was landed when lowering ceilings and icing conditions made further flight inadvisable.

**ah1** **Class E mishaps** □ (S series) Transmission oil pressure rose to 90 psi during landing. Caused by failure of transducer. □ (S series) Master caution and transmission oil pressure lights came on during landing. Caused by failure of oil pressure switch.

**ch47** **Class E mishap** □ (B series) Forward cyclic speed trim indicator showed full extension during final approach at 60 knots. Caused by failure of cyclic speed trim actuator.

**oh58** **Class E mishaps** □ (A series) Before-takeoff check revealed smoke coming from around wire bundle on front of overhead console. Caused by overheated pilot instrument light rheostat. □ (C series) Transmission oil pressure fluctuated from 40 pounds to 100 pounds during flight. Caused by failure of oil pressure transducer. □ (A series) During runup, when hydraulic switch was returned to on position after hydraulic check, caution light remained on. Circuit breaker was recycled, but hydraulic control was not regained. Caused by failure of hydraulic pump.

**c7** **Class E mishap** □ Flaps were cycled after engine start. When flaps were retracted from 40-degree position, flap lever was positioned to zero flaps. Flaps started to retract but stopped at 30-degree position. Aircraft was returned to ramp. Linear actuator drive gears were extremely difficult to operate and gear shaft housing assembly was internally frozen.

**c12** **Class E mishap** □ (A series) Power drop and surge on No. 1 engine during takeoff was caused by failure of high pressure bleed valve.

**u21** **Class E mishaps** □ (A series) Aircraft yawed left and No. 1 engine inlet turbine temperature and $N_1$ decreased to zero. Single-engine landing was made. Caused by failure of fuel control, resulting in fuel starvation. □ (A series) About 10 minutes into flight, pilot noticed fuel siphoning from filler cap on left nacelle. Fuel cap was improperly seated. Caused by improper preflight check.

## From National Transportation Safety Board

On February 12, 1979, an Allegheny Airlines Nord 262 crashed on takeoff from Clarksburg, West Virginia. The accident resulted in two fatalities and seven serious injuries. At the time of takeoff, there were light snowshowers at the airport with an estimated accumulation rate of approximately 1 inch per hour. Deicing of the aircraft, with a 78-percent solution of an ethylene glycol-based deicing fluid and water, was completed 25 to 40 minutes prior to takeoff. Witnesses reportedly saw snow on the exposed horizontal surfaces of the aircraft when it taxied out. The

*(continued on back page)*

# Stacom

## Operators Manual and Checklist update

Listed below are the effective dates of the current aircraft operators manuals and checklists with the number and date of the latest change. Please check your weekly AG Publication Center Bulletin for subsequent changes.

| Fixed Wing TM 55-1510 | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 201-10/4 | RU-8D | | | | |
| | U-8D/G | 3 Apr 78 | | Jul 78 | |
| 201-10/5 | U-8F | 21 Mar 78 | 1, 18 Dec 78 | Jul 78 | |
| 204-10/3 | OV-1B | 9 Mar 79 | 1, 14 Jan 80 | Feb 79 | |
| 204-10/4 | OV-1C | 10 Apr 79 | 2, 14 Jan 80 | Apr 79 | |
| 208-10 | T-42A | 27 Feb 79 | | Feb 79 | |
| 209-10 | U-21A | 25 Mar 77 | 5, 6 Oct 80 | Feb 77 | 5, 12 Jun 80 |
| 209-10-1 | RU-21A/D | 28 Feb 77 | 5, 24 Jul 80 | Mar 77 | 2, 23 Aug 78 |
| 213-10 | OV-1D/RV-1D | 4 Aug 78 | 2, 16 Jan 80 | Nov 78 | |
| 214-10 | RU-21B/C | 15 Mar 77 | 5, Undated | Apr 77 | 4, 12 Jun 80 |
| 215-10 | U-21G | 11 Mar 77 | 4, 26 Jun 80 | Apr 77 | 3, 12 Jun 80 |
| 215-10-2 | RU-21H (GR-V) | 29 Dec 78 | 1, 28 Jun 80 | Dec 78 | 1, 12 Jun 80 |
| 216-10 | U-3A/B | 11 Dec 78 | 1, 3 Jul 80 | Dec 78 | |
| | C-12A | 8 Jan 80 | | Jan 80 | |
| | C-12C | 1 Dec 78 | | Jan 79 | |

| Rotary Wing TM 55-1520 | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 209-10 | CH-47A | 9 Jan 79 | | Dec 78 | 1, 2 Feb 79 |
| 210-10 | UH-1D/H | 18 May 79 | 7, 6 Nov 80 | Feb 79 | 2, 1 Apr 80 |
| 214-10 | OH-6A | 17 Dec 76 | 9, 6 Jun 80 | Dec 76 | 3, 20 Jun 80 |
| 217-10-1 | CH-54A | 8 Apr 77 | 2, 10 Oct 79 | Mar 77 | 1, 13 May 77 |
| 217-10-2 | CH-54B | 15 Apr 77 | 2, 10 Oct 79 | Mar 77 | 2, 22 Aug 79 |
| 219-10 | UH-1B | 16 Jan 69 | 16, 10 Sep 79 | Dec 68 | 8, 11 Apr 79 |
| 220-10 | UH-1C/M | 8 Sep 80 | 1, 7 Nov 80 | Jul 71 | 8, 13 Apr 79 |
| 221-10 | AH-1G | 18 Mar 80 | 1, 6 Nov 80 | Mar 80 | |
| 227-10-1 | CH-47B | 23 Aug 78 | 3, 14 Nov 80 | Dec 78 | 2, 22 Aug 79 |
| 227-10-2 | CH-47C | 23 Aug 78 | 4, 16 Sep 80 | Nov 79 | 1, 2 Feb 79 |
| 228-10 | OH-58A | 7 Apr 78 | 9, 20 Nov 80 | Jul 78 | 3, 20 Nov 80 |
| 233-10 | TH-55A | 30 Sep 76 | 2, 14 Jul 78 | Oct 76 | 4, 17 Oct 78 |
| 234-10 | AH-1S (MOD) | 17 Nov 76 | 11, 6 May 80 | Nov 76 | 3, 3 Nov 79 |
| 235-10 | OH-58C | 7 Apr 78 | 14, 20 Nov 80 | Jul 78 | 5, 20 Nov 80 |
| 236-10 | AH-1S (PROD) | 11 Jan 80 | 2, 20 May 80 | Jan 80 | |
| 237-10 | UH-60A | 21 May 79 | 7, 7 Oct 80 | Dec 78 | 6, 7 Feb 80 |
| 239-10 | AH-1S (MC) | Cancelled, effective 15 Nov 80. All AH-1S (PROD) (ECAS) and (MC) use 236-10 and -CL. | | | |

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Mishap briefs

probable cause of the accident was determined to be, in part, the loss of lateral control and lift due to snow on the wings and empennage when the aircraft climbed out of ground effect. The presence of frozen snow on the upper horizontal airfoil surfaces was confirmed by photographs after the accident.

On February 18, 1980, a Redcoat Air Cargo, Ltd., Bristol Brittania 253, crashed shortly after takeoff from Logan International Airport, Boston. The accident resulted in seven deaths and one serious injury. Light snow had fallen throughout the period of flight preparation, taxi, and takeoff at a rate of between 0.5 and 0.8 inch per hour. The aircraft had been deiced with a 30-percent solution of an ethylene glycol-based deicing fluid 45 to 60 minutes prior to takeoff. Evidence indicates that wet snow, which accumulated on the wings and horizontal stabilizer prior to takeoff, was a major factor in this accident.

Although an ethylene glycol-water mix is useful as a deicing agent, only the undiluted fluid is recommended by the manufacturer as an anti-icing agent. In the above accidents, the very fact that the exposed airfoil surfaces were wetted may have actually enhanced the accumulation of wet snow and created a condition in which the wet snow was not blown off by air moving over the surfaces.

## Maintenance

**oh58** **Class E mishap** ☐ (A series) TOT fluctuated from 200° C. to 700° C. during landing. Postlanding inspection revealed upper nut on TOT cable terminal block on engine fireshield was loose.

**c7** **Class E mishap** ☐ Crew smelled electrical fumes during flight. When breaker panels were checked, slight electrical shock was felt. Pilot returned to airfield and landed. D.C. bus bar was installed either touching or close enough to allow arcing to auxiliary electronics breaker panel rear housing box.

### Messages received

- Safety-of-flight message concerning UH-60A tail rotor pivot assembly (UH-60A-80-44, 232010Z Dec 80).

Summary: The tail rotor pivot assembly retainer has been found to occasionally disbond from the spar and come loose from the pivot assembly. To prevent recurrence of this situation, a 10-hour/5-day inspection will be performed. Contact: Earl Parsons, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

- Maintenance notice concerning OH-58A jet assembly bleed valve removal (OH-58-81-01, 090900Z Jan 81).

- Information message on U-21/RU-21 inspection of engine oil filters (131345Z Jan 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# Mishap review

## Synopsis

An instructor pilot and pilot were on a U-8D training flight. After a simulated engine failure, the aircraft was landed gear up.

## History of flight

A pilot was being transitioned into the U-8D. He had about 22 hours total time in the aircraft. After flying in the local area for awhile, the aircraft entered the traffic pattern. On downwind leg, the IP simulated a failure on the No. 2 engine. After the pilot correctly identified the "dead" engine, the IP placed the right engine in zero thrust configuration. Continuing on downwind, the IP proceeded with the before-landing checklist. The pilot identified the gear handle, moved it downward, and locked it. Neither the pilot nor the IP confirmed that the gear went down, although both remember seeing the landing gear in-transit light being on. The final landing check, calling for confirmation of landing gear down, was not made.

The pilot felt the tail hit the runway. At the same time, the IP sensed the gear was not down and took control of the aircraft. He hit the landing gear switch to confirm it was down, then held the aircraft off the runway as long as possible. The U-8 settled to the ground with the landing gear up and skidded to a halt.

## Crewmember experience

The 44-year-old IP had more than 9,000 rotary wing hours and almost 1,400 fixed wing hours. He had about 75 hours in the U-8D. The 34-year-old pilot had almost 700 rotary wing hours and more than 700 fixed wing hours.

## Commentary

The crew was not using a "challenge and response" type checklist, and the final landing check was not made. Neither pilot confirmed that the gear had actually gone down. Both assumed the landing gear was down based on their observation of the gear in-transit lights being on when the landing gear handle was initially moved downward. ■

# Status of pyrotechnics

Following is a list of all lots of pyrotechnics with Department of Defense Identification Codes (DODIC) L117, L118, L119, and L275 currently suspended, restricted, or assigned priority of issue by TB 9-1300-384-1 or 2.

| DODIC | Lot | Status |
|---|---|---|
| L117 | PAL-2-30 - PSIU | Demil |
| | PAL-2-31 - PSIU | Demil |
| | PAL-2-32 - PSIU | Demil |
| L118 | 16-ESC-67 - PSIU | Demil |
| | 25-ESC-67 - PSIU | Demil |
| | 5-PAI-1066 - PSIU | Inspect 100% |
| | 14-PAI-66 - PSIU | Demil |
| | 15-PAI-66 - PSIU | Demil |
| | 26-PAI-1266-104 - TSIU | Pending inves. |
| | 102-PAI-1967 - PSIU | Demil |
| | 1-PAI-1969 - PSIU | Demil |
| | 1-PII-1969 - PSIU | Demil |
| L119 | MBA-5-14 - TUO | |
| | MBA-5-19 - TSIU | Pending inves. |
| L275 | All stock manufactured prior to Jan 60 - PSIU | Demil |
| | All Kilgore (K) lots manufactured in 1960 - PSIU | Demil |
| | All Harvell-Kilgore (HK) lots manufactured in 1962 - PSIU | Demil |
| | All Propellex (P) lots manufactured in 1969, 70, or 72 | Assigned priority of issue unless otherwise suspended/ restricted |

| DODIC | Lot | Status |
|---|---|---|
| | 16-FND-0470 - TUO | |
| | 22-FND-0670 - PSIU | Demil |
| | 78-HK-0263 - PSIU | Demil |
| | HK-1-0363 - PSIU | Demil |
| | HK-48-0663-195 - TUO | |
| | 4-HK-1964 - PSIU | Demil |
| | 40-HK-0365-195 - PSIU | Demil |
| | 85-HK-0565-195 - PSIU | Demil |
| | 9-HK-0965-104 - TUO | |
| | 4-HK-1066 - PSIU | Demil |
| | 31-HK-1266 - PSIU | 100% Inspect |
| | 20-HK-0367 - TUO | |
| | 31-HK-0367 - TUO | |
| | 91-HK-0667 - TUO | |
| | 111-HK-0767 - TUO | |
| | 111-HK-1967 - TUO | |
| | 132-HK-0867 - PSIU | 100% Inspect |
| | 135-HK-0867 - TUO | |
| | 135-HK-1967 - TUO | |
| | 91-KC-1967 - TUO | |
| | 96-KC-0767 - TUO | |
| | 111-KC-1967 - TUO | |

| DODIC | Lot | Status |
|---|---|---|
| | 114-KC-0767 - PSIU | Demil |
| | 115-KC-0767 - PSIU | |
| | 117-KC-8/67/0 - PSIU | Demil |
| | 123-KC-0867 - PSIU | 100% Inspect |
| | 132-KC-1967 - PSIU | 100% Inspect |
| | 134-KC-0867 - PSIU | Demil |
| | 135-KC-1967 - TUO | |
| | 5-KC-1170 - TUO | |
| | 8-KC-1971 - PSIU | Demil |
| | 9-KC-1971 - PSIU | Demil |
| | 13-KC-0971 - PSIU | Demil |
| | 16-KC-1971 - PSIU | Demil |
| | 1-KC-0672 - PSIU | Demil |
| | 14-KC-1173 - TUO | |
| | 2-KC-0577 - PSIU | |
| | 16-P-69 - PSIU | Demil |
| | 12-P-0569 - PSIU | Demil |
| | 17-P-0769 - PSIU | Demil |
| | 3-P-0969 - PSIU | Demil |
| | 11-P-0371 - PSIU | Demil |
| | 12-P-0371 - PSIU | Demil |
| | 31-P-0771 - PSIU | Demil |

TSIU - Temporarily suspended from issue and use
PSIU - Permanently suspended from issue and use
TUO - Training use only
Demil - Demilitarization authorized

**Thanks to WO1 Don Everhart, 3d ACR, Fort Bliss.** ■

# Recap of TSARCOM and AVRADCOM messages

Following is a list of AIG 8881 addressed messages transmitted by TSARCOM and AVRADCOM from 1 October through 31 December 1980.

**AH-1-80-21** Maintenance notice concerning the AH-1S voltage regulator adjustment

**AH-1-80-22** SOF maintenance notice concerning maintenance of temperature sensing element installed on T53 engine fuel controls

**AH-1-80-23** Maintenance notice concerning conservation of T55 and T53 engines for all UH-1, AH-1, OV-1, and CH-47 series aircraft

**AH-1-80-24** SOF technical message on inspection and replacement of nuts, tail rotor drive shaft clamps, on EH-1/UH-1 and TH-1/AH-1 helicopters

**AH-1-80-25** Maintenance notice concerning AH-1 tail rotor drive shaft bearings

**AH-1-80-26** Maintenance notice concerning inspection of AH-1 pitch link tube

**AH-1-80-27** Maintenance notice concerning removal of time between overhaul from T53-L-701, T-53-L-701A, and T53-L-703 engines for AH-1 and OV-1 series aircraft

**UH-1-80-14** SOF maintenance notice on temperature sensing element installed on T53 engine fuel controls, UH-1, AH-1, and OV-1 aircraft

**UH-1-80-15** Maintenance notice on conservation of T55 and T53 engines for all UH-1, AH-1, OV-1, and CH-47 series aircraft

**UH-1-80-16** SOF technical message on inspection and replacement of nuts, tail rotor drive shaft clamps, on EH-1/UH-1 and TH-1/AH-1 helicopters

**OH-6-80-06** SOF technical one-time inspection and treatment of all OH-6 and OH-58A/C helicopter governors and fuel controls used on T63-A5A, T63-A-700, and T63-A-720 gas turbine engines

**OH-6-80-07** SOF message rescinding message OH-6-80-06

**OH-6-80-08** SOF one-time inspection of tail rotor assembly on OH-6 helicopters

**OH-58-80-09** Maintenance notice concerning jet assembly bleed valve removal

**OH-58-80-10** SOF technical one-time inspection and treatment of all OH-6 and OH-58A/C helicopter governors and fuel controls used on T63-A5A, T63-A-700, and T63-A-720 gas turbine engines

**OH-58-80-11** SOF message rescinding message OH-58-80-10

**OH-58-80-12** Maintenance notice on OH-58C primary directional control system

**CH-47-80-11** SOF one-time inspection for all CH-47A/B/C aircraft to inspect stick-boost dual actuating cylinders

**CH-47-80-12** Maintenance notice on conservation of T55 and T53 engines for all UH-1, AH-1, OV-1, and CH-47 series aircraft

**CH-47-80-13** Maintenance notice concerning additional calendar time inspections

**CH-47-80-14** Maintenance notice advising maintenance personnel of pitch link bearing wear limits

**CH-47-80-15** SOF one-time inspection of chip detector circuits

**CH-54-80-03** Maintenance notice on inspection of horizontal pins

**OV-1-80-09** SOF one-time inspection for cracking of nose gear assemblies

**OV-1-80-10** Maintenance notice for MK-J5D ejection escape system

**OV-1-80-11** Maintenance notice on conservation of T55 and T53 engines for all UH-1, AH-1, OV-1, and CH-47 series aircraft

**OV-1-80-12** SOF maintenance notice on temperature sensing element installed on T53 engine fuel controls

**OV-1-80-13** SOF one-time inspection for chafing of propeller reversing wires

**OV-1-80-14** Maintenance notice concerning removal of time between overhaul for T53-L-701, T53-L-701A, and T53-L-703 engines

**GEN-80-25** Maintenance notice on proper maintenance procedures and use of proper tools when installing flexible hose assemblies on all Army aircraft

**GEN-80-26** SOF message on M5 dispersing system

**GEN-80-27** SOF message on M5 dispersing system

**UH-60A-80-34** SOF maintenance notice concerning main rotor blade

**UH-60A-80-35** SOF one-time inspection of inboard damper attachment bolts

**UH-60-80-36** SOF message on main rotor hub assembly damper rod end

**UH-60A-80-37** SOF one-time inspection for APU/engine fuel shutoff valve

**UH-60A-80-38** SOF maintenance notice on tiedown assemblies

**UH-60A-80-39** SOF one-time inspection of main transmission input module free wheel unit nut

**UH-60A-80-40** SOF maintenance notice on inboard and outboard damper attachment bolt torque

**UH-60A-80-41** SOF maintenance notice on troop/cargo door stops

**UH-60A-80-42** SOF maintenance notice on installation of main rotor hub assembly

**UH-60A-80-43** SOF maintenance notice on life limited components

**UH-60A-80-43 (correction)** Correction to UH-60A-80-43

**UH-60A-80-44** SOF maintenance notice on tail rotor pivot assembly

Addresses requiring copies of messages should contact their next higher headquarters. ■

# Could this be me?

Take a good look at the photograph on this page. It was taken in front of base operations at an Army airfield while refueling operations were in progress. Although all discrepancies are not visible in the photograph, the following safety violations were noted:

The operator shown was not wearing any protective goggles or gloves and was servicing the aircraft with his sleeves rolled up. The refueling truck was improperly positioned with respect to the aircraft and was less than 10 feet away from it. No assistant was provided to aid the operator in shutting off the fuel pump, moving the vehicle, or manning a fire extinguisher in the event of a fire—as stipulated in FM 10-68, C2. Nor was spilled JP-4 cleaned up or otherwise treated in accordance with procedures found in the above FM.

But this doesn't just concern the operator in the picture. His identity is immaterial. In reality, the matter is a personal one. It concerns every individual in the Army in every job assignment. It concerns the NCOIC and the supervisor. To quote an old cliche, "Safety is everybody's business."

Disregard for safe practices produces mishaps that cost the Army dearly every year in terms of dollars, equipment, injuries, and lives. And only you can put a stop to these senseless and needless mishaps—by following TM and FM procedures, obeying regulations and SOPs, and making sure those around you do the same.

Go ahead! Take another look at the photo, and then ask yourself: "Could this be me?" ■

# Selected mishap briefs

**uh1** **Class C mishaps** □ (V series) Main rotor blades hit tree during takeoff from confined area. □ (H series) During approach to low level autorotation, aircraft was flown through the top branches of a tree, breaking chin bubbles and lenses of landing light and searchlight. □ (H series) With throttle in full open position, emergency governor switch was inadvertently placed in emergency position, causing $N_2$ and rotor rpm to overspeed to more than 7200 rpm.

**Class E mishaps** □ (H series) Pilot noticed severe high frequency vibration in pedals during climbout. Running landing was made. Caused by failure of No. 5 hanger bearing. □ (H series) IP gave pilot simulated engine failure. $N_1$ dropped to 70 percent, but $N_2$ remained at 6000 rpm and engine/rotor tachometer needles didn't split. Power recovery was made and aircraft landed. Caused by failure of input quill assembly. □ (H series) Loud hissing sound was heard from engine during flight. Caused by cracked combustion chamber drain valve boss. □ (H series) $N_2$ tachometer went to zero during landing. Caused by failure of tachometer generator.

**uh60** **Class E mishap** □ Stabilator would not program in manual or automatic mode during runup. Water had frozen inside stabilator actuator. After being heated, stabilator system operated normally.

**ah1** **Class C mishap** □ (S series) As pilot was landing to confined area, he felt approach was too steep and fast, so he decided to make circling approach to lose altitude and dissipate airspeed. As aircraft turned downwind, pilot increased left pedal to keep aircraft in trim. Gusty wind condition and aircraft attitude caused rate of descent to rapidly increase, and pilot tried to make go-around by quickly increasing collective. Torque momentarily increased to 64 pounds.

**Class E mishaps** □ (G series) Vibration and shudder during takeoff were caused by malfunction of transducer. □ (G series) Crew smelled electrical odor and landed. Caused by shorted out map light. □ (S series) Ninety-degree gearbox chip detector light came on and high frequency vibration developed in pedals. Caused by failure of 90-degree gearbox. □ (S series) Transmission oil pressure dropped from 60 to 35 psi during takeoff. Caused by failure of oil pressure transducer.

**ch47** **Class C mishap** □ (A series) Aircraft descended over mound of dirt and rocks during slope operation, crushing rescue hatch door and puncturing belly of aircraft.

**Class E mishaps** □ (A series) Heavily loaded aircraft was hovering westbound into refueling area at civilian airport. Several civilian aircraft were parked on north side of flight path about 225 feet away. Surface wind was from the south at 12 to 15 knots. Pilot turned south to continue to refueling area. Rotorwash blew civilian aircraft off the ground and its right wing hit the ground. One wing was secured with tiedown rope and one was not. The other civilian aircraft were properly secured. CH-47 pilot was aware of the wind and aircraft weight, but he flew close to the civilian aircraft,

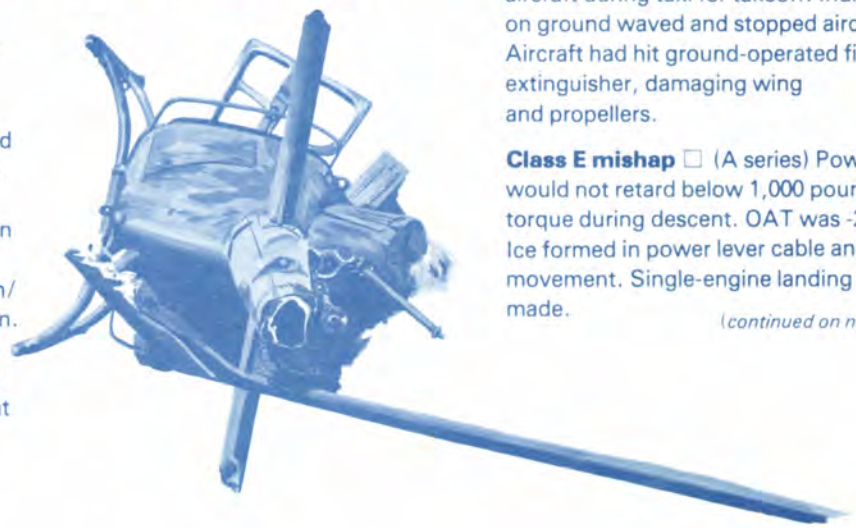
assuming they were secured and that rotorwash would not be a factor. ☐ (C series) During instrument checkride, IP pulled No. 1 engine condition lever to ground position. Almost simultaneously, No. 1 engine chip detector light came on. Engine was shut down and running landing was made. Metal chips in filter and on chip detector plug indicate failure of engine accessory gearbox.

**oh6** **Class C mishap** ☐ Postflight inspection revealed ADF sensing antenna had failed near top bracket and became entangled in tail rotor, damaging both blades.

**oh58** **Class A mishaps** ☐ (A series) Aircraft was at 9-foot hover. Pilot inadvertently applied aft cyclic while looking underneath aircraft to determine height above ground, allowing aircraft to drift rearward in tail-low attitude. Tail rotor hit ground, control was lost, and aircraft crashed. 8113 ☐ (C series) Aircraft was involved in night visual goggles training over snow-covered terrain. Main rotor system/transmission separated. Details unknown. 8114 ☐ (A series) While pilot was attempting left pedal turn with right skid heel on the ground, aircraft rolled to right and came to rest on right side. 8115

**c12** **Class E mishaps** ☐ (C series) Fire warning light came on during flight. There was no other indication of fire, and all engine instruments were normal. Caused by faulty fire detector. ☐ (A series) Engine tone changed and oil pressure and torque on left engine dropped. Single-engine landing was made. Small aluminum sliver was found lodged in oil pressure relief valve.

**ov1** **Class A mishap** ☐ (D series) Aircraft, on maintenance test flight for engine rigging and nose gear strut replacement, hit ground and exploded. Two fatalities. 8116



**Class E mishap** ☐ (RV-1D) No. 1 engine chip detector light came on, engine oil pressure dropped to zero, and power was lost. Engine was secured, and aircraft was landed. Cause by failure of reduction gear system.

**u8** **Class E mishap** ☐ (F series) During power reduction from climb to cruise, No. 2 engine began running rough and surging. Cylinder head temperature was dropping, and engine was secured. Caused by malfunction of fuel injection pump assembly.

**u21** **Class C mishap** ☐ (A series) Thump was heard from rear of aircraft during taxi for takeoff. Individual on ground waved and stopped aircraft. Aircraft had hit ground-operated fire extinguisher, damaging wing and propellers.

**Class E mishap** ☐ (A series) Power lever would not retard below 1,000 pounds torque during descent. OAT was -25° C. Ice formed in power lever cable and froze movement. Single-engine landing was made.

*(continued on next page)*

# Mishap briefs

## Maintenance

**ah1** **Class E mishap** ☐ (G series) No. 1 hydraulic light came on and pump cavitated during takeoff. Caused by loose fitting on tail rotor SCAS actuator. Fitting had not been tightened during recent maintenance.

**oh58** **Class E mishap** ☐ (A series) Lateral cyclic binding occurred during hover. Caused by improper torque on intermixing bellcrank.

**c7** **Class E mishap** ☐ As engine was running on ground, flight attendant told pilot something was leaking from engine. Pilot verified this and shut down engine. Mechanic had just changed oil screen, working on hot engine. Work was visually checked, but maintenance operational check for leaks was not made because it would have delayed flight. When gasket was changed, a small piece of gasket material adhered to engine and was undetected because of darkness, engine heat, and dripping hot oil. This allowed oil to leak around gasket when oil pressure built up to normal operating pressure.

**c12** **Class E mishap** ☐ (A series) Gear handle was placed in up position after liftoff. Lights in gear handle remained on, indicating unsafe condition. Gear handle was placed in down position, and aircraft landed. Left main gear up-limit switch was out of adjustment.

### Messages received

☐ Safety-of-flight message concerning one-time inspection of T55-L-11ASA engine variable inlet guide vanes (CH-47-81-03, 131400Z Jan 81). Summary: Recently, a T55-L-11ASA engine incurred a variable inlet guide vane and compressor failure. Another T55-L-11ASA engine in the same unit was making a humming noise. Inspection of the engines revealed wear in individual inlet guide vane arms in the hole where they are bolted to the unison ring. One vane on each engine was free due to the hole being worn through the side of the arm. When this hole is worn through, the individual VIGV does not move with the others. This loose vane blocks the air flow and sets up fatigue stresses in the first stage compressor blades which subsequently lead to their failure. Compressor blade failure unbalances the rotor which, in turn, causes complete compressor failure. All T55-L-11ASA engine VIGVs will be inspected for excessive wear of the vane attachment points. Contact: Robert Lawyer, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

• Safety-of-flight message concerning incorrect wiring of fuel level transmitters in RU-21H aircraft (U-21-81-01, 141915Z Jan 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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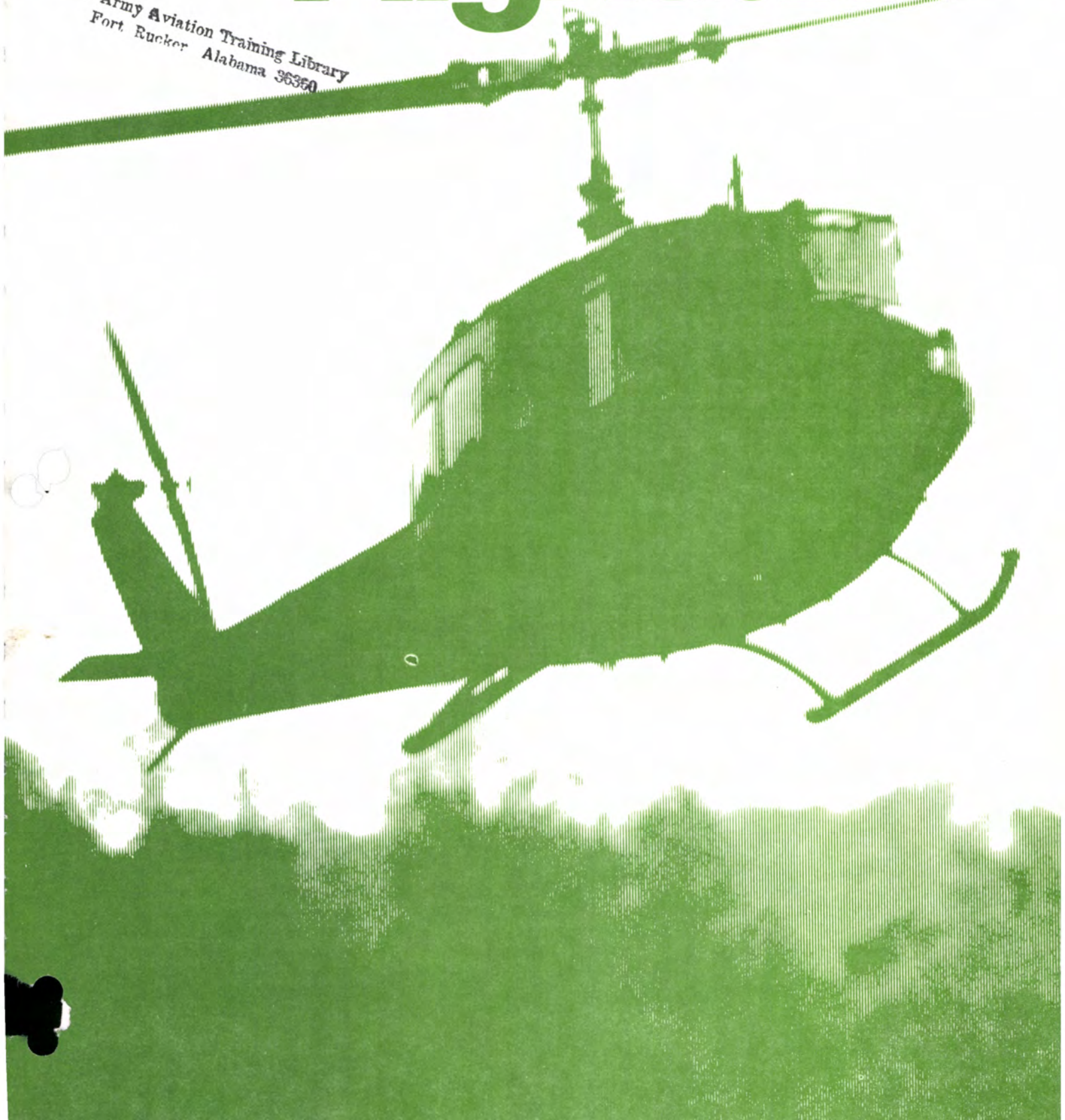

# Nine receive Broken Wing Award

The Broken Wing Award is given to aircraft crewmembers who demonstrate a high degree of professional aviation skill while actually recovering an aircraft from an in-flight failure or malfunction necessitating an emergency landing. Requirements for the award are spelled out in AR 672-74, dated 15 May 1979.

Nine aviators received the Army Aviation Broken Wing Award from October through December 1980.

• **CW2 Roy L. Dossey, Company D, 24th Aviation Battalion, Hunter Army Airfield, Georgia.** CW2 Dossey was on a low-level flight in an OH-58A when the low rpm audio came on and $N_2$ rpm decayed to 100 percent. Dossey turned right toward a dirt road he had just passed. Rpm continued to decay. When it became obvious he would not be able to land on the road, Dossey maneuvered the helicopter to the only available forced landing area, which was about 35 feet wide and 70 feet long, bordered on all sides by 25- to 30-foot trees. The helicopter was landed with no damage.

• **CW4 Charles H. Kreiner, Davison Army Airfield, Fort Belvoir.** CW4 Kreiner was piloting a U-21A on a service mission. When the copilot raised the gear handle during the takeoff climb, the gear moved a small amount and stuck in the down position. Reaching altitude, Kreiner notified ATC of the emergency. Procedures in the checklist and operators manual were followed without result. Based on the fuel available, winds aloft, weather conditions, facilities available, and type of emergency, Kreiner decided to continue to his destination. As the U-21 neared the airfield, the pilot of a helicopter told Kreiner the gear appeared to be down. The airplane was slowed to the slowest possible safe speed during the approach for a minimum amount of ground run after touchdown. As the airplane touched down, the main gear failed and the airplane porpoised. Kreiner was committed to land at this point and maintained control for a second touchdown. The airplane porpoised again because of the collapsing gear. After touching down for the third time, Kreiner realized there might not be enough runway available to complete the landing if the airplane became airborne again, so he pushed the flight controls full forward and forced the airplane onto the runway. The U-21 came to rest with minimal damage about 1,800 feet from the first touchdown point and 16 inches to the left of the runway centerline of a 75-foot-wide runway.

• **Charles R. Ledford, Doss Aeronautical Services, Fort Rucker.** Mr. Ledford was the instructor pilot on a T-42 training flight. During takeoff from the airfield, Ledford noticed that the gear "up" light had not activated and the airplane was not increasing airspeed as it should. The landing gear motor circuit breaker had popped. The circuit breaker was reset and the landing gear recycled, but the "up" light remained off. Ledford told one of the student pilots to visually check the nose gear with the mirror. The student pilot confirmed that the gear was about 25 degrees from being fully retracted. The back seat student was told to try to manually lower the gear. The manual crank engaged but would not turn. The airplane was returned to the airfield, and a low pass over the tower confirmed that both the main gear and nose gear were partially extended. On final for the low pass, the cockpit filled with smoke and strong fumes. All vents and windows were opened, and the smoke finally cleared. Ledford wanted to burn off some fuel, so he left the traffic pattern. When he felt enough fuel had been burned off, he told the tower personnel he was ready for the runway to be foamed. When the foaming was completed, Ledford made a low approach to check the runway before touching down. On the second approach, just as the airplane cleared the approach end of the runway, mixtures for both engines were closed and prop levers were moved to the feather position. The T-42 hit the runway, sliding about 200 feet before the gear totally collapsed. The airplane slid another 1,800 feet on its belly after the gear collapsed. The only damage was to the main and nose gear doors and rods.

• **CW3 Craig P. McCurdy, C Troop, 4/9th Cavalry, 6th Cavalry Brigade, Fort Hood.** CW3 McCurdy was on a UH-1H test flight. On final approach, at 20 knots and 30 feet agl, the helicopter yawed right when power for landing was applied. Directional control could not be maintained with full left pedal, and the Huey started to spin to the right. Because of the low altitude and airspeed, McCurdy could not regain streamlined flight for landing at an improved airstrip. He reduced the throttle and was able to stop the spin after about two and one-half revolutions. McCurdy landed the UH-1 with no damage, using collective to cushion the landing and throttle to maintain heading.

• **CW2 Peter R. Minnar, Company A, 26th Aviation Battalion, Massachusetts Army National Guard.** CW2 Minnar was performing unit trainer duties in an OH-6A. As the helicopter was flying at 80 knots and 1,000 feet agl, a loud bang was heard from the engine area and the engine flamed out. Minnar took control of the helicopter and entered autorotation. The terrain in the immediate vicinity consisted of an ocean with a seawall of rocks and a line of telephone poles with cable running along the shoreline and a pond and marshy areas. There was also a high tension line running parallel to the telephone cable. Minnar aligned the helicopter with the only clear landing area, a bicycle path running between the high tension line and the telephone cable. Because of the proximity of the wires to the path, there was very little room to maneuver for a safe landing. During the descent, the pilot kept Minnar informed of airspeed buildup and rotor rpm status. The OH-6 was landed with no damage.

*(continued on next page)*

# Broken Wing Award

• **CW3 Craig R. Nixon, D Troop, 1st Squadron, 10th Cavalry, Fort Carson.** CW3 Nixon was the instructor pilot aboard an AH-1G on a night gunnery qualification mission. The qualifying pilot was hovering at an altitude of 10 to 15 feet over a pinnacle firing point when the third rocket engagement was made. As four pairs of rockets were fired, several compressor stalls occurred and engine power was lost. Nixon took control of the helicopter and, within 15 seconds, landed on the precipice, while combating the momentary loss of orientation from the firing of the rockets and the distraction of the repeated bright flashes from the engine. With only minimal illumination and a light quartering tailwind from the left, Nixon was able to maintain directional control within 3 degrees of the initial heading by applying full left pedal and reducing throttle. The severity of the compressor stalls had caused excessive torsional loads to be applied to the drive train, shearing the No. 4 tail rotor drive shaft during the emergency.

• **1LT Kevin G. Scherrer, Company A, 503d Aviation Battalion, APO NY 09165.** Lieutenant Scherrer was taking off in an OH-58A from a field site. Engine failure occurred as the helicopter was 200 feet above the ground. Scherrer began a left turn while descending for an autorotational landing to the only suitable landing area, a tank trail. To the left rear were three 50-foot antennas bordered by powerlines. To the left front was an 8-foot-high fence. On the right side was a rough field with tall vegetation and a 6-degree downward slope. The helicopter had to be landed downwind. Minimum ground run was necessary to insure the OH-58 would land on the tank trail and not skid 10 feet further into a 3-foot-deep drainage ditch bordering the tank trail on both sides. Scherrer landed the helicopter with a ground run of less than 5 feet. There was no damage.

• **CW3 Kenneth P. Shriver, Yuma Proving Ground, Yuma, Arizona.** CW3 Shriver was the instructor pilot on an AH-1S night vision goggles training flight. As the student turned downwind, a severe vibration was felt throughout the airframe, and tail rotor thrust was lost. Shriver took control of the helicopter and began a descent. Within 10 seconds of the vibration, the helicopter, now at 50 feet agl and 70 knots, yawed right. Antitorque pedals had no effect on the yaw, and the spiraling descent continued. Aware of the uneven terrain beneath the aircraft, Shriver reduced collective slightly and positioned the cyclic so as to decelerate during the spiral turn. At about 25 feet with zero airspeed, Shriver retarded the throttle to stop the rotation and then used the remaining collective pitch to cushion the touchdown. Just before ground contact, he leveled the rotor system to minimize the danger of main rotor flap. The cross tubes were bent and the undercarriage damaged during the landing.

• **CW3 Terrance W. Sullivan, Company D, 40th Aviation Battalion, Buckley Air National Guard Base, Aurora, Colorado.** CW3 Sullivan was piloting an OH-6A on a night training flight when the aircraft yawed left and then right, and the nose tucked under. The low rpm audio activated. Sullivan immediately reduced collective and established an autorotational glide. He checked the throttle full on and fuel shutoff full down. After an unsuccessful attempt to regain power, Sullivan rolled the throttle back to flight idle and maneuvered the aircraft into the wind. He was unable to see recognizable terrain features because of the darkness. The observer called out rotor rpm and airspeed. About 75 feet agl, terrain features became more identifiable, and Sullivan flared the aircraft and maneuvered to miss a large hill in front of him. The autorotation was completed, with a 12-foot ground slide, to an area surrounded by hills, slopes, and a ravine. The helicopter was not damaged. ■

# Wedding ring causes loss of finger

This account was adapted from an article by AD2 Michael E. Arnold, U.S. Navy crew chief, which appeared in **Mech, the Naval Aviation Maintenance Safety Review.**

As I look back, I recall it was a nice day and I had a 0900 briefing for a scheduled flight. I suited up and started going over my flight gear to make sure everything was ready for the hop. When finished, I grabbed my usual cup of coffee and donuts and headed for the readyroom. The briefing was uneventful—local area paradrops, along with an assistant crewman instructor checkride for me. The flight was to conclude with a vibration check on No. 1 engine, a task necessary to comply with the requirements of a 300-hour engine inspection. It looked like a busy day.

Preflight was uneventful, but due to the maintenance that had been performed on No. 1 engine, a visual leak check would be required. As No. 1 engine was brought to ground idle, a fuel leak did develop around the fuel purifier. The engine was shut down, and maintenance control was notified. One hour later, we again preflighted and started engines. This time everything worked as prescribed. Takeoff was uneventful. The mission had the usual simulated emergencies, but nothing I couldn't handle. Landing was also uneventful, and except for a minor engine vibration check, I could call it a day.

Here is when the trouble started. As we taxied into the line, we discussed the vibration check. The plan of attack was to keep the bird turning while I ran into the tool room and got the vibration tester. When I returned, No. 2 engine would continue to run while No. 1 engine would be shut down so that I could install the test equipment without getting burned on the exhaust pipe. We would then conduct the engine vibration test.

I saw nothing wrong with this, as I had done it the same way in the past—using this same procedure. With chocks installed, I did everything as briefed.

Back inside the helicopter, I started hooking up the test gear to the engine. I felt something jerk my left hand and heard a loud grinding sound. I pulled my hand back as quickly as possible, and what I saw turned my guts. My flight glove had been torn completely apart. I shook the glove off, and what I saw made me collapse. I saw a bloody mess where my whole hand had been. I remember telling the pilot, "Shut it down. I think I just lost two fingers."

The results of a later investigation showed that my hand had been caught by the engine drive shaft, which was still rotating 2 inches away from the attachment points for the vibration tester. I was rushed over to the regional hospital, where I was told I would lose my ring finger of my left hand. At the time of the accident, I had been wearing my wedding ring under my flight glove. While in surgery, the doctor said he thought my middle finger could be saved, but because my ring had torn my other finger off, there wasn't anything he could do for that one. As he told me this, I remember thinking of all those safety posters I had seen and all the people who had told me not to wear jewelry while working around aircraft. I recall telling them that my wedding vows meant a lot to me and that my wedding band wouldn't come off my hand. Well, I had it taken off for me by an aircraft engine. It wasn't worth it.

I write this article in the hope that someone will read it—think twice—and then take off any jewelry they have before starting to work around operating machinery. ■

# Selected mishap briefs

**uh1** **Class A mishaps** □ (H series) Student pilot did not apply sufficient right pedal during straight-in autorotation. Aircraft touched down in left yaw condition, rolled over, and burned. 8117 □ (H series) Skid hit ground during hover, and aircraft rolled over. 8118

**Class C mishap** □ (H series) During hover for takeoff from confined area, tail rotor blade hit tree branch. Blade, 42-degree gearbox, and 90-degree gearbox were damaged.

**Class E mishaps** □ (H series) Pilot felt excessive pressure on cyclic before pickup for hover. Caused by ice buildup on hydraulic servo. □ (H series) Copilot's greenhouse cracked during climbout. Probably caused by severely cold temperatures. □ (H series) Needles did not split when collective was lowered and throttle rolled to engine idle position during standard autorotation. Power-on landing was made. Caused by failure of sprag clutch to disengage.

**uh60** **Class E mishaps** High-pitched whining sound was heard from No. 2 engine during runup. Caused by foreign object damage to one variable inlet guide vane. □ No. 1 stabilator actuator failed during runup. Caused by ice in actuator.

**ah1** **Class A mishap** □ (S series) Whiteout occurred during landing, and aircraft hit ground and rolled left. Aircraft was about 5 feet off the ground when whiteout occurred, and go-around could not be made because of powerlines in front of aircraft. 8119

**Class E mishaps** □ (S series) Engine oil pressure went from 85 psi to 150 psi and then stabilized at 130 psi. Caused by defective oil pressure transducer. □ (G series) Transmission oil pressure gauge dropped to zero during landing. Caused by failure of transmitter. □ (S series) Engine oil pressure light came on during hover to parking area. Caused by failure of oil pressure switch. □ (S series) Fuel boost pump light came on during runup. When forward fuel boost pump circuit breaker was pulled, pressure dropped to zero. Caused by failure of aft fuel boost pump.

**ch47** **Class E mishaps** □ (B series) Static beep failed on No. 1 engine during landing. Caused by failure of actuator. □ (C series) Master caution and warning lights came on during runup. Dual generator failure was caused by shearing of both generator shafts. □ (C series) Forward transmission oil pressure was lost during flight. Caused by failure of transducer.

**oh58** **Class C mishap** □ (A series) As pilot was looking down at his maps during low-level flight, aircraft hit three powerlines and one telephone wire. Visibility was 5 miles with light rain and haze.

**Class E mishaps** □ (A series) Pilot heard muffled bang from rear of aircraft and smelled smoke. Low rpm audio and light and engine-out light came on. Crosscheck of instruments confirmed engine failure. Pilot autorotated to snow-covered field. Caused by compressor failure. □ (A series) Low fuel light came on during flight. Winds were forecast at 20 to 26 knots. Winds en route increased to 32 to 35 knots. □ (A series) Engine chip detector light came on. Caused by failure of gear inside accessory gear section. □ (A series) $N_2$ was 102.5 percent during approach. Linear actuator would not move. $N_2$ stabilized at 101 percent on landing. Caused by broken linear actuator wire.

**th55** **Class E mishaps** □ Grinding noise was heard from main transmission area. Caused by defective heater blower motor. □ Pilot seat support broke during flight. Caused by defective seat frame.

**c7** **Class E mishap** □ When throttles were moved from idle to reverse before takeoff, right propeller feather button light remained on. Propeller reverse light did not come on when right throttle was in reverse range.

Right engine thrust meter indicated positive thrust. Caused by failure of blade switch plunger, which would not allow propellers to go to reverse position.

**c12** **Class E mishaps** □ (A series) TGT on right engine increased from 590 degrees to 700 degrees during climbout. $N_1$ increased from 92 percent to 97 percent. Fuel flow increased from 370 to 420 pounds per hour. Caused by rupture of high pressure bleed valve diaphragm. □ (A series) When landing gear was cycled down, light did not come on. Gear reflection was seen in nacelle and low pass over airfield revealed gear appeared to be down. Landing was made without incident. Caused by failure of landing gear position indicator switch.

**ov1** **Class E mishap** □ (D series) Engine chip detector light came on. Oil pressure was lost, $N_2$ rpm increased, and power was lost. Caused by failure of reduction gear system.

**u21** **Class E mishaps** □ (A series) Postflight inspection revealed fuel on No. 2 engine cowling. Further inspection revealed fuel leak around fuel nozzles. Caused by failure of preformed packing. □ (A series) No. 2 engine failed during HIT check. Caused by failure of fuel control.

# Maintenance

**ah1** **Class C mishap** □ (G series) As aircraft was being run up for MOC after main rotor hub installation, some ground bounce occurred at engine idle. Loud metallic clang was heard as pilot increased governor increase-decrease switch. Aircraft was shut down. Inspection revealed both housing assemblies had the centers punched out and were protruding inboard. Grip spacing adjustment may have been inaccurately set.

**Class E mishap** □ (S series) Antitorque pedal began to bind during flight. Postlanding inspection revealed jam nut on tail rotor SCAS transducer had backed off, allowing transducer arm to bottom out and bend.

**c7** **Class E mishap** □ Engine quit running during pretakeoff magneto check. P lead insulated washer was not correctly positioned, allowing metal portion to cut through insulation and ground out magneto.

**u3** **Class E mishap** □ (A series) Pilot noticed that right throttle was stiff and later saw liquid coming from top of right engine. Single-engine landing was made. New engine air filter had been installed. Excessive oil from filter blew out on engine cowl. No fuel leak was found. Stiff throttle was caused by ice in throttle cable.

## Messages received

- Safety of personnel and equipment message concerning parachute riser assemblies used on OV-1/RV-1 aircraft main recovery parachute (201900Z Jan 81).
- Maintenance notice advising maintenance personnel of CH-54 tail rotor balancing procedures (CH-54-81-01, 192000Z Jan 81).
- Maintenance notice advising maintenance personnel of CH-47 overhaul and retirement schedule changes (CH-47-81-04, 221820Z Jan 81).
- Maintenance notice on OH-58A and C tail rotor rigging instructions (OH-58-81-02, 221840Z Jan 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# ALSE

## COI to be developed for ALSE

The U.S. Army Transportation School has been tasked to develop a course of instruction for aviation life support equipment (ALSE).

The Transportation School's initial thrust is underway to establish a resident course for which graduates would be awarded an additional skill identifier (ASI Q2). MILPERCEN has already approved such an ASI, effective with a change to AR 611-201 to be published in March 1981. The kinds of ALSE to be addressed are flight gear, survival vests and kits, flight helmets, life rafts, survival radios, oxygen masks, and protective armor.

The initial thrust follows the Instructional Systems Development model. This involves a Phase I operation or analysis of jobs and tasks as well as comparable courses being presented in other services. The Air Force and Navy are being queried about their ALSE courses. Should the analysis indicate that the Transportation School could provide a cost-effective and training-effective resident course, an approximate time for conducting the first class would be early 1982. ■

## Remove iodine from first aid kits

According to a message dated 081921Z Dec 80 from Army Medical Materiel Agency, Fort Detrick, all lot numbers of Povidone Iodine, one-half fluid ounce, NSN 6505-00-914-3593, manufactured by Sherwood Pharmaceutical Company, have been suspended from issue and use. This iodine should be removed from all first aid kits and replaced with a suitable product.

**Thanks to ASO, 3d ACR, Fort Bliss.** ■

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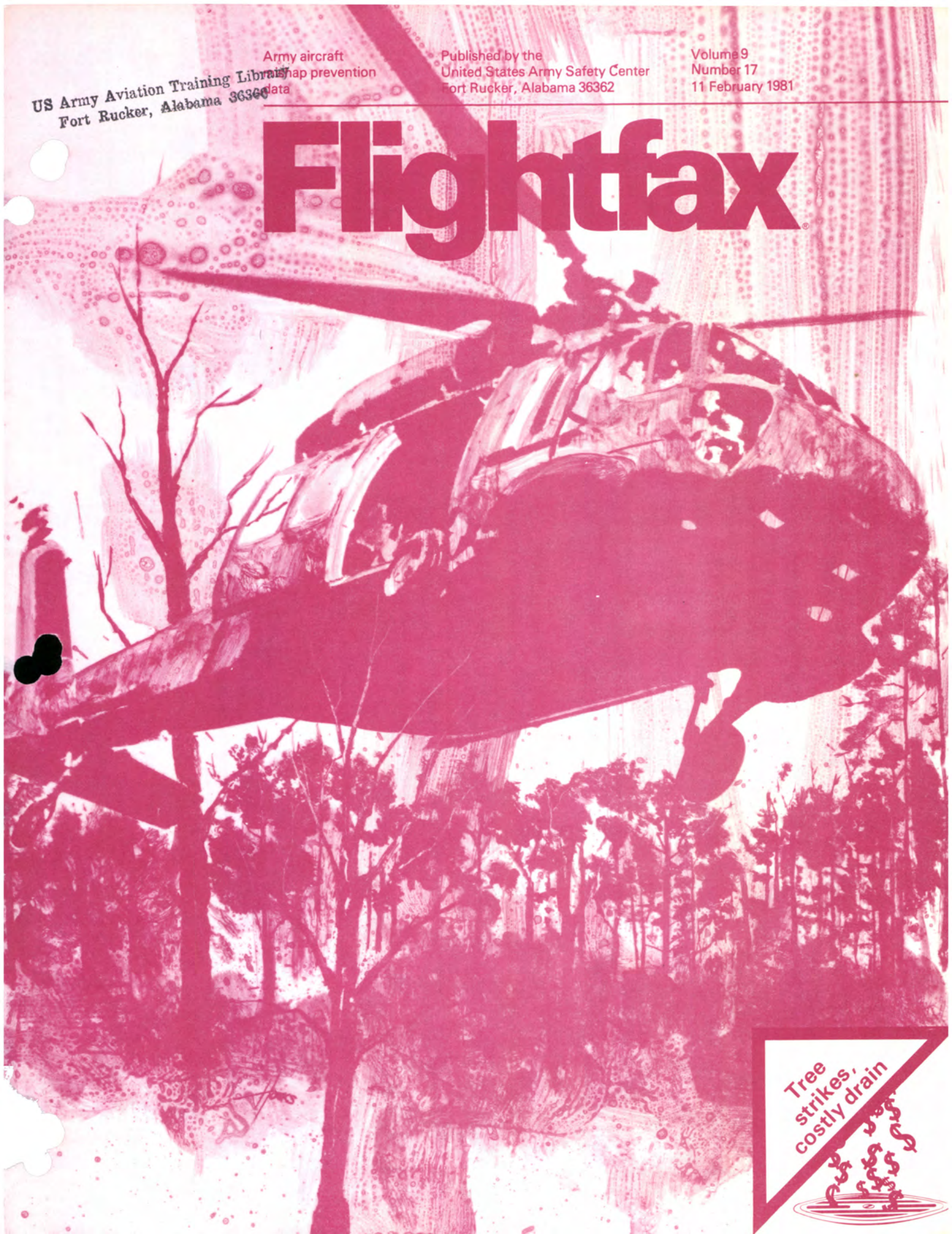
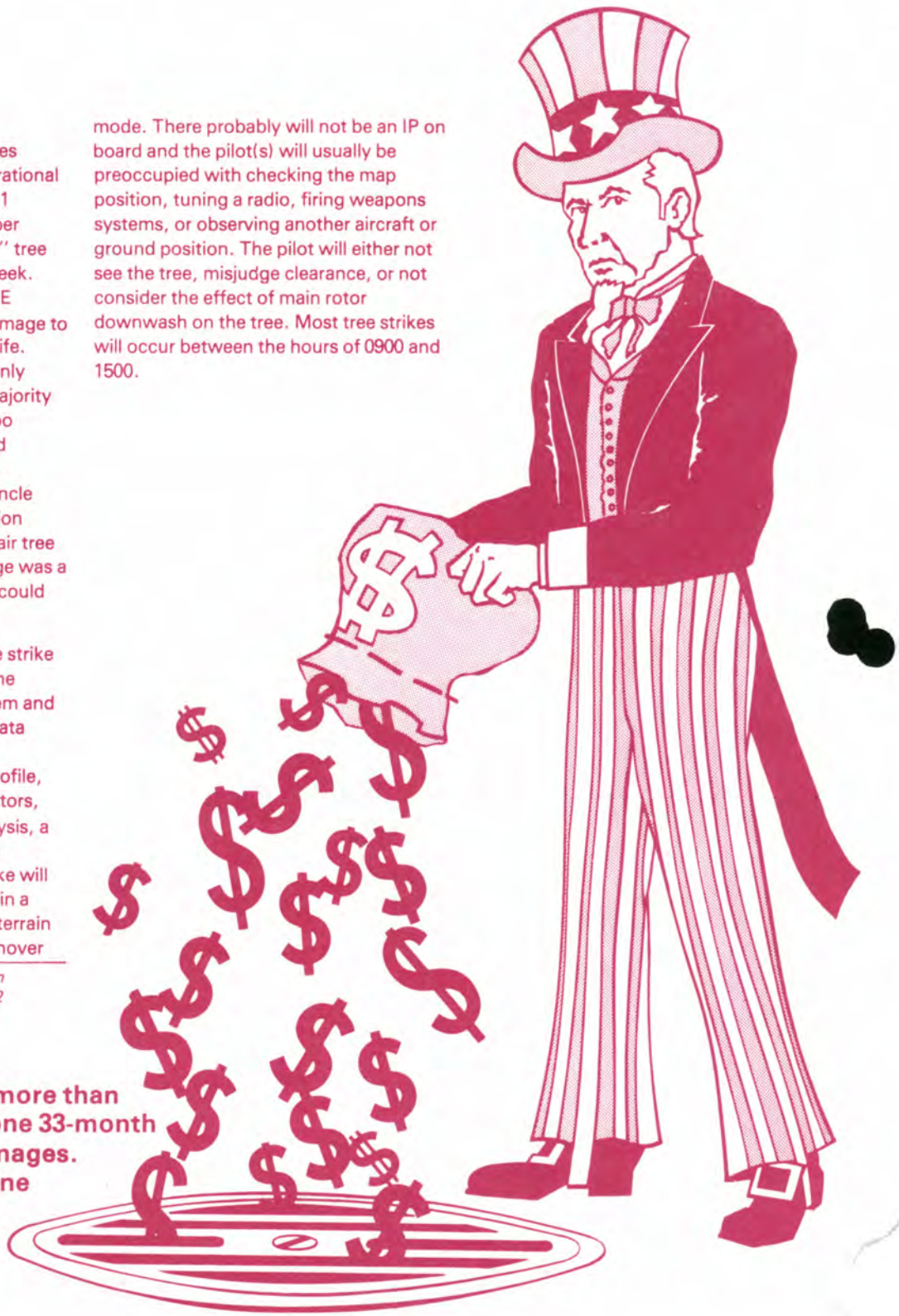


# The tree strike drain

Unnecessary damage and downtime due to tree strikes continue to affect the operational capabilities of tactical units. From 1 January 1978 through 30 September 1980, the Army had 260 "reported" tree strike mishaps—almost two per week. These mishaps ranged from Class E precautionary landings with no damage to Class A mishaps involving loss of life. Fortunately, the usual tree strike only damages equipment and, in the majority of the cases, that damage is not too great, although the actual cost and downtime vary tremendously. It is alarming to note, however, that Uncle Sam shelled out more than $6 million during the 33-month period to repair tree strike damage. Most of this damage was a result of just pure negligence that could have been prevented.

An indepth study* of reported tree strike mishaps was made to determine the magnitude of the tree strike problem and what to do about it. All available data from the Safety Center data base, including aircraft mission, flight profile, and human and environmental factors, were analyzed. Based on this analysis, a typical tree strike flight profile was apparent. Most likely, the tree strike will occur during a single ship mission in a simulated tactical environment at terrain flight altitudes, usually in an NOE hover mode. There probably will not be an IP on board and the pilot(s) will usually be preoccupied with checking the map position, tuning a radio, firing weapons systems, or observing another aircraft or ground position. The pilot will either not see the tree, misjudge clearance, or not consider the effect of main rotor downwash on the tree. Most tree strikes will occur between the hours of 0900 and 1500.

*Study by CW3 John Farmer, a student in Warrant Officer Senior Course, Class 80-2*



**Uncle Sam shelled out more than 6 million bucks during one 33-month period in tree strike damages. That's enough to buy nine Hueys and two OH-58s.**

Following are actual briefs of typical tree strike mishaps reported in PRAMs.

• OH-58—0920 hours—While performing NOE flight (5-10 knots groundspeed), aircraft was over heavily forested terrain of uneven tree height. As the aircraft moved forward the trees were bent over and down by rotorwash. After the tree was passed, it recoiled up, hitting the tail rotor blades in the left rear quadrant of the rotor disc. Damage cost: $10,120.

• AH-1G—1230 hours—At 20-foot hover, with left quartering tailwind, copilot was orienting aircraft position on the map. Pilot was monitoring position of scout aircraft. Aircraft drifted right and main rotor blades hit tree branches. Damage cost: $16,998.

• AH-1G—1300 hours—During NOE flight to an aerial firing point, main rotor blades hit a small pine tree. Aircraft developed slight vibration and landing was made without incident. Damage cost: $17,078.

Unfortunately, many of the tree strikes reported through PRAMs included explanations such as the following which provide no insight as to the tree strike causes or preventive measures.

• AH-1S—1630 hours—Postflight inspection revealed damage to both main rotor blades. Damage cost: $15,000.

Although the above mishaps are typical, they do not reflect all contributing factors. In fact, the data in the Safety Center computer does not begin to tell why all the tree strikes occurred. Most tree strike mishaps are not investigated, and the events reported through PRAMs are sketchy at best. Using the data available, it was discovered that, not surprisingly, human factors contributed to most tree strikes. The factors most often cited were faulty judgment (misjudging clearance or effects of rotorwash), fatigue, overconfidence, and flying at excessive speed. Environmental factors were present in 17 percent of the mishaps. These environmental considerations were more specifically defined as reduced visibility due to darkness, weather, or dust/sand/snow. Only 11 tree strikes, or 4 percent of the 260, occurred at night.

Next, a comparison of tree strike mishaps by major command was made to determine any significant differences. Naturally, units doing the most tactical flying are having the most tree strikes. To try to give meaning to this data, exposure was considered. Total tree strikes for the 33-month period were compared with reported flying hours of tactical aircraft for the same period, and a rate per 100,000 flying hours was determined. While there is a significant difference in tree strike rates between major commands, a comparison of the rates of the various types of tactical aircraft (table 1) is even more revealing. The most startling fact is that, for a change, the OH-58 is not the biggest culprit. It is the Cobra and, believe it or not, the Blackhawk.

Should these statistics be cause for concern? Certainly. Considering the skyrocketing cost of helicopter components and the mere cost of rotor blades on the modernized Cobra and the Blackhawk, it is apparent that damage costs from tree strikes in the future will multiply rapidly. A single Blackhawk blade costs $58,000 today, and blades for the modernized AH-1S are $19,000 each.

Commanders may ask "How can we have realistic training and not have tree strikes?" Surely, the last thing we want to do is compromise realistic training. Every crewmember must be trained to do those tasks he will be expected to do in combat. However, tree strikes should not be taken so lightly as fair wear and tear during this training. Aircraft damaged by tree strikes aren't of much use in a real or simulated battle until they are fixed. And this increases the workload of our maintenance people, who already have enough to do.

(continued on next page)

**TABLE 1—Tree Strikes**
**1 January 1978 - 30 September 1980**

| Type Aircraft | Total Tree Strikes | Rate per 100,000 Flying Hours |
|---|---|---|
| UH-1* | 99 | 4.78 |
| AH-1** | 69 | 26.25 |
| OH-58 | 76 | 9.56 |
| CH-47 | 9 | 6.11 |
| UH-60 | 6 | 30.05 |

*Includes EH-1
**Includes TH-1

# Tree strike drain

Tree strikes are "a fact of life" because commanders let them be. Commanders really interested in solving their tree strike problem should take a few minutes and analyze each tree strike. At the Safety Center each mishap is analyzed to answer three basic questions: what happened, what caused it to happen, and what can be done about it. What happened is usually pretty well defined. Determining what caused it to happen is more complex. There are often several factors leading to definite and contributing causes of the mishap.

Major causes of tree strikes could be such things as fatigue (inadequate crew rest), target fixation (particularly if flying with the heads-up display in the AH-1S), aviator attitudes (everyone hits trees, it is a fact of life), environment (glare from sun, dirty windscreen, etc.), or just a case of stupidity (flying too fast to see and avoid the obstacle). The mishap may have more than one cause. Examples could be lack of a crew rest policy and a commander's general acceptance of downtime from tree strike damage; poor housekeeping and dirty aircraft; poor crew scheduling or an ineffective standardization program; etc. All things must be considered if the "what do we do about it" is to be implemented effectively. All levels of command contributing to the problem must be made aware of their role and be willing to take action to help solve it.

What's the fallacy in this line of thinking? It can be traced to the lowest command levels. The platoon commander and unit commander have to take time to analyze the problem, then have enough backbone to get the corrective action accomplished, even if it means stepping on toes. It may not be just a platoon or company problem, and commanders at highest levels cannot do anything about problems that are not brought to their attention.

As an immediate measure, units can do a great deal to reduce tree strikes if they just stress commonsense, professional flying, and effective leadership. Lip service alone will not do it. Here are some suggestions for safety officers and commanders to take as a first step.

• Start a unit tree strike awareness program. Keep track of your tree strikes and downtime they cause. Bump this against any loss of effectiveness your unit suffered. Also let the pilots know the dollar cost. If you haven't had any tree strikes, good! Visit a neighboring unit—they probably have! Also, take some pictures. They are good attention getters.

• Take a look at your SOP. Does it spell out crew duties and responsibilities? Not just PIC and copilot, but pilot at the controls and pilot not at the controls. The same applies to the scout which has an observer as the second crewmember. Good crew coordination is a key to eliminating tree strikes. The pilot at the controls has his hands full flying the aircraft. Things that require attention inside the cockpit have to be accomplished by the other crewmember. Also, don't forget about **flying** when using the weapons systems.

• Keep the tree strike topic alive in pilot discussions, mission briefings, and safety meetings. Tree strikes are not something that will go away if we ignore them.

Obviously there are other things that can be done. If you have done something or have an idea as to how to solve the problem, let us know at the Safety Center. Maybe we can use your ideas to help others.

The main point about tree strike mishaps is that they should not be accepted as "a fact of life." They can and should be prevented. Commanders must determine the underlying causes behind tree strikes and take appropriate action to resolve the problem. An antitree strike attitude should be developed and nourished through effective education and group interaction. It is up to the chain of command and responsible aviators to erase this needless, costly waste of assets.

Point of contact at the Safety Center concerning tree strike prevention is Major Kenton, AUTOVON 558-3901/3913. ■

# Mishap review

## Synopsis

As the crew of the UH-1H on a night flight was looking for a landing zone, the aircraft hit a tree. The pilot was able to maintain flight and return to the airfield.

## History of flight

The mission was to insert personnel into a landing zone by rappeling. Two helicopters were to be used. The mission was cancelled during the afternoon because of deteriorating weather and then rescheduled later because the weather was clearing.

The two Hueys took off about 1930, flew to a forward area refueling point, refueled, and continued to a field location where the aircraft were rigged for rappeling. The crew chief of the No. 1 aircraft remained on the ground at the field location, and the rappeling master occupied the crew chief's seat. Four rappelers secured themselves on the floor of the cargo compartment.

Both aircraft took off and flew toward the LZ. There was not much illumination, and the crews had trouble locating the LZ. They identified a road intersection just east of the LZ and turned south to follow the road. They were flying at 60 knots and 200 feet agl. Light rain was falling, and the windshield wipers were turned on.

As the pilot of the lead aircraft was looking out his window, searching for the LZ, the copilot suddenly saw a tree ahead of them and shouted a warning over the intercom. The pilot saw the tree about the same time. He raised the nose of the aircraft and increased collective pitch as impact was made with the tree. The pilot maintained control of the aircraft, climbed several hundred feet, and asked the pilot of the other helicopter to guide them to the LZ for landing. It had begun to rain hard, and the LZ could not be immediately located.

The pilot of the lead aircraft had full control and decided to return to the airfield for landing. The landing was uneventful, and all occupants exited uninjured. Both chin bubbles were shattered, both main rotor blades were damaged, and the airframe sustained extensive damage.

## Crewmember experience

The 26-year-old pilot had almost 1,000 rotary wing flight hours, with 900 in UH-1Hs. The 32-year-old copilot had more than 950 rotary wing hours, with about 900 in UH-1Hs.

## Commentary

The pilot was unable to determine the altitude of his aircraft by outside visual references and could not locate the LZ because of limited natural illumination and light rain. He was tying to establish outside visual references and was crosschecking his altimeter and other flight instruments to maintain the desired altitude. The copilot was navigating and dividing his attention between the map and outside terrain features.

The pilot was the unit SFTS instructor and was confident he could maintain an adequate crosscheck of his instruments while simultaneously searching for the LZ. Therefore, he did not ask the copilot to help monitor the altitude. ■

# Shortfax

## Procedures for requisitioning publications changed

The following change to publications requisition procedures was issued in a message dated 282035Z Jan 81 from The Adjutant General, Washington DC:

Effective 1 February 1981 the data processing installation (DPI) supporting the U.S. Army Publications Center (Baltimore, Maryland and St. Louis, Missouri) will be consolidated into a single DPI at Baltimore. This consolidation does not affect the location of stock normally stored and shipped from St. Louis, only its ADP support.

Customers requisitioning publications and blank forms from the St. Louis Publications Center as prescribed in DA Pamphlet 310-10-2 must change the routing of their requisition to Baltimore. These requisitions will then be automated at the consolidated DPI and transmitted to the St. Louis Center for fill and direct shipping.

Correct routing identifier for all requisitions submitted via AUTODIN is RULNBPC.

Correct address for all requisitions submitted by mail is Commander, U.S. Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220.

Any requisitions submitted to the St. Louis Publications Center via AUTODIN after 30 January 1981 will be rejected by your local tele-communications centers. Only requisitions/data messages addressed to the Baltimore AG Publications Center will be transmitted after this date.

Changes are being processed to AR 310-1, AR 310-2, AR 310-3, and DA Pamphlet 310-10-2 to highlight this important change. This message is an advance notice of a major operational/procedural change in the automated support of the Army publications system.

All requisitions for publications and blank forms stocked at either the Baltimore or St. Louis AG Publications Centers may be consolidated into one message for transmission via AUTODIN. Included are requisitions for classified or unclassified publications, accountable or sensitive forms, or requisitions under multiple account numbers.

Point of contact for questions and/or additional information is Jack Doyle, AUTOVON 223-0398 or 223-7714. ■

## Recent TSARCOM Supply Letters

The following Supply Letters from TSARCOM are available. Check to see if you have yours.

- SL 46-80, subject: Retention of DS/GS Shop Set Tools.
- SL 47-80, subject: Use of Plastic Covers for Helicopter, UH-1/AH-1 Tail Booms and Other Aircraft Items. ■

## Maintenance tip

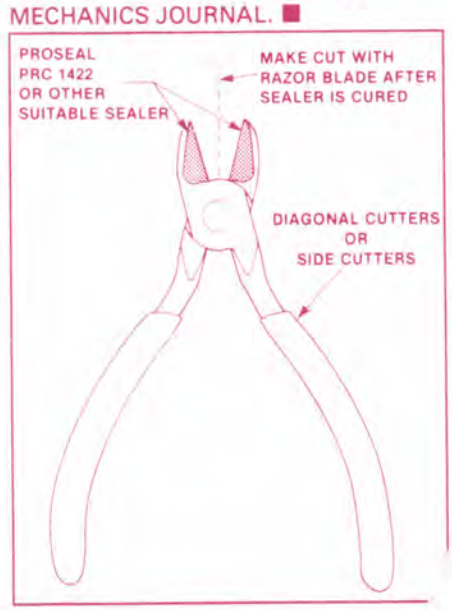
Take a pair of 6-inch wire cutters, tape the handles together, then fill the cavity with some sort of sealant. After it cures, cut the sealer with a razor blade, so the cutters are restored to normal operation.

The sealer acts as an extra set of fingers catching ends of safety wire and cotter pins after the cutters snip them. This keeps the ends from flying where they shouldn't (your eyes, the belly of an aircraft where it could cause trouble, etc.).

They work real nice, especially when you can only get one arm into the area you are working in. This can also be done to safety-wire pliers.

These cutters make cutting a lot safer for the technician and the crew. Not too many people pull up panels or floorboards just to get ends that fly away. Too many are just let go.

This maintenance tip by Donald Young of Brookfield, Ohio, was published in the December 1980 issue of AVIATION MECHANICS JOURNAL. ■



# Selected mishap briefs

**uh1** **Class E mishaps** □ (H series) Old car body was rigged for sling load using one-half inch nylon rope. Load was picked up and, as helicopter accelerated through 30 feet and 30 knots, load dropped. Car body was incorrectly rigged. The sharp edges of the car body cut the rope because the rope was too short and was not doubled. Rope was used instead of multi-leg sling because car bodies were used as targets in dud impact areas. □ (H series) On short final to dusty LZ, aircraft began uncontrollable right turn. Tail rotor control was inadequate and aircraft completed two 360-degree right turns before control could be regained. Pilot and copilot felt that aircraft was overtorqued, but neither saw an overtorque indication. Density altitude and wind conditions contributed to the mishap. □ (H series) While trying to sling load M102 Howitzer, pilot noticed torque at 53 psi. Mission was aborted because of overtorque.

**uh60** **Class E mishap** □ Collective boost maintained about 40 pounds of downward pressure during flight. Collective balance spring had jumped out of socket.

**ah1** **Class E mishaps** □ (G series) Crew chief saw hydraulic fluid leaking from fitting on No. 1 hydraulic pump pressure relief line. Caused by failure of fitting on pressure relief line. □ (TH-1G) Fuel gauge fluctuated and stuck intermittently during flight. Caused by failure of fuel pressure gauge. □ (G series) P2 hydraulic light came on during runup. Caused by failure of hydraulic pressure line for fore and aft servo. □ (TH-1G) Pitch channel SCAS flashed on and off during takeoff. Caused by malfunction of SCAS pitch card.

**ch47** **Class C mishap** □ (C series) Right aft work platform came open during hover and was damaged.

**Class E mishaps** □ (C series) Flight engineer noticed fuel leak in No. 2 engine area during flight. Caused by failure of quick disconnect coupling. □ (C series) Rotor tachometer dropped to zero during flight. Caused by sheared shaft on tachometer generator. □ (C series) Crew chief noticed hydraulic fluid flowing out of drain line after APU was started. Caused by failure of seal in accessory gearbox motor pump. □ (C series) When aircraft was landed from hover, pilot applied brakes but aircraft would not stop. Pilot stopped aircraft by initiating two-wheel taxi stopping maneuver. Aft wheel swivel locks disengaged and utility hydraulic pressure decreased to 100 psi. Aft wheels were chocked when aircraft came to rest with all four wheels on the ground. Loss of utility hydraulic pressure resulted from failure of utility hydraulic pump and loss of hydraulic fluid. □ (C series) Flight engineer saw fuel leaking from No. 1 engine during runup. Caused by broken fuel hose.

**oh58** **Class E mishaps** □ (A series) Cabin filled with smoke during climbout. Aircraft had just undergone change of free wheeling unit and oil had seeped into mix valve for heater duct. □ (A series) Low rpm warning system activated and $N_2$ dropped to 94 percent during hover. Caused by malfunctioning double check valve.

**c12** **Class E mishap** □ (A series) Gear light remained on after takeoff. Gear was recycled and it extended normally. When it was retracted, it came halfway up and stopped. Cockpit began to fill with fumes. Gear was hand pumped down and aircraft landed. Caused by failure of gear retraction motor.

**t42** **Class E mishap** □ No. 2 fuel pressure fluctuated and then steadily decreased during climbout. Fuel line from fuel distribution manifold on No. 2 engine to instrument panel fuel pressure gauge contained water and air.

**u21** **Class E mishaps** □ (A series) Fuel boost pump pressure fluctuated during flight. Caused by failure of boost pump. □ (A series) Pilot saw fuel siphoning from left nacelle fuel cap during flight. Fuel cap was not seated correctly.

*(continued on next page)*

# Mishap briefs

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## Maintenance

**uh60** **Class E mishap** □ Stabilator failed during flight and could not be reset. Jam nut on bias adjustment screw was missing, allowing screw to back out and causing stabilator to fail.

**ah1** **Class E mishap** □ (G series) Main generator would not come on line during runup. Antenna wire harness installed for previous experiment apparently caused short in circuit.

**ch54** **Class E mishap** □ (A series) Master caution and first-stage servo lights came on during takeoff. Postlanding inspection revealed incorrect pressure line installed on aircraft caused rupture.

**oh58** **Class C mishap** □ (A series) Mechanic was performing MOC for engine replacement, along with another mechanic and an engine technician who were fireguarding and checking for leaks. Mechanic at controls decreased rpm to 100 percent with linear actuator. After the reduction, aircraft started to rotate counterclockwise. Mechanic reduced throttle in an attempt to stop rotation, but rotation increased. Mechanic applied right pedal, but aircraft hit GPU and tractor.

**Class E mishaps** □ (A series) Banging noise was heard from transmission area, accompanied by excessively stiff collective. Postlanding inspection revealed washer had been left under collective sleeve during installation. □ (A series) Crew heard loud noise and felt vibration during maintenance test flight hover check. Postlanding inspection revealed main drive shaft had slung out all grease. O-rings were not installed on both ends of main drive shaft, which had just been repacked during phase maintenance.

### Messages received

- Maintenance message concerning AH-1S modernized fire control system (AH-1-81-01, 271845Z Jan 81).
- Information message concerning UH-60 stabilator actuator tie rods (291920Z Jan 81).
- Maintenance notice advising CH-47 users of a change to MWO 55-1520-241-30-4 (CH-47-81-05, 302100Z Jan 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# FOD not the issue

Recently, a mechanic's screwdriver caused $25,000 in damages to the engine of a UH-1. But despite the foreign object involved, the real issue concerns improper maintenance practices—not FOD.

In this instance, mechanics were to flush the engine of an aircraft that had been operated in a salt water spray environment. They proceeded to do the job by removing the outer filters and the top half of the particle separator. Then, as the engine was motored, they sprayed cleaning solution into it. After washing the engine internally, mechanics rinsed it with clean water. When they completed the flushing operation, they reinstalled the top half of the particle separator and called a TI to inspect the assembly. After the engine was inspected, personnel completed the job by reinstalling the outer filters.

During the engine operational check that followed, all indications appeared normal at idle. However, as the pilot advanced the throttle, he heard an explosion, saw smoke coming from the rear of the aircraft, and noted a decrease in engine rpm. Following these events, he promptly shut down the engine.

Inspection revealed numerous broken compressor blades and other related damage along with the culprit—a common screwdriver. After examining the evidence available, investigators concluded that the screwdriver involved in the mishap was probably one that had been missing for several weeks and which, in all probability, had been in the engine inlet for some time before being drawn into the compressor.

This conclusion was based, in part, on the results of a toolbox inventory conducted several weeks before the mishap. At that time a screwdriver that matched the description of the one found in the engine was shown to be missing. In any event, it is believed that the tool responsible for the damage was not left in the engine intake at the time the engine was flushed. A common screwdriver is not needed to remove the particle separator, and none was taken to the aircraft when the work was done.

This raises an important question. If the screwdriver had been lodged in the engine inlet for several weeks before the mishap, why did the TI fail to detect it? To find the answer, a test was conducted in which both halves of a particle separator were removed from an aircraft and a screwdriver placed in the inlet. The lower half of the separator was then reinstalled and an experienced TI was summoned to inspect the engine. Using a flashlight an a mirror, the TI examined the area for a full 5 minutes before declaring it free of

**What was once a common screwdriver (arrow) is shown centered among some of the compressor blades it demolished on its way through the engine.**

FOD. The lower half of the particle separator was then removed, and the TI was asked to take a second look. To his surprise, he immediately spotted the screwdriver.

TM 55-2840-229-24 stipulates that both halves of a UH-1 particle separator are to be removed before the engine is flushed. Yet unit mechanics consistently failed to follow this procedure. In fact, the TI who had inspected the engine that was damaged by FOD not only had approved the incorrect flushing method that was used but had taught that procedure in a class only 9 days before the mishap occurred. Further, a check showed that while all maintenance supervisors in the unit were aware of the procedure being practiced, few knew the correct procedure.

When unit personnel were asked why they had deviated from the TM, the apparent reason that surfaced was "to save time." Yet in a test, maintenance personnel removed both the upper and lower halves of the separator in just 12 minutes.

The harmful effects of deviating from prescribed practices are obvious. First, such deviation sets a bad example that can be carried over into other areas of maintenance. Second, it can result in a wrong procedure becoming an accepted practice. Third, as an accepted practice, an improper procedure can end up being taught as the authorized one to be used. Finally, it can cause mishaps.

Sometime ago, two crewmen and an aircraft were lost because a trunnion separated from the outer swashplate ring of a UH-1, causing the aircraft to enter an uncontrollable descending right turn and crash. Investigation revealed the assembly had not been properly inspected and maintained.

While it's not known at what echelon of maintenance the error occurred, it is known that some maintenance personnel were not following correct procedures when replacing trunnion assemblies. This was clearly evidenced both by the number of damaged trunnion components noted during a one-time inspection of UH-1 aircraft following the accident, and by observing the improper procedures used by various mechanics while they were participating in this inspection.

In one instance, a section of a trunnion housing broke when a mechanic pried the ears apart with a screwdriver. Other discrepancies included failure to properly align trunnion slots with bolt holes and forcing retaining bolts in place by pounding them with a hammer or twisting them with a wrench when bolt holes and trunnion slots were not properly aligned.

The point is clear: When authorized procedures are not followed, the stage is set for mishaps—perhaps catastrophic ones. But what if a TM procedure happens to be in error? While each TM is regarded somewhat as a maintenance bible, these "bibles" are not infallible. The human element being what it is, errors do creep in. So, if you discover that some TM procedure is wrong, then it is your duty to submit either a DA Form 2028 (Recommended Changes to Publications and Blank Forms) or a DA Form 2028-2 (Recommended Changes to Equipment Technical Manuals) so that the procedure can be corrected.

Similarly, should you feel that some particular TM procedure is unnecessary and cumbersome, then again you should submit a DA Form 2028 or 2028-2 to get the TM changed.

Good maintenance practices are absolutely essential to safety. These practices require you to follow correct procedures stipulated in the various maintenance manuals. ■

# Selected mishap briefs

## uh1

**Class A mishap** ☐ (H series) Aircraft crashed during training flight. Two fatalities and one major injury. Details unknown. 8120

**Class C mishaps** ☐ (H series) Tail rotor pitch contol chain broke during hover to helipad. Fixed pitch tail rotor failure occurred, followed by complete loss of tail rotor control. Aircraft spun right four complete turns before pilot was able to land. Tail rotor drive shaft was damaged. ☐ (H series) Hovering autorotation was initiated at too great an altitude during AAPART checkride at night. IP took control too late to prevent hard landing. Rotor rpm had bled off too much to provide adequate cushion on termination. Crew had been on duty for 12 hours and said they felt fatigued. ☐ (H series) Aircraft hit wire during NOE flight at 25 knots and 5 feet above vegetation. IP was at the controls and pilot was reading map. Wire was broken or cut by stationary stabilizer on lower left underside of aircraft. Aircraft was landed without difficulty.

**Class E mishaps** ☐ (H series) When pilot placed governor in emergency position to perform emergency governor hover check, compressor stall and overspeed occurred. Pilot decreased rpm to 6000 with beep switch rather than retarding rpm with throttle before placing governor switch to emergency. ☐ (H series) Hydraulic failure occurred during flight. Caused by failure of hydraulic line. ☐ (H series) Hydraulic pressure light came on during runup. Leaking hydraulic servo cylinder was caused by failure of preformed packing.

**Aviation-related mishap** ☐ When maintenance stand was moved away from aircraft, it hit and dented synchronized elevator.

## uh60

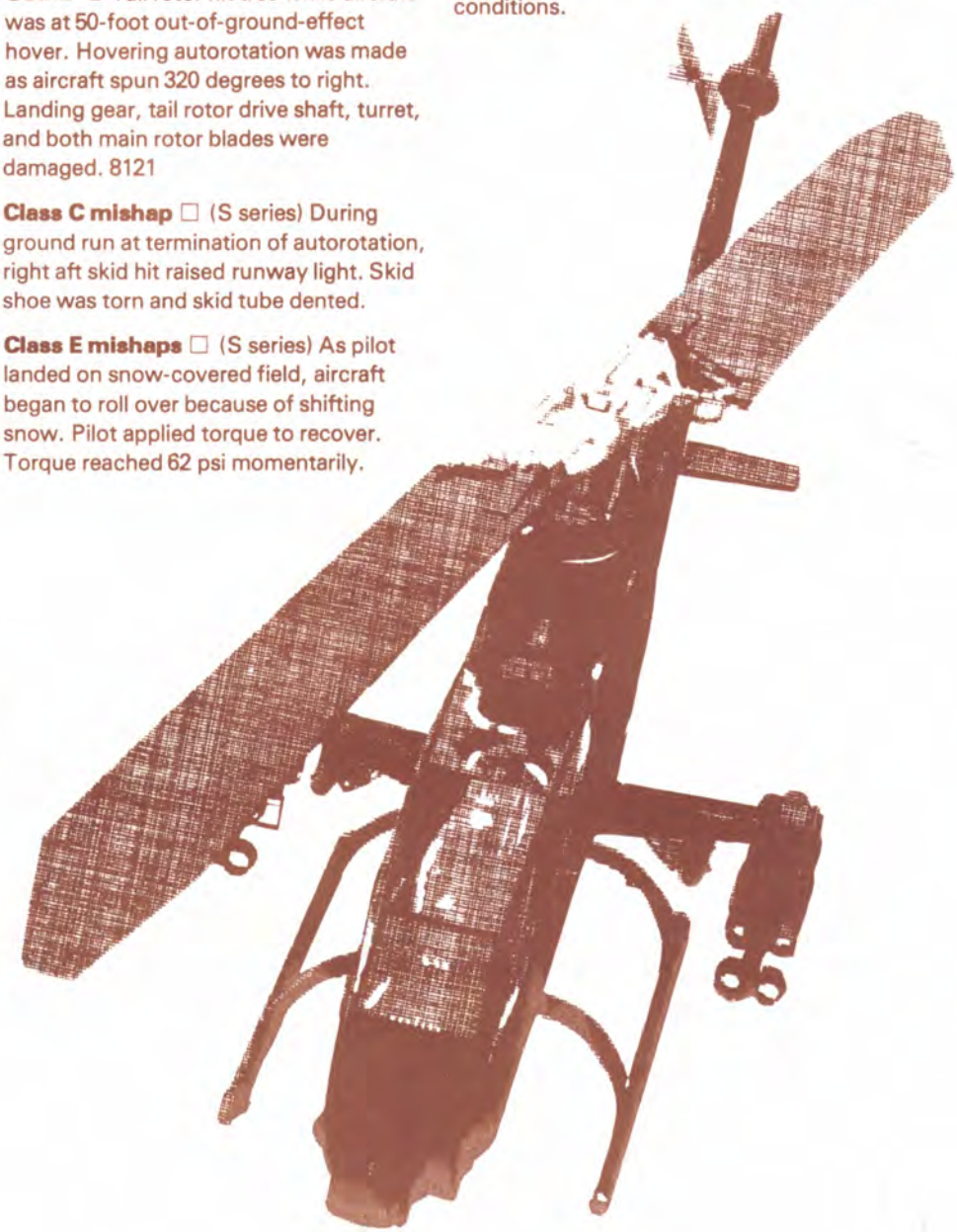
**Class E mishap** ☐ When battery was turned on during engine start, required lights did not illuminate. Caused by failure of caution advisory panel.

## ah1

**Class B mishap** ☐ (S series) Tail rotor hit tree while aircraft was at 50-foot out-of-ground-effect hover. Hovering autorotation was made as aircraft spun 320 degrees to right. Landing gear, tail rotor drive shaft, turret, and both main rotor blades were damaged. 8121

**Class C mishap** ☐ (S series) During ground run at termination of autorotation, right aft skid hit raised runway light. Skid shoe was torn and skid tube dented.

**Class E mishaps** ☐ (S series) As pilot landed on snow-covered field, aircraft began to roll over because of shifting snow. Pilot applied torque to recover. Torque reached 62 psi momentarily. ☐ (TH-1G) Fuel quantity gauge dropped 400 pounds in 10-minute period. Caused by failure of fuel pressure transmitter. ☐ (G series) While hovering OGE, pilot was warned of another aircraft to his rear. During pedal turn, torque rose to 54 pounds. Pedal application was too fast for conditions.



**Aviation-related mishap** ☐ SM installing map light in pilot's compartment noticed safety wire on cover over wing-store-jettison switch was broken. SM flipped cover up. After finishing work on amp light, SM started to exit aircraft. Cyclic stick was in full rear position. SM's knee hit uncovered jettison switch, triggering firing mechanism and jettisoning rocket pods and tow missile launchers. Ground safety pins were not installed.

**ch47** **Class E mishaps** ☐ (C series) Crew chief noticed hydraulic fluid leaking on No. 1 hydraulic flight boost manifold during flight. Caused by torn preformed packing. ☐ (B series) Aircraft developed vibrations in cockpit area during hover/taxi. Caused by failure of cockpit vibration absorber. ☐ (B series) No. 2 engine a.c. beep failed in static position. Pilot was able to control engine with emergency d.c. beep and land. Caused by broken wire inside pilot's beep trim switch.

**Aviation-related mishap** ☐ Maintenance crew checking fuel system for leaks in lines noticed fuel venting overboard from left main fuel cell. Aircraft floor had buckled up and left side had structural damage. Caused by overpressure. Piece of sand caused one-way check valve to stick open.

**oh58** **Class C mishap** ☐ (A series) While at NOE hover, aircraft settled into tree branch. Pilot was looking at APC moving along road. Tree strike punctured main rotor blade.

**Class E mishaps** ☐ (A series) Pilot was flying at 70 knots and 300 feet agl when he saw wires dropping into valley. Pilot applied aft cyclic and increased power to maximum allowable limits. Wire hit bottom part of vertical fin. Wire broke and aircraft was landed with no damage. ☐ (A series) Engine oil bypass light came on during hover for takeoff. Caused by stripped oil fitting in accessory gearbox. ☐ (A series) HIT check indicated +55° C. three times. Maintenance determined that HIT check log base line for another OH-58A was used. It is unknown how the log got into the logbook. ☐ (A series) Aircraft was on 5-hour local flight plan. Flight was begun with 390 to 400 pounds of fuel indicated on fuel gauge. After less than 2 hours of flight, low fuel light came on. Five minutes later, pilot landed in open field. During descent, engine failed from fuel exhaustion. Postlanding inspection revealed no fuel in engine fuel pump filter or combustor fuel line. Aircraft was not topped off prior to flight. Suspect 100-pound error in fuel quantity indicator and partial failure or misadjustment of low fuel switch.

**Aviation-related mishaps** ☐ While backing tractor to hook up to tow bar, driver applied brakes. The edge of his foot caught the throttle rod protruding from the side of the accelerator pedal, causing simultaneous application of gas and brake. Tractor hit OH-58, damaging airframe. ☐ As main rotor blade assembly was being pushed out of hangar, blade hit hangar door. Blade and tension torsion strap assembly were damaged.

**c7** **Class E mishaps** ☐ When gear was retracted after takeoff, intransit light came on and hydraulic pressure fluctuated. Gear handle was recycled and gear came up. No. 2 hydraulic pump low pressure light came on as pressure dropped to zero. Hydraulic shutoff valve was moved to emergency system. Landing gear was lowered using emergency system. Nose gear air bottle was activated and held during landing roll. Ruptured hydraulic line in right wing allowed loss of all normal system hydraulic fluid and pressure. ☐ After reaching maximum power during takeoff roll, No. 1 engine indicated 2525 rpm. Takeoff was aborted with 3500 feet of runway remaining. Several days earlier, No. 1 engine prop decrease had been adjusted at 1100-1350 rpm. As a result, takeoff rpm was out of adjustment.

**t42** **Class E mishap** ☐ Right fuel pressure fluctuated during climbout. Caused by malfunction of engine-driven fuel pump.

**ov1** **Class E mishap** ☐ (D series) About 1 minute after liftoff, loud bang was heard and No. 2 engine failed. Single-engine landing was made at airport

**u21** **Class E mishaps** ☐ (A series) Flaps stuck in approach position. Caused by failure of flap motor. ☐ (A series) Copilot's windshield cracked in two places during takeoff. Windshield anti-ice was on and outside air temperature was -7° C.

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishap** □ (H series) Crew chief was at the control during maintenance ground runup for 120-day voltage regulator check. As he moved his hand from instrument panel, the cuff of his flight glove caught on the emergency governor switch, moving it to emergency position. Throttle was full open with engine rpm at 6000. Slight shift in airframe was noted with corresponding increase in engine noise. Governor switch was immediately returned to automatic position. $N_2$ was verified at 6700 rpm and decreasing. Engine overspeed inspection is in progress.

**uh60** **Class E mishap** □ Stabilator failed several times during runup, and APU fire handle light came on during shutdown. Lateral accelerometers to stabilator were out of adjustment, causing stabilator to fail. Cannon plug to photo sensor was bent, causing fire light to illuminate.

**ch47** **Class E mishap** □ (C series) On final approach, flight engineer noticed hydraulic fluid leaking from top of thrust stick boost actuator. Caused by incorrect torque on nuts holding thrust stick boost actuator together.

**oh58** **Class E mishaps** □ (A series) $N_2$ fluctuated and TOT increased during approach. Heater fitting was crossthreaded. □ (A series) When pilot tried to reduce engine to flight idle, engine continued to run at full rpm. Cotter key was not installed on bolt at bottom of control tube to $N_1$ lever. Nut backed off and bolt fell out.

**c12** **Class E mishap** □ (A series) Right landing gear light did not indicate down and locked during final approach. Crew pumped gear down and landed. Landing gear switch was out of adjustment and lightbulb was faulty.

### Messages received

- Message concerning inspection and maintenance of troop/cargo door and upper and lower tracks (UH-60A-81-1, 051930Z Feb 81).
- Maintenance notice concerning information on AH-1 ground handling wheels (AH-1-81-02, 031500Z Feb 81).
- Maintenance notice on AH-1 engine tailpipe ejector (AH-1-81-03, 031730Z Feb 81).
- Maintenance notice concerning ultrasonic inspection of 540 main rotor blades, P/N 540-011-250-1 and 540-011-001-5 (AH-1-81-04, UH-1-81-01, 061445Z Feb 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Conversion of UH-1D to UH-1V

Some PRAMs from the field are reporting UH-1Hs as UH-1Vs. To be a UH-1V, a UH-1H must first have MWO 55-1500-219-30-8, then MWO 55-1520-210-30-48, applied. The authority for conversion of models is contained in MWO 55-1520-210-30-48. Only aircraft manufactured with 1966 series and later serial numbers are authorized the UH-1V (medevac) designation. ■

## UH-1 emergency governor operation

Reference TC 1-135, TM 55-1520-210-10, and TM 55-1520-210-CL. When switching from "automatic" mode to "emergency" governor ($N_1$), the throttle, **not** the linear actuator (beep switch), is to be retarded. When the $N_1$ governor goes into "emergency" mode, the $N_2$ governor is bypassed. ■

## New AR on protective clothing and equipment

AR 385-32, dated 1 January 1981 and effective 1 February 1981, prescribes policy, responsibilities, and procedures for providing protective clothing and equipment to Department of the Army military and civilian personnel. This new regulation supersedes AR 385-32, dated 27 August 1965, and AR 32-301, dated 12 May 1970. ■

# Stacom

## Midairs

In a recent 15-day period, Army aircraft were involved in two midair collisions. The score for the mishaps follows:

- Three fatalities
- Four aircraft destroyed
- Seven injuries

The fact that there were seven survivors while four aircraft were destroyed is a near miracle. However, the psychological impact of such a traumatic experience could be far-reaching.

One thing is certain—there are now seven swivel-necked aviators who have an alertness factor of 100 percent when airborne.

Ordinarily, this type of mishap is a complete wipe-out, but these two instances offer the safety specialists the opportunity for analysis and determination of probable cause.

The mishaps should also serve as a reminder for constant vigilance on the part of the aviator and for all aviation units to evaluate their efforts toward establishing an awareness of the collision-avoidance mechanism. ■

## VHIRP

Paragraph 3-4, AR 95-1, 15 November 1980, establishes the requirement for vertical helicopter IFR recovery procedures (VHIRP) for all installations that support aviation units engaged in tactical terrain flight training.

The intent of the regulation is to use existing instrument approach facilities and ATC procedures for recovery of helicopters from inadvertent IMC.

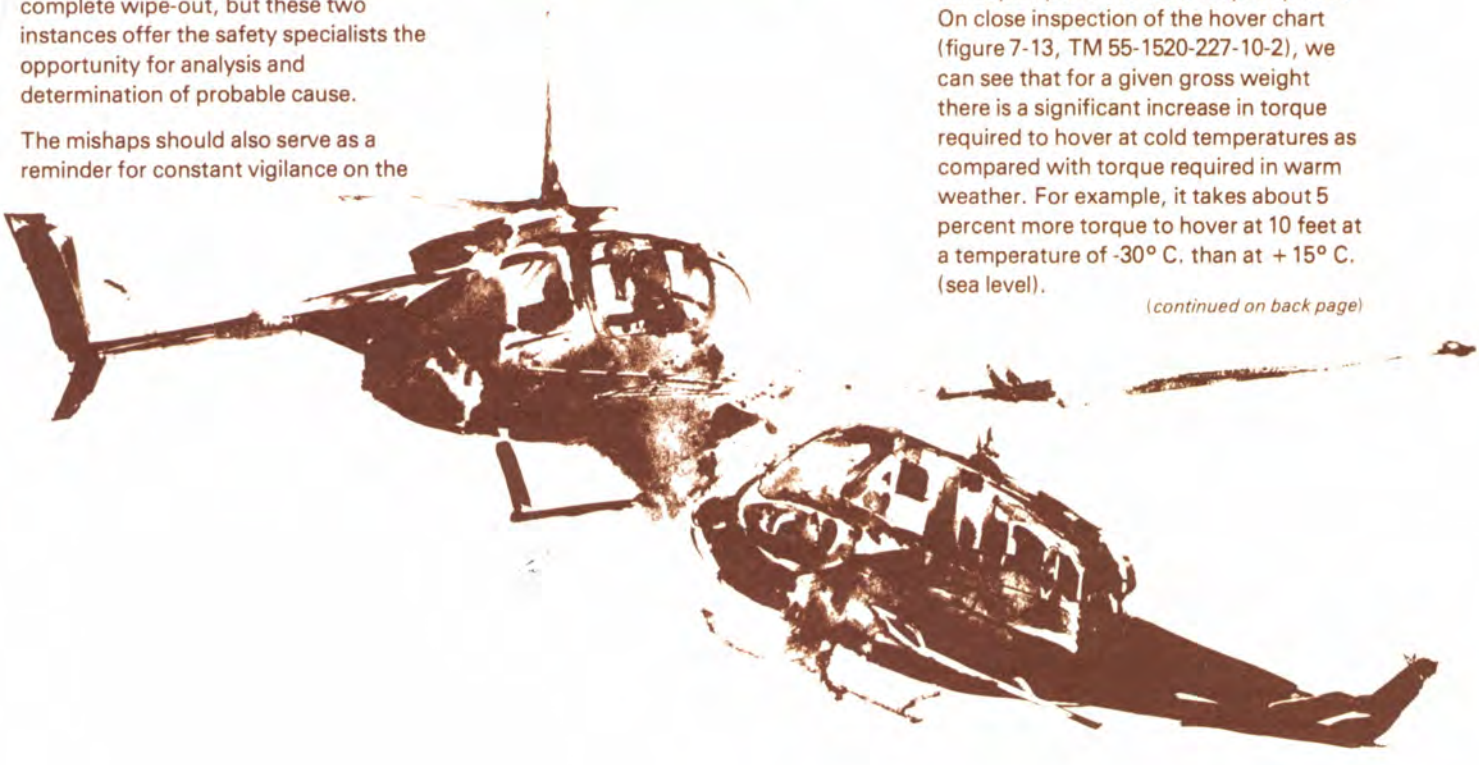
This paragraph is not intended to be used as justification for installation of additional navigational aids. ■

## Compressawhat?

Two Army aviators were discussing CH-47 performance during the annual CW4 convention (if you believe that I have some nice swampland in Florida to sell you). One was assigned to a CH-47 unit in Alaska and was describing degraded hover performance at cold temperatures. A bystander, hearing part of the conversation, wandered away thinking how the drinks had screwed up the old warrant to the point where he actually thought that cold weather reduced hover performance. Which aviator needed a lesson in helicopter performance, the bystander or the old W4?

Some people in this world believe that as temperature decreases at a given altitude, helicopter performance always improves. On close inspection of the hover chart (figure 7-13, TM 55-1520-227-10-2), we can see that for a given gross weight there is a significant increase in torque required to hover at cold temperatures as compared with torque required in warm weather. For example, it takes about 5 percent more torque to hover at 10 feet at a temperature of -30° C. than at + 15° C. (sea level).

*(continued on back page)*



# Stacom

This change in torque required is caused by compressibility effect on the main rotors and is accounted for on the center chart of figure 7-13. UH-60 and CH-54 manuals also show similar effects. As you have guessed by now, the old warrant's head was really on straight when he talked about hover performance. ■

## Read the question carefully

The control tower has advised a UH-1H pilot that density altitude (DA) is 7,000 feet. **Question:** Can the UH-1H (performing to required specification) hover OGE at 9,200 pounds at a DA of 7,000 feet?

a. Yes
b. No
c. Yes and no
d. None of the above.

If you go to the dash 10 to check what the performance charts have to say you soon know that "you have been had." More information is required.

In answering the question, we will consider two different pressure altitude/temperature combinations, which equate to a density altitude of 7,000 feet:

a. PA = 7,000 feet; FAT = +1° C.
b. PA = 3,500 feet; FAT = +40° C.

At first glance, it might appear that a pressure altitude of 7,000 feet would result in less than a hover out-of-ground-effect capability. A look at the UH-1H maximum torque available chart (figure 7-3, TM 55-1520-210-10) shows us that approximately 50 psi calibrated torque is available at 7,000 feet pressure altitude and +1° C. FAT, while 38 psi calibrated torque is available at 3,500 feet pressure altitude and +40° C. FAT. From the hover chart (figure 7-5), we find that hover performance is better at 7,000 feet/ +1° C. than at 3,500/ +40° C. As a matter of fact, the UH-1H will barely hover at 3,500 feet for the given conditions. If you selected answers A or B, you **may** be right. Answer C is the right choice.

Density altitude alone is of limited value in determining hover performance unless temperature and pressure altitude are known. ■

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

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Class A and B
mishap followups
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# Mishap review

## Synopsis

As the instructor pilot of a UH-1H tried to terminate an approach to a hover, the helicopter rotated about the mast to the right with full left pedal applied. The IP tried to follow the turn with cyclic and fly the aircraft downhill as rpm started to bleed off. Two large trees were in the flight path, and the IP lowered collective. The Huey hit the ground, rolled to the right, and came to rest partially inverted.

## History of flight

The mission was twofold: reconnaissance and training. The flight platoon leader assigned the mission to the platoon UH-1H IP because he had nearly 2,800 hours of flight time and some mountain flying experience. The IP was paired with a relatively inexperienced pilot so he could give him some training in mountain flying.

Five passengers boarded the Huey for a reconnaissance of the area of operation scheduled for a mountain training exercise the next day. A crew chief was also aboard. Weights of the occupants were estimated, plus 10 pounds of equipment each.

The first part of the flight, which ended with a landing at an Air Force base, was uneventful. The helicopter was refueled, and the pilot took off again. After several landing zones were located for a possible troop insertion, the IP decided to make an approach to one of the landing zones to confirm that an insertion could be made. During the approach, the IP was on the controls and the pilot was calling out torque readings. The approach was terminated at a 15-foot hover.

With the torque reading 43 pounds, the Huey began a slow turn to the right. Full left pedal was applied, but the turn did not stop. The low rpm warning light and audio activated.

The IP tried to fly the helicopter out of the turn by flying downslope and to the right, but the yaw rate increased. Realizing that two large dead trees would prevent him from flying the aircraft out of the turn, the IP reduced collective to land as the nose of the aircraft turned upslope. The toe of the left skid hit the ground, and the aircraft rolled and yawed to the right. The right skid then hit the ground and broke off. Both main rotor blades hit the ground and displaced the transmission. The Huey came to rest partially inverted.

The passengers and crew exited without difficulty. The pilot sustained minor contusions and abrasions.

## Crewmember experience

The 42-year-old IP had almost 2,800 rotary wing flight hours, with more than 1,100 hours in UH-1Hs. He had 2 hours of mountain flying time more than 2 years before this mishap. The 26-year-old pilot had more than 300 rotary wing flight hours, with almost 150 in UH-1Hs.

## Commentary

The Huey was not capable of hovering out of ground effect under the gross weight (8,389 pounds), temperature (18° C.), and pressure altitude (8,520) which existed at the time of the mishap. Power required to hover was 44 psi indicated torque. Maximum power available under the conditions was 39.5 psi. The IP believed that a load of five passengers was no problem because the squadron S-3 had established a standard load of five combat-equipped troops without regard for the aircraft's capability to handle such a load under existing conditions.

The IP was confident he could handle the mission because he had almost 2,800 hours of flight experience, was highly regarded by his commander, and had undergone classroom training on mountain flying conducted by the unit. He said he took the mission because it was much too hazardous for the other aviators. ■

# Followups

## Additional information on mishap briefs previously published

**uh1** **Class B mishap** in 25 Jun 80 issue (8045) ☐ IP and pilot were on training flight. During termination of autorotation with turn, main rotor blades hit and severed tail boom. IP did not correctly coordinate flight controls under existing conditions (low rotor rpm and a combination of control movement, forward velocity, and wind) to safely terminate a standard autorotation with turn. This was the result of lack of proficiency in the maneuver and poor judgment. IP had not done a standard autorotation with turn for about 6 months and had not done one on his last IP standardization ride.

**Class B mishap** in 6 Aug 80 issue (8055) ☐ Power fluctuated during cruise flight, followed by decrease of engine rpm. Decrease of power was caused by leak in P1 bellows which caused fuel control to reduce fuel flow to a point below that necessary to sustain normal operation. With the governor switch in the emergency position and no friction on the throttle and collective controls, the PIC removed his left hand from the collective, leaving it and the throttle unguarded. The collective fell from the position selected by the PIC, resulting in a power surge that the PIC misinterpreted as another fuel control malfunction. PIC increased collective to control the overspeed and abruptly reduced throttle, causing flameout. PIC entered autorotation which terminated in hard landing.

**Class A mishap** in 17 Sep 80 issue (8067) ☐ PIC on NOE reconnaissance training mission was late leveling off from descent, and aircraft hit tree. Tail rotor separated, and aircraft entered a spin when additional power was applied. Aircraft was autorotated into trees and consumed by postcrash fire. PIC's actions resulted from inaccurate estimate of closure rate with tops of trees. Excessive NOE airspeed during descent to and arrival at NOE altitude probably contributed to the error.

**Class A mishap** in 8 Oct 80 issue (8069) ☐ During approach to confined area, pilot did not maintain approach angle that would allow for obstacle clearance, and main rotor blades hit trees, throwing debris into tail rotor blades. Tail rotor system and 90-degree gearbox separated, and aircraft hit ground while spinning to right. Pilot's attention was probably focused inside the cockpit in anticipation of an engine rpm droop as the aircraft neared the trees. Pilot may have been distracted during the initial portion of the approach, disrupting his concentration on establishing a proper approach angle.

*(continued on next page)*

8055

8069

# Followups

**Class A mishap** in 8 Oct 80 issue (8070) ☐ Crew heard loud whining noise during flight at 300 feet agl, followed by partial power loss. Suitable forced landing area was not available and PIC could not maintain altitude. Complete power loss occurred about 20 feet above treetops. PIC autorotated into trees, and aircraft was destroyed on ground impact. Power loss resulted from failure of power shaft support bearing. Cause of bearing failure could not be determined because of extensive damage to bearing.

8070

**ah1** **Class B mishap** in 3 Sep 80 issue (8063) ☐ Turbine section of engine failed during flight. Aircraft touched down on heels of skids during landing and then rocked up on toes. Main rotor blades flexed down and hit tail boom. Fuel control on engine was mismatched with a temperature sensing assembly from a fuel control to which it was not calibrated. Unauthorized maintenance on the fuel control resulted in unmanaged fuel flow to the engine and ultimate failure.

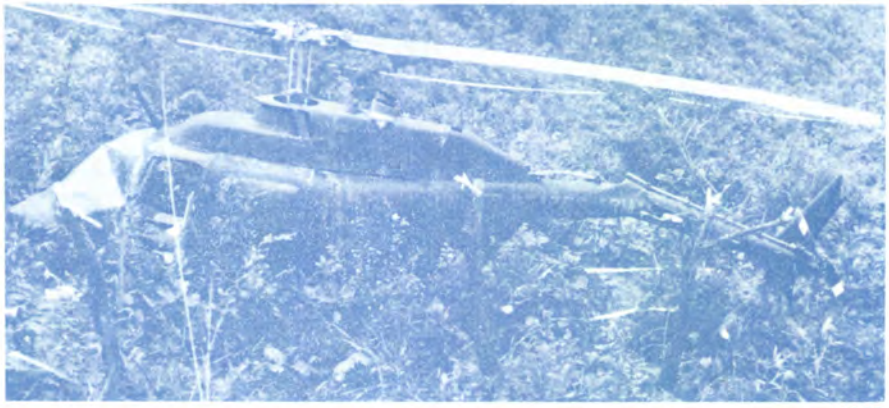
**oh58** **Class B mishap** in 25 Jun 80 issue (8046) ☐ Pilot was flying 700-800 feet agl over mountainous terrain when aircraft entered turbulence and complete loss of engine power occurred. The turbulence changed the disc loading of main rotor system, and engine governor and fuel control responded to maintain a constant $N_2$ rpm. Fuel control entered a deceleration schedule that was too lean to sustain engine operation. The lean deceleration schedule resulted from failure of the main flyweight shaft bearing in the fuel control. A substitute grease used in the bearing hardened and did not provide adequate lubrication, causing the bearing to fail. The power loss occurred over terrain unsuitable for a forced landing without damage, and a hard landing occurred during touchdown.

**Class A mishap** in 8 Sep 80 issue (8065) ☐ PIC tried to land at unsurveyed field

8063

location with left to right upslope and right crosswind. More suitable areas were available. After placing right skid on ground, PIC decided slope was excessive and tried to lift off to a hover. During liftoff, a roll developed as collective was increased. PIC did not reduce collective to stop the roll and aircraft came to rest on right side. The PIC's flight control actions were caused by his lack of flying experience.

**Class A mishap** in 10 Sep 80 issue (8066)
☐ PIC initiated approach to OGE hover above a ridge. At near zero groundspeed and 40 feet agl, as collective was increased to stop normal rate of descent, left pedal hit the stop and aircraft yawed uncontrollably to the right. PIC could not regain control, and aircraft crashed on slope. Aircraft was being operated within the parameters of the operators manual at the time of the mishap. It spun to the right because the tail rotor did not provide sufficient antitorque thrust. ■



8066

8065

# Selected mishap briefs

## uh1

**Class A mishap** ☐ (M series) Tail rotor separated in flight and aircraft crashed. Suspect bird strike. 8122

**Class C mishap** ☐ (H series) While landing from a hover in LZ for troop lift, pilot saw two soldiers running toward the front of the aircraft parallel to the fuselage. Pilot turned his head right to clear right side of aircraft and to check on movement of running troop. Aircraft skid height was about 1 foot. Crew chief followed the movement of the other soldier running along left side of aircraft and lost visual contact just aft of copilot's door. Pilot completed landing after verifying that soldier on right side was still about 20 feet away. After landing, pilot was told by the passengers to pick the aircraft back up. Crew chief told pilot skid had landed on soldier. Soldier's foot was injured.

**Class E mishaps** ☐ (H series) IP was letting pilot practice hovering in emergency governor mode. During hovering turn, IP saw vehicles approaching and took controls while vehicles passed. While IP had controls, gust of wind caused aircraft to turn and engine to overspeed. ☐ (H series) Hydraulic pressure light came on during takeoff. Caused by ruptured hydraulic line. ☐ (H series) Tail rotor pedals became stiff during hover. Caused by failure of tail rotor servo cylinder. ☐ (H series) Engine oil pressure gauge dropped to zero. Caused by failure of transmitter. ☐ (H series) Fire warning light came on during flight. Caused by corroded cannon plug at fire detector box.

## uh60

**Class C mishap** ☐ During flight at 80 knots and 100 feet agl, crew chief told pilots load was oscillating badly. Pilot slowed aircraft to 60 knots until load stabilized. Pilot then returned to 70 knots to keep up with flight. Load was set down in LZ and pilot flew to refueling point. At refueling point, crew chief saw hole in bottom of aircraft aft of main fuel drains.

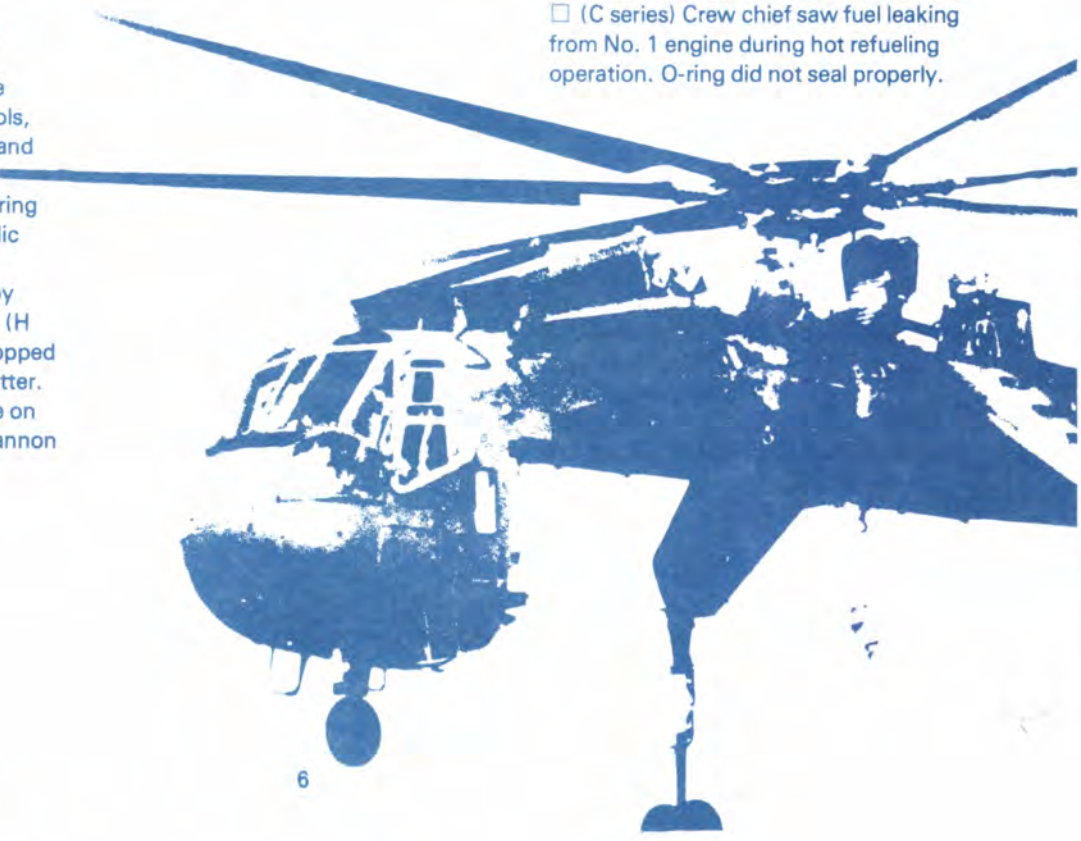
## ah1

**Class C mishaps** ☐ (S series) Using ground guides, pilot landed on top of tree limb placed on ground to keep skids from sinking into snow-covered ground. When throttle was rolled off, aircraft shifted and both skids were bent. ☐ (G series) During descent for landing, forward battery compartment door flew off, damaging one main rotor blade. Crew failed to insure lock wires were engaged when compartment door was closed.

**Class E mishaps** ☐ (S series) Pilot overcontrolled aircraft during practice of evasive maneuvers, causing overtorque. ☐ (G series) No. 2 hydraulic and master caution lights came on. Running landing was made. Caused by failure of hydraulic line.

## ch47

**Class E mishaps** ☐ (C series) No. 2 engine would not respond to normal engine beep during hover. Caused by failure of $N_2$ actuator. ☐ (B series) Utility hydraulic accumulator pressure reading of 3500 psi in flight was caused by defective hydraulic accumulator gauge. ☐ (B series) When airspeed was slowed for landing, forward speed trim would not retract in automatic or manual mode. Cannon plug on speed trim actuator had one bent pin. ☐ (B series) Transmission oil leak during landing was caused by defective oil filter. ☐ (B series) Forward speed trim programmed up to 70 knots during runup. Caused by defective speed trim amplifier. ☐ (C series) Crew chief saw fuel leaking from No. 1 engine during hot refueling operation. O-ring did not seal properly.



**ch54** **Class C mishap** □ (A series) Crew was preparing to test electroexplosive circuit during runup. Individual in rear seat said circuit was in test position. Circuit was tested, click was heard, and no green light was seen. Circuit was found to be in fire position. When pilot tested circuit, cable severed.

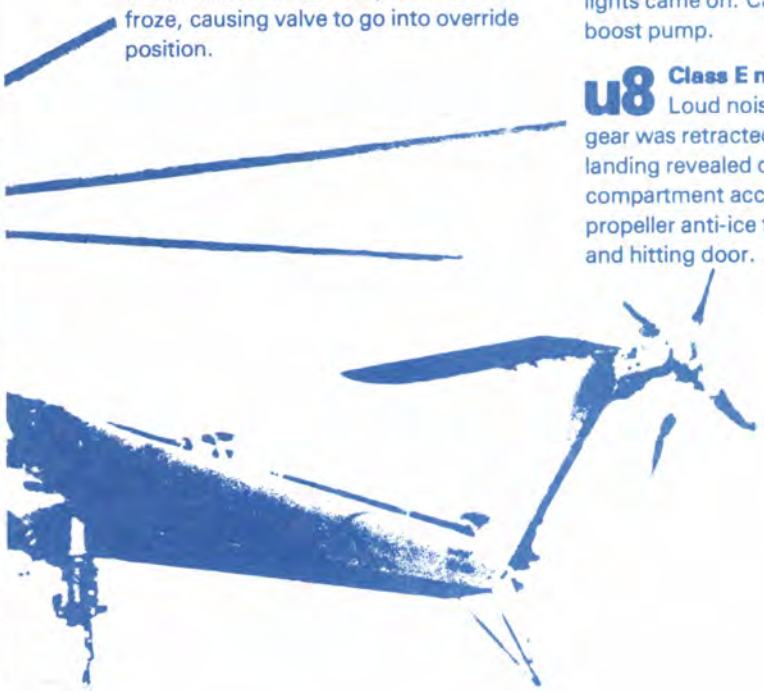
**Class E mishap** □ (A series) Rotor brake advisory light on master caution panel came on during before-landing check. Pilot placed rotor brake switch in release position and landed. Caused by failure of high pressure switch.

**oh6** **Class E mishaps** □ Transmission oil pressure light came on during hover. Caused by failure of transmission pressure switch. □ As cyclic was applied to stop aircraft for right 90-degree turn, severe binding and feedback were felt through cyclic. Condensation in one-way lock valve froze, causing valve to go into override position.

**oh58** **Class C mishaps** □ (A series) On termination of low-level autorotation, aircraft hit runway tail skid first, resulting in spike knock and structural damage to tail boom. □ (A series) Main rotor blades hit tree during confined area takeoff. Sun through plexiglass window momentarily obscured pilot's vision.

**Class E mishaps** □ (A series) Aircraft was in deceleration phase of practice autorotation. Collective pitch was applied about 10 feet agl, and collective froze after 1 inch of upward travel. The combined physical efforts of both the IP and pilot broke loose the frozen collective at about 1 foot agl, and successful autorotation was made. Caused by malfunction of servo actuator. □ (A series) Engine-out audio came on during pickup to hover. Caused by defective engine rpm sensing unit. □ (C series) Master caution and fuel boost pump lights came on. Caused by failure of fuel boost pump.

**u8** **Class E mishap** □ (F series) Loud noise was heard as landing gear was retracted. Inspection after landing revealed damage to avionics compartment access door. Caused by propeller anti-ice fluid tube breaking off and hitting door.



# Maintenance

**uh1** **Class E mishap** □ (H series) Following autorotation with turn, with aircraft on the ground, hydraulic and master caution lights came on. Hydraulic assistance was lost. Hydraulic line was chafed because of incorrect installation of spacing clamp. Clamp was installed without insert, allowing clamp to rub against line.

**ah1** **Class E mishap** □ (S series) During hover/taxi for departure, pilot gave gunner the controls. Gunner increased altitude to 10 feet and positioned aircraft for searchlight adjustment. As aircraft accelerated through 5 knots, pilot turned ECO on. Gunner felt lateral cyclic input and binding to left. Popping sound was heard aft of pilot's seat in hydraulic compartment, and aircraft was landed. ECU ducting was touching lateral cyclic control tube under pilot's seat. Duct was repositioned to provide adequate clearance.

*(continued on next page)*

# Mishap briefs

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**ch47** **Class E mishaps** □ (C series) No. 1 flight boost and SAS lights came on, and boost pressure dropped to zero during landing with slingload. Pilot selected No. 2 flight boost system, placed load on ground, and landed. Rigid line under combining transmission chafed against another line, causing pinhole leak and loss of hydraulic pressure. □ (JCH-47C) No. 1 engine $N_1$ began to increase during flight, and No. 2 engine $N_1$ rapidly decreased. No. 1 engine emergency trim was used in an attempt to control No. 1 engine torque. During this attempt, No. 1 engine torque rapidly reduced to zero, allowing No. 2 engine to increase. As No. 2 engine absorbed the load, it flamed out. Single-engine landing was made. Inspection revealed No. 2 engine fuel line quick disconnect located at engine deck was not completely seated, causing engine to flame out.

**ov1** **Class E mishaps** □ (D series) At cruise with autopilot engaged, autopilot initiated abrupt turn to right. Steering, compass, and gyro flags came up. Pilot disengaged autopilot, resumed wings level on standby altitude indicator, and selected backup compass on nav mode compass switch. Primary altitude indicator did not align and compass indications were erratic. No-gyro ILS approach was completed. No. 1 and No. 2 inverters were out of adjustment, causing overvoltage condition. □ (D series) Pilot became light-headed, drowsy, and uncoordinated during cruise flight. Symptoms continued with 100 percent oxygen. Pilot then noticed oxygen flow indicator had stopped working. System pressure indicated 450 psi. Pilot returned to base and landed. Oxygen hose had become partially disconnected during recent ejection seat maintenance and disconnected completely during flight.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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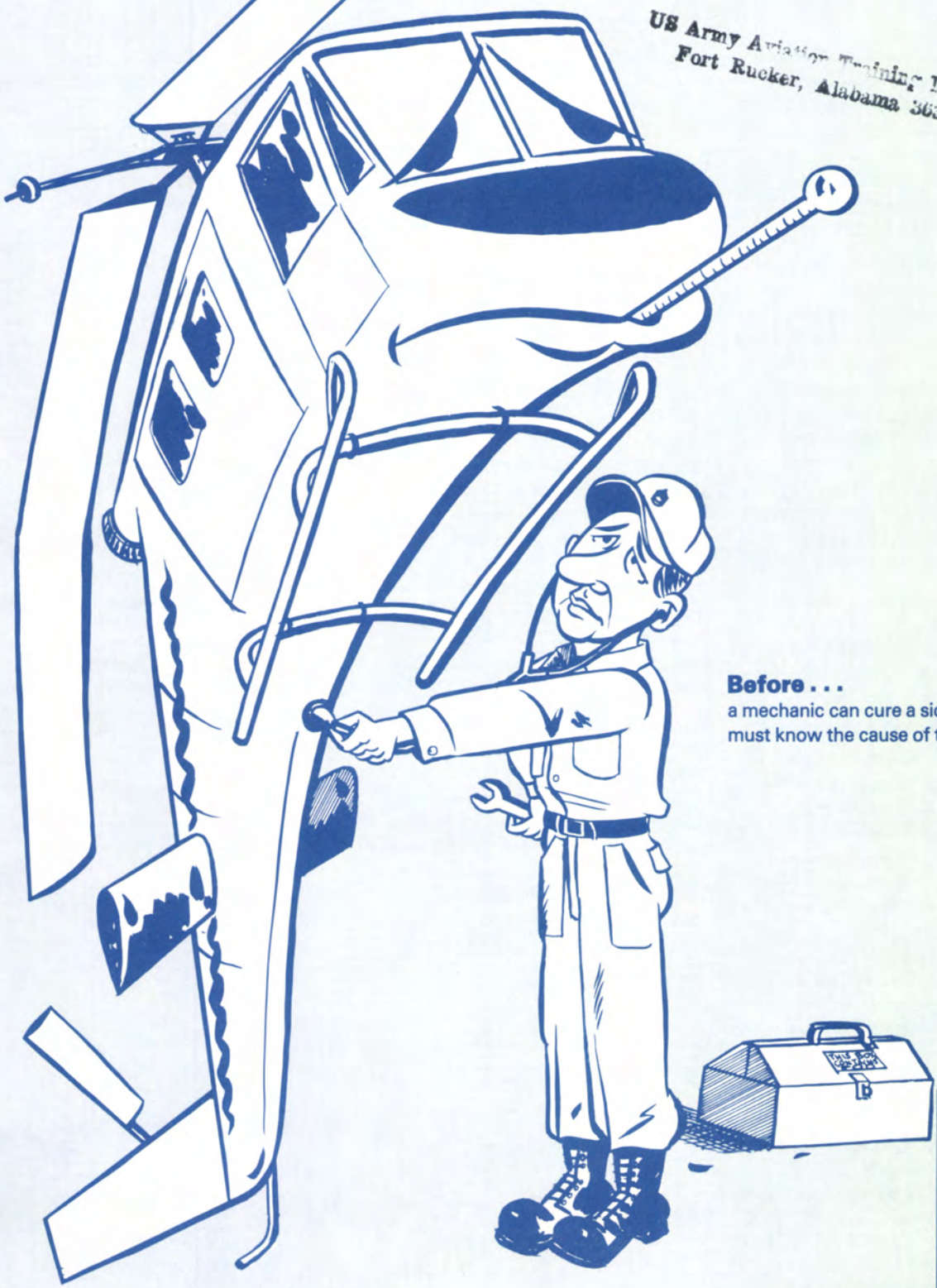

**Before . . .**
a mechanic can cure a sick aircraft, he must know the cause of the illness

**Symptoms, causes, and cures**

# Symptoms, causes, and cures

Before a doctor can prescribe proper treatment, he must first identify his patient's illness. This may require a variety of tests. But such tests are not performed arbitrarily. They are dictated by the symptoms the patient exhibits. So awareness of the symptoms is the first step toward effecting a cure.

Similarly, before a mechanic can correct an aircraft discrepancy, he must identify the problem. To do so, he may have to perform one or more checks based on the symptoms displayed. Often, he must rely on the pilot for this information. If the pilot fails to accurately describe any symptoms noted or deliberately omits some because they may appear to be insignificant, he can thwart the mechanic's efforts, cause undue delays in determining the problem, and, in some instances, actually prevent a cure.

A simple example concerns a pilot who noted severe vibrations during takeoff in a fixed wing, propeller-driven aircraft. He remained in the traffic pattern, landed the aircraft, and made the following entry in the -13: "Engine vibrates severely."

Maintenance personnel proceeded to check both the engine and propeller for possible causes of vibration, but could find none. Nor could the vibration problem be duplicated during ground runup. Finally, the aircraft was test flown. Immediately following liftoff, the test pilot noted severe vibrations. However, these vibrations stopped shortly afterwards and could not be induced by changes in power settings. The answer was simple. A check of the nose wheel showed it to be out of balance.

How much time and effort could have been saved had the pilot been a little more specific in his writeup? A simple "Severe vibration noted following takeoff; vibration stopped and did not recur" would have done the job.

In another instance, not only could unnecessary maintenance have been prevented but, possibly, a mishap might have been avoided. The aircraft involved was an OH-58. Initially, the aircraft was written up as follows: "Maximum $N_2$ is 102.5." When checked by maintenance, N2 was found to be within limits, and a test flight revealed no discrepancy. So no corrective action was taken. The discrepancy was cleared by the entry in the -13 to the effect that the aircraft was checked and found okay.

However, a day later, the following entry was made in the -13: "Low rpm audio and light came on in flight. $N_2$ returned to normal. Flight continued to airfield." Once again maintenance personnel could find no discrepancy. Further, a test flight revealed the aircraft performed exceptionally well. As a result, it was assumed that the tone generator must be at fault, and maintenance personnel carried the writeup forward on a red diagonal until a replacement part could be obtained.

Several weeks elapsed before the tone generator was replaced. During this time, the aircraft was not flown. On the next flight, following part replacement, the pilot was at an altitude of about 100 to 150 feet agl when he heard what he thought to be an emergency locator transmitter (ELT) beeper. After checking his instruments, he determined there was no problem with the aircraft. Shortly afterwards, however, he heard the beeper sound again. This time, a visual check showed the engine $N_2$ rising from 98 percent to 103 percent, and the pilot decided to make a power-on approach short of his intended destination.

While on approach, engine $N_2$ decayed to 68 percent and rotor rpm to 220. The aircraft landed hard and encountered "spike knock" and "pylon whirl." The main rotor blades struck the tail rotor drive shaft and tail boom.

Indications were that the powerplant malfunction resulted from the tail rotor system setting up a vibration which was transmitted through the airframe and engine mount to the fuel control governor and the main control spring, causing it to detune and restrict the fuel flow. The end result was a partial power loss and hard landing, with substantial damage to the aircraft.

This mishap is unique in that the conditions believed to have developed to cause the failure were unheard of at the

**Following two pilot writeups, unresolved problem appeared a third time—with these results.**

time the mishap occurred. At best, they had not been positively identified and publicized. Consequently, the difficulty maintenance personnel experienced in trying to diagnose the problem during each of the two writeups prior to the mishap is understandable, and the corrective actions taken following these entries would seem to be adequate. After all, the test pilot could not duplicate the problem, and the aircraft checked out exceptionally well during the test flight. In addition, mechanics could not find any physical evidence of a problem as none was visible. As a result, they based their corrective action on the inaccurate assumption that the fault must apparently lie with the tone generator.

But what if the pilot had been more specific in his writeup by recording all applicable instrument readings? Two such similar entries would have left no doubt that a problem existed—even if it could not be readily identified or the condition that caused it duplicated.

Similarly, while maintenance personnel may very well have felt that no problem existed after the first writeup, they should have definitely become suspicious after the second entry—especially when the pilot's comment included the statement ". . .$N_2$ returned to normal. . ."

When appropriate troubleshooting procedures failed to reveal the problem, it should have been referred to support maintenance and, if necessary, to a factory representative. Had this been done, it is not likely the aircraft would have been released until the problem had been positively identified and corrected. As it was, time was wasted, a serviceable unit was replaced, and the trouble was not resolved. The result was a mishap that, luckily, produced no injuries, but cost nearly $14,000 for aircraft repairs.

The objectives, then, are clear: to insure the integrity of our aircraft and enhance the safety of our aircrews and passengers. To do this successfully, there must be close cooperation between aviators and maintenance personnel.

As a pilot, you can help by being as specific as possible in your writeup and by recording all events encountered and applicable instrument indications noted.

As a mechanic, it becomes your responsibility to properly troubleshoot, accurately diagnose the problem, and correct any discrepancies found. In doing this, avoid making assumptions that are not substantiated by facts. If in doubt, consult your support maintenance activity, factory representative, or other appropriate agency. It is much better for all concerned to take the time to insure an aircraft is safe before releasing it than to be sorry afterwards. ■

# Mishap review

## Synopsis

After landing as the second aircraft in a trail formation, the OH-58A was lifted to a hover and a right pedal turn was made. As the aircraft was hovered forward, visual reference to the ground was lost. The left skid hit the ground and the aircraft came to rest on its left side.

## History of flight

After completing an aerial scout recon mission, five aircraft were to be flown to another area. The flight was delayed because of a snowstorm. Takeoff was made about an hour and 45 minutes behind schedule.

Night landing aids, consisting of an inverted Y and a jeep with rotating yellow beacon, were available at the field location.

The pilot of the first aircraft landed and called the pilots of the other aircraft to tell them about a blowing snow condition in the LZ. The pilot of the second aircraft landed without incident. He then picked up his aircraft to move it to the east side of the LZ to make room for the other aircraft in the flight. A right pedal turn was made and a forward hover was begun. Rotorwash recirculated the snow, causing the pilot to lose ground reference. Collective was applied, but the left skid hit the ground while the aircraft was drifting left. The OH-58 rolled onto its left side. The pilot was not injured, and the crew chief sustained a minor injury to his knee.

## Crewmember experience

The 30-year-old pilot had almost 1,100 rotary wing hours, with more than 500 in OH-58s.

## Commentary

Although warned of the recirculating snow conditions in the LZ, the pilot hovered his aircraft at 2 to 5 knots and 2 to 5 feet agl instead of using an airspeed just above translational lift or a high hover as prescribed by TC 1-137.

When the helicopter became engulfed in the snow, the pilot became momentarily confused as to whether he should reduce altitude to ground taxi or add power to climb above the recirculating snow. By the time he decided to do the latter, the left skid had dug into the snow.

The pilot had been routinely flying in recirculating snow conditions for three days without difficulty and believed he was capable of coping with this environment. As a result, he had not developed a full appreciation for the probability of inadvertently encountering a loss of outside visual references and was admittedly caught by surprise when it happened.

When the flight was delayed for more than 1 ½ hours because of bad weather, the pilot was aware that any further flight on his part during the hours of darkness would probably exceed day/night crew rest flight limits. He was concerned about the lack of suitable RON facilities and after considerable deliberation decided to continue to the unit LZ. ■

# Selected mishap briefs

**uh1** **Class A mishaps** □ (H series) Tail rotor blades hit tree during approach to hilltop signal site. Aircraft spun two or three times and crashed. Crew chief sustained back injury. 8069 □ (H series) Crew heard loud grinding noise from engine/transmission area while flying 300 feet over mountainous terrain. Crew of another aircraft told pilot smoke and/or flames were coming from engine area. Aircraft autorotated and crashed in trees. Pilot, copilot, crew chief, and seven passengers were injured. 8070

**Class C mishap** □ (H series) Right door of parked aircraft was closed but not secured. Rotorwash from hovering aircraft blew door open and snapped it off. Door was blown into and shattered right chin bubble of another parked aircraft.

**Class E mishaps** □ (H series) Crew smelled strong fuel odor shortly after takeoff. Failure of solenoid valve caused fuel leak. □ (H series) As pilot was applying takeoff power, IP heard grinding noise and felt vibration in airframe. Caused by failure of transmission. □ (H series) Rotor rpm decayed during autorotation. Needles did not split. Caused by sprag clutch seizing in flight. □ (H series) During attempted engine start, starter would not engage. Crew chief saw smoke in engine compartment area. Inspection revealed battery charge was insufficient to motor starter, causing overheating of starter/generator.

**Aviation-related** □ Aircraft was being ground handled from ramp to hangar. When aircraft was brought to a stop inside hangar, individual hanging onto tail stinger inadvertently released it. Nose of aircraft went up and main rotor blade flexed, hitting ceiling.

**uh60** **Aviation-related** □ Truck was driven under aircraft forward main rotor blade as crew chief held up blade. Truck hit blade, damaging cap assembly.

**ah1** **Class E mishaps** □ (S series) Engine chip detector light came on during start. Cuased by internal engine malfunction. □ (TH-1G) Transmission oil bypass light came on during approach. Caused by defective oil bypass switch. □ (TH-1G) Forward fuel boost pump light came on during hover. Caused by failure of fuel pressure switch.

**ch47** **Class C mishap** □ (C series) As aircraft was climbing out with slingload of howitzer and A-22 accessory bag, bag fell from howitzer and hit road. Bag was not securely attached to leg of howitzer.

**Class E mishaps** □ (A series) No. 2 torque indicator surged plus and minus 100 pounds during climbout, and No. 2 engine chip detector light came on. Caused by failure of torquemeter drive roller assembly. □ (C series) Forward transmission oil pressure dropped to 15 psi. Caused by failure of oil pressure transducer. □ (C series) Hydraulic fluid started spraying from flight control closet during flight. Caused by failure of elbow tube. □ (C series) Flight engineer told pilot smoke was coming from No. 2 engine. Engine was secured and one fire extinguisher bottle was fired into engine. Crew chief then noticed that smoke was in aft transmission area and located source as the utility hydraulic cooler fan. No. 2 engine was restarted and aircraft was flown to base and landed. Cooler fan was replaced.

**Aviation-related** □ As combining transmission was being installed on aircraft, hoist cable broke 42 inches from hook, causing transmission to fall to ground.

**ch54** **Class E mishap** □ (B series) No. 2 engine oil pressure was lost during flight. Caused by failure of O-ring on external oil line to No. 5 engine bearing.

**oh6** **Class E mishap** □ Pilot heard unusual noises from transmission area during shutdown. Oil was drained and chip detector plug removed. Piece of metal was seen through chip detector hole, but metal was too big to be removed through hole. Sight gauge glass was removed and metal taken out through hole. Metal was about 1¼ inches long.

**Aviation-related** □ As aircraft was being moved into mall for recruiting display, horizontal stabilizer hit door

*(continued on next page)*

# Mishap briefs

standard. Person supposed to be clearing horizontal stabilizer had walked to opposite side of aircraft. ☐ Truck driver had dropped a logbook off at one aircraft and was driving down the flight line when his truck hit main rotor blade of parked aircraft.

**oh58** **Class C mishap** ☐ (A series) Postflight inspection after NOE training flight revealed crack in skin on underside of main rotor blade.

**Class E mishaps** ☐ (A series) Engine oil pressure was seen at 80 to 90 psi after takeoff to hover. Inspection revealed O-ring had broken up and piece was lodged in oil pressure regulator. ☐ (A series) Loud banging and knocking sound was heard and aircraft shook. Severe feedback was felt through controls. Caused by separation of pylon isolation mount at three points. ☐ (A series) Low rpm light and audio activated. Pilot reduced collective to see if $N_2$ rpm would recover. $N_2$ was stable at 96 percent. Pilot continued autorotation to ground. Caused by $N_2$ governor failure. ☐ (C series) During OGE hover check, jam and disengage lights on primary directional control indicator panel came on. Aircraft had a history of similar VR directional control problems.

**th55** **Class C mishap** ☐ Aircraft yawed to left during practice straight-in autorotation and landed hard on right skid, damaging aft cross beam.

**c12** **Class E mishap** ☐ (A series) Crew smelled burning odor and blue smoke entered cockpit and then disappeared. Caused by failure of cabin temperature mode selector.

**ov1** **Ground mishap** ☐ (D series) Aircraft was being checked for propeller rigging. Power levers had just been placed in flight idle position when nose gear collapsed. Caused by cracked strut attaching point.

**Class E mishaps** ☐ (D series) During engine runup, hydraulic pressure gauge maintained continuous fluctuation between 800 and 2400 psi. Caused by failure of flap selector valve. ☐ (D series) Left main gear would not indicate down when handle was placed in down position. Visual inspection by tower personnel revealed gear appeared to be down, and aircraft was landed. Internal failure of indicator caused erroneous indication of gear position. ☐ (D series) No. 2 hydraulic gauge showed zero during landing. Pressure returned to normal after 5 minutes. Loss of hydraulic pressure was caused by air lock in lines.

**t42** **Class E mishap** ☐ VFR test flight was being made for removal of elevators and aileron and flight check of ILS. As aircraft was leveled off at traffic altitude and 120 knots, right

engine began running rough, with marked reduction in power compared to left engine. Increase in throttle caused power recovery. Altitude was maintained with right engine under partial power. Aircraft was landed, and right engine quit during rollout. Caused by failure of mixer valve arm linkage to throttle plate arm.

**u8** **Class E mishap** □ (F series) As aircraft was leveling off at 8,000 feet, manifold pressure was reduced to 30 inches and rpm to 2750. No. 2 engine began to surge and rpm fluctuated. Cylinder head temperature dropped to 100° C. and oil pressure began to drop. Engine was secured and aircraft landed. Caused by failure of fuel injector pump.

**u21** **Class E mishaps** □ (A series) Shortly after level-off, IP slowed aircraft and aft trim was applied, with no response. There was about one-half turn of play in trim wheel. IP moved trim wheel to forward trim and aircraft responded. Aft trim was again applied, with no response. Electric trim was tried, but only forward trim worked. Aircraft was flown to airfield and landed. Bolt had sheared, causing elevator trim cable to come loose from autopilot servo-cable pulley. □ (RU-21H) Left avionics door came open during takeoff. Both pilots said door was secured during preflight.

# Maintenance

**uh1** **Class C mishap** □ (H series) Crew was making P1 bellows check. Rpm stabilized at 6200 and, as collective was increased, engine exploded. Improper engine flush procedures resulted in FOD ingestion.

**Class E mishaps** □ (H series) Loud banging noise was heard from engine area and aircraft yawed left. Power-on landing was made. Caused by out-of-rig variable inlet guide vane actuator. □ (H series) IP saw vapors coming from battery intake vent as aircraft was being refueled. One cell of battery had been reversed during service check. □ (H series) As aircraft stopped to drop off passenger, crew chief saw hydraulic fluid on floor of cargo compartment. Hydraulic fluid sight gauge showed empty. Fluid was streaming from lock nut on elbow fitting of hydraulic pump to pressure line. Lock nut had backed off.

**ah1** **Class E mishap** □ (S series) Transmission oil temperature indicated 105° C. and rising slowly, and transmission oil hot light came on. Postflight inspection revealed oil line quick disconnect to oil cooler was not tightened correctly, restricting flow to oil cooler. Pins on quick disconnect were not out.

**ov1** **Class E mishaps** □ (D series) No. 2 hydraulic gauge dropped to zero and loud whining noise was heard during taxi. No. 2 engine was shut down and No. 1 hydraulic pressure gauge dropped to zero. Inspection revealed threads had stripped on aluminum fitting at nose gear actuator, causing fitting to back off. Caused by improper installation.

*(continued on next page)*

# Mishap briefs

### Messages received

• Safety-of-flight message concerning suspension of closed circuit refueling of UH-1C/M helicopters with rollover vent valves installed (UH-1-80-13, 241340Z Sep 80). Contact: Ray Boland, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

### Urgent change to OH-58 maintenance checklist

Change 5 to TM 55-1520-228-PM was published 29 August 1980.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Cold weather survival training

For those of you who can't make the U.S. Air Force Cold Weather Survival Course in Alaska, there is another school available with limited quotas. The Navy conducts two 5-day courses each year in Maine. One begins 19 January 1981 and the other begins 23 February 1981. If enough interest is shown, the Navy will conduct some 3-day courses in cold weather survival.

Survival schools prepare you psychologically to accept the fact that you are in a survival situation and that you know how to take the necessary precautions to survive. The courses are primarily for Navy personnel but any unfilled quotas are on a first-come first-served basis.

If you're interested in self-improvement and a challenge, contact CW3 Scammon or SGT Paschal at the Army Aviation Support Facility, Bangor, Maine, AUTOVON 476-6257, commercial 207-947-6593. ■

"It is almost as bad for the pilot to have complete faith in weather forecasts as it is for him to have none at all. Pilots who understand both the information given and the limitations of weather observations and forecasts usually are the ones who make the most effective use of the weather service. The weather-wise pilot looks upon a forecast as professional advice rather than as the absolute truth."
**—from "Aviation Weather for Pilots and Flight Operations Personnel"**

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Volume 9
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# Flightfax

# Mishap review

## Synopsis

A CH-47C on a service mission lost rotor rpm during takeoff. Attempts to increase engine rpm with normal and emergency engine beep trim were unsuccessful. The helicopter could not sustain flight and descended from about 75 feet. It hit two trees, crashed, rolled on its right side, and caught fire.

## History of flight

The mission called for six CH-47s to fly to a location about an hour and a half away, pick up a load, return to home base, and then repeat the trip. The pilots arrived at the airfield, and the pilot of the No. 3 aircraft asked about the weight and balance form for his load. The operations officer said he had the forms and the crews did not have to fill them out because they had already been completed. The pilot then asked for a dash 10 to fill out a performance data card. He was told by one of the other pilots that it wasn't necessary to fill out the card since the aircraft would not have either single-engine flight or single-engine hover capability with the load configuration. The pilot checked the flight plans of the other crews and found that none of them had the performance data on the back.

Six people were aboard the No. 3 aircraft—the pilot, copilot, flight engineer, crew chief, and two passengers. Checking the engine and flight instruments before takeoff, the crew noticed that the No. 1 torque needle was vibrating.

The flight to the pickup area was uneventful. The aircraft were landed at the loading area, refueled, and loaded for the return flight. The weight and balance form was not checked for accuracy nor was an aircraft performance data card computed for the return flight. One aircraft remained as a maintenance aircraft.

The five aircraft departed without a 1-minute separation between aircraft and without the completion of a hover/power check. During the takeoff, the pilot and copilot of the No. 3 aircraft noticed that the No. 2 engine torque had decreased and that a 10-rpm decrease in rotor speed had occurred. Normal engine beep was applied but was slow to respond. Emergency engine beep was activated and rotor rpm increased to the desired operating speed. The remainder of the flight to home base was uneventful.

The five aircraft were landed, unloaded, and refueled. The second flight to the loading area was uneventful. The aircraft were refueled and loaded for the flight to home base. The crew of the No. 3 aircraft did not check the actual cargo weight against the precomputed weight and balance form or prepare a performance data card for the flight. The pilot and copilot made a walk-around inspection of the aircraft, using the checklist. No discrepancies were noted.

Because of the problem with torque and rpm on the previous flight, the pilot decided to wait for the rotorwash created by the first two aircraft to dissipate before departing. A modified hover/power check (not conducted in accordance with the dash 10 CL) was done. The pilot, who was at the controls in the left seat, brought the aircraft to a hover. During the hover/power check, torque was noted at 790 to 800 pounds with rotor rpm between 235 and 238. The pilot turned the aircraft slightly to the left to align with the desired departure heading. Power was added for takeoff. The copilot saw the torque needles split, and rotor rpm dropped through 235.

Normal engine beep for both engines was activated. There was no engine response. At this point, the aircraft had traveled about 100 to 160 meters and was about 75 feet off the ground. Emergency engine beep was applied, with no engine response. The split in torque increased as rotor rpm decayed. This was accompanied by a decrease in engine noise level.

The pilot tried to land to a cleared portion of a golf course about 150 meters to his right front while rotor rpm continued to bleed off. The bottom of the aircraft passed through the tops of two trees. Initial ground impact was on the right rear wheel assembly. The aircraft came to rest on its right side, and a fire broke out around the forward part of the aft pylon and engine areas. Firefighting equipment was on the scene in less than 2 minutes, and the fire was completely extinguished within 15 minutes.

The six occupants sustained contusions, abrasions, and lacerations.

*(continued on next page)*

# Mishap review

## Crewmember experience

The 28-year-old pilot had more than 1,200 rotary wing flight hours, with more than 250 in CH-47s. The 29-year-old copilot had more than 1,100 rotary wing flight hours, with more than 50 in CH-47s. Of the 8 hours flown by the pilot in the CH-47C and the 10 hours flown by the copilot in the CH-47C, only 4 hours were flown in a CH-47C equipped with T55-L7C engines. These 4 hours were flown on the day of the mishap.

## Commentary

The crew was not aware of the power available or required for the operation of the aircraft because they had not prepared a performance planning card. During the takeoff, the pilot applied enough thrust to cause the No. 1 engine to bleed off. This resulted in a decrease in torque on the No. 1 engine. The copilot, who was monitoring the instruments during the takeoff, did not know that an excessive power demand had been made on the engines because he was not aware of the maximum power available or required and he was not monitoring the N1s or No. 1 torque needle.

Thinking the No. 2 torque needle was decreasing, the pilot tried to increase power to the No. 2 engine. Attempts to increase power to the No. 2 engine using the normal trim switch for both engines and the emergency trim switch for the No. 2 engine were successful. However, the copilot was not aware of this because, as he applied the switches, he was monitoring the No. 1 torque needle. The application of normal engine trim to both engines did not increase power output from the No. 1 engine because the engine was already producing maximum power.

The aircraft had reached an altitude of about 75 feet, flown through translational lift, and was approaching a treeline at the onset of the decrease in torque which was caused by an excessive demand for power from the engines. The pilot did not reduce thrust sufficiently to allow the engine to recover power because he was confident in the copilot's ability to rematch the torque needles and continue the flight.

While the copilot was trying to increase power to the No. 2 engine, the pilot overflew a large clear area which could have been used as a landing area. The aircraft, which did not have either single-engine flight or single-engine hover capability due to the load carried, gradually descended because of main rotor bleedoff. By the time the pilot realized that further flight was impossible, a safe landing area was not available.

Mission planning, coordination, and unit standardization were inadequate.

- Flight plans were not filed in accordance with AR 95-1.

- A weather briefing required for flights outside the flying area was not obtained.

- When arriving and departing the loading area, aircraft were required to make high angle approaches into their loading pads and were required to depart over 75-foot trees. This route of flight was selected by flight lead. A more desirable approach and departure route was available that would have allowed the crews a minimum of 1,300 feet to a maximum of 3,200 feet of level, open terrain to make a forced landing.

- The aircraft were on the ground at the loading area about 1 ½ hours before the mishap flight. During this time, no one checked the weight and balance for the flight. Preplanned weight and balance forms were prepared for the mission. However, the crews did not have these documents on board their respective aircraft and had not checked them. The weight listed on the preplanned Form 365F differed from the weight of the cargo loaded on the aircraft.

- Hover checks were not done before departure.

- Both aviators were inexperienced in CH-47Cs and neither had flown the CH-47C equipped with T55-L7C engines before the day of the mishap.

- The decision was made to use, as a cargo-carrying aircraft, the CH-47C equipped with T55-L7C engines when a CH-47 equipped with T55-L11 engines was available. The CH-47C equipped with T55-L11 engines has a greater cargo-carrying capability and would enhance the operation of an aircraft near its maximum gross weight. ■

# Will we ever learn?

"I didn't grab it; I just laid my hands on it! I've done it a hundred times before and never had any trouble!"

These words were spoken by an aircraft mechanic with more than 40 years of military and civilian aviation experience. He had just tried to slow down the rotor blades of an OH-58A by placing friction on the tail rotor drive shaft. How? With his hands, of course. The result was a minor cut on his finger and the destroyed glove you see in the photograph.

The mechanic was extremely lucky in that his gloves were made from a vinyl material instead of leather. This resulted in the glove ripping apart when it was "grabbed" by the drive shaft, thus freeing the mechanic's hand. Had the gloves been made from a stronger material such as leather, there is no doubt that the mechanic would have been seriously injured.

Why did he do it? He wouldn't admit it, but the fact that the fuel truck was standing by waiting for the blades to be tied down and that it was just about lunch time were probably contributing factors. But there is more to it than that. The mechanic said he had done the same thing several times in the past. Where were the pilots when all this was going on? Surely they had not left the aircraft before the blades were even tied down. (It makes for a difficult postflight inspection.) And where were the maintenance supervisors?

What it means is that a lot of people were aware of an unsafe practice and did little or nothing about it. Why?

The mechanic was highly respected because of his experience and dedication to duty. Could it be that those observing this unsafe practice were hesitant to correct him because of all his experience? If so, why did they not bring it to the attention of the aviation safety officer and let him handle it? After all, that is certainly part of his job.

It can only be assumed that as the pilots walked away, they probably thought something like "Oh, well, nothing happened so I'll let it go." By letting this unsafe practice continue, they contributed to what was almost a serious accident and provided a disservice to the very individual they respected so much. Assuming, of course, that is what happened.

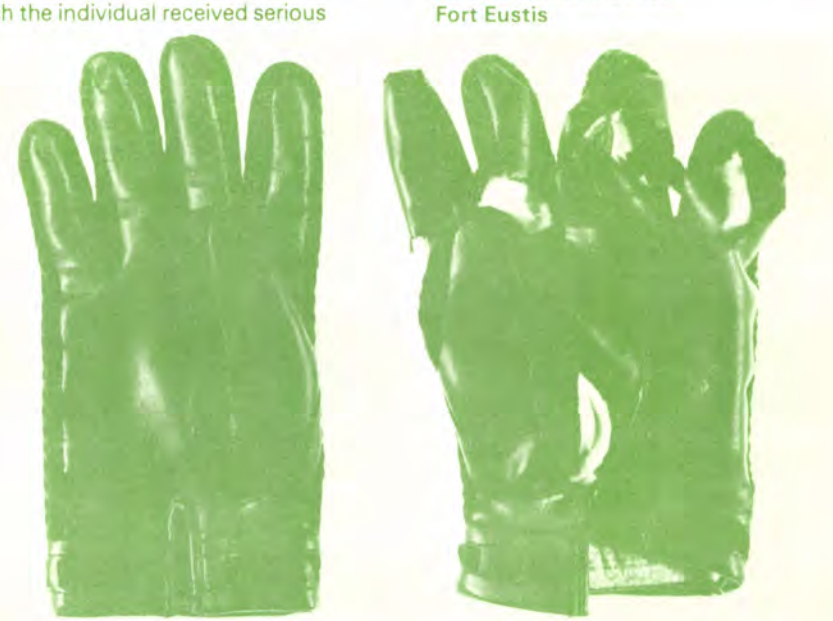
In any event, the basic responsibility must be borne by the mechanic, who certainly knew better. The mechanic had just finished reading an issue of FLIGHTFAX that described an identical mishap in which the individual received serious injuries. You would think it would have kept him from doing the same thing. But it didn't.

It would be nice if someone would invent a pill or an injection that would eliminate the old "It can't happen to me" syndrome. But it will take a concerted effort on the part of everyone involved in Army aviation to eliminate unsafe practices before they lead to mishaps.

If you cannot (or will not) take immediate corrective action, at least let your safety officer know about the problem, either verbally or by means of an Operational Hazard Report. He will know the best way to handle it, hopefully in time to prevent someone from getting hurt.

Do not think you are doing the individual a disservice by blowing the whistle on him. As this mishap points out, you will actually be doing him a very big favor. ■

—CW4 Peter J. Smith
Aviation Safety Officer
Fort Eustis



Glove on right was ripped open when mechanic used his hand to try to slow down OH-58 rotor blades.

# Selected mishap briefs

**uh1** **Class A mishaps** □ (H series) Aircraft was sitting on rough tundra surface at field location. As copilot was picking aircraft up to hover, right skid would not come off ground. Aircraft rolled right and both pilots pushed collective down to stop roll. Aircraft momentarily stabilized and then rolled onto right side. Skid may have caught in tundra, causing rollover. 8123 □ (H series) Flight following base station received a call that aircraft was going down. Air search was initiated, but search aircraft could not reach area where aircraft is thought to have landed because of weather. 8124

**Class C mishap** □ (H series) As throttle was being increased during engine start, engine suddenly surged from 5800 rpm ($N_2$) to 7600 rpm. Rotor rpm was 370. Maximum $N_1$ and torque were not observed. Overspeed condition existed for about 2 seconds.

**Class E mishaps** □ (H series) Sparks were seen coming from battery compartment 25 minutes after start of medevac mission. Crew turned off all electrical power and landed in open field. Copilot was unit maintenance officer and isolated electrical problem to failure of main inverter. Spare inverter was put on line, and mission was continued because of critical condition of patients. □ (H series) Fire warning light came on. Caused by failure of fire control alarm box. □ (H series) Transmission oil pressure light came on. Caused by failure of pressure relief valve. □ (H series) Master caution and hydraulic lights came on. Caused by failure of hydraulic pressure switch.

**ah1** **Class E mishaps** □ (S series) Transmission oil pressure fluctuated during hover. Caused by failure of oil pressure switch. □ (S series) Master caution and engine oil bypass lights came on. Caused by failure of transmission oil cooler drain valve. □ (JAH-1S) As pilot was moving out of simulated firing position, small section of sheetmetal was blown up through main rotor system and down onto front center section of copilot's canopy. Inspection revealed no damage. □ (TH-1G) SCAS malfunction occurred during flight. Caused by failure of pylon transducer.

**ch47** **Class C mishap** □ (C series) Aircraft picked up trailer containing 600-gallon pod at field site for transport to another field site. Aircraft was passing through 30 to 40 knots when crew chief said pod was shifting in trailer. Crew slowed aircraft and started descent. Pod continued to shift and fell out of trailer. Load may have been rigged incorrectly and pod may not have been secured in trailer.

**Class E mishap** □ (B series) No. 2 engine transmission hot light came on. Caused by failure of transmission.

**ch54** **Class C mishap** □ (A series) Flight engineer noticed right front pod door was open. During approach for landing, door

separated from pod and went through main rotor blades. Wedge block failed.

**oh58** **Class E mishap** □ (A series) As rpm increased during runup, engine chip detector light and master caution light came on. Caused by broken chip detector wire.

**th55** **Class C mishap** □ Clutch would not engage during runup. IP told student to guard controls and maintain 1600 engine rpm while he inspected linear actuator cable. During check, IP heard grinding sound and engine advancing to overspeed condition. IP rushed back to cockpit and found student trying to lower collective pitch. IP assisted in reducing collective and shut down aircraft. Overspeed caused quick engagement, damaging complete drive train and main rotor blades. Hard rain, followed by freezing temperatures, had caused accumulation of ice.

**u21** **Class E mishap** □ (A series) No. 2 generator failed during climbout. No. 1 generator indicated 100% load. Caused by blown fuse. Wire leading to fuse was bare.

**u8** **Class E mishap** □ (F series) Right engine had been shut down to practice single-engine procedures. It was restarted and warmed up at idle. When power was increased, engine failed.

**ov1** **Class E mishap** □ (D series) Crew noticed fluid on right side entrance hatch, followed by drop in No. 2 engine oil pressure. Pilot shut down No. 2 engine and copilot verified oil was flowing from engine nacelle. Caused by failure of seal.

**c7** **Class E mishap** □ During pretakeoff magneto check, No. 1 engine quit when right magneto was selected. Caused by failure of magneto.

# Maintenance

**ch47** **Class E mishap** □ (A series) IP saw shower of hydraulic fluid coming from top of companionway during approach phase of tactical instrument training flight. IP took controls and initiated descent. No. 1 flight boost gauge indicated zero, and master caution light and No. 1 hydraulic flight boost light came on. Postlanding inspection revealed ruptured hydraulic pressure line to forward swiveling actuator. Medium-pressure, single-strand line had been installed instead of high-pressure, double-strand line.

**oh58** **Class E mishaps** □ (A series) During start, fireguard saw white smoke coming from exhaust stacks. Pilot shut aircraft down and motored starter until temperature stabilized below 200° C. Crew chief had not kept exhaust stack covers on stacks. Water collected and froze in stacks. This turned to steam when engine was started. □ (A series) High frequency vibration in tail rotor controls during flight was caused by out-of-alignment No. 3 tail rotor hanger bearing. □ (C series) Engine/rotor tachometer dropped to 90 percent and low rpm audio activated during NOE flight. Caused by dirt and moisture on tachometer cannon plug.

**u21** **Class E mishap** □ (G series) When left power lever was reduced for slow flight, power would not go below 650 psi torque. Single-engine landing was made. Air hose was loosely tied to engine mount, allowing hose to shift and block movement of throttle.

### Messages received

- Maintenance notice advising maintenance personnel of CH-47 fire extinguisher cartridge retirement schedule changes (CH-47-81-06, 192030Z Feb 81).

**For more information on mishap briefs, call AUTOVON 558-4202/4198.**

# From National Transportation Safety Board

Air turbulence in the wake of a Boeing 727 that had landed less than a minute earlier led to the crash of a commuter flight that killed three persons, the National Transportation Safety Board has concluded.

The Board said the pilot of Air Pennsylvania's Flight 501 failed to follow wake turbulence avoidance procedures while attempting to land at Philadelphia International Airport on the clear, calm morning of July 25, 1980.

The crash of the Piper Navajo 10-seater took the lives of the pilot, copilot, and lone passenger. There were no other victims.

The Boeing 727, a United Airlines flight, had used runway 27R and was just 52 seconds ahead of the Air Pennsylvania flight from Reading, Pennsylvania. The Safety Board said witnesses reported that when the commuter flight was about one-half mile from the runway threshold it rolled from side to side, pitched up, rolled inverted, and crashed nose first.

The Board concluded that the probable cause of the accident "was the loss of aircraft control due to an encounter with

*(continued on next page)*

# Mishap briefs

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the wake turbulence from the preceding aircraft at an altitude too low for recovery and the pilot's failure to follow established separation and flight path selection procedures for wake turbulence avoidance."

The Board report noted that the fixed wings of airplanes cause air turbulence in their wake which takes the shape of two counterrotating vortices. "Studies have shown that in calm wind conditions, wingtip vortices are strongest and most constant behind and below the generating aircraft. Therefore, pilots of small aircraft should fly above the large aircraft's flight path. . . ."

The Board found that Flight 501's path was lower and flatter than the flight path of the 727. The Boeing has a wing span of 108 feet, while the Piper PA-31-350 has a span of under 49 feet.

It is difficult for aircraft with short wing span (relative to the span of the aircraft generating the turbulence) to counter the imposed roll induced by the vortex-shaped airflow, the Board report said. Because of the disparity in size of the aircraft involved, "it is unlikely that the pilot of Flight 501 had the control capability to counteract the aircraft roll," the Board concluded.

Under FAA regulations, air traffic controllers provide VFR aircraft which—in the tower controller's opinion—may be adversely affected by wake turbulence from a large aircraft, the position, altitude and direction of flight of the large aircraft followed by the phrase "Caution—Wake Turbulence." None of the controllers involved in handling the Air Pennsylvania flight felt a cautionary phrase was necessary. The Board's review of the circumstances involved in the accident provided no basis to challenge the controllers' decision.

Pilots are expected to adjust their operations and flight paths as necessary to preclude serious wake encounters, the Board said, adding that "when a pilot accepts a visual clearance or instructions to follow an aircraft, he also accepts separation responsibility."

The flight crew of Flight 501 twice accepted instructions to follow Flight 555 (the Boeing 727) and also accepted a visual approach clearance. Consequently, it was the flight crew's responsibility to provide safe landing interval and wake turbulence separation, the Board said.

The pilots, both of whom were employed by Perkiomen Airways, Limited, were company flight instructors and their syllabus contained information concerning wake turbulence recognition and avoidance. ■

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# Flightfax

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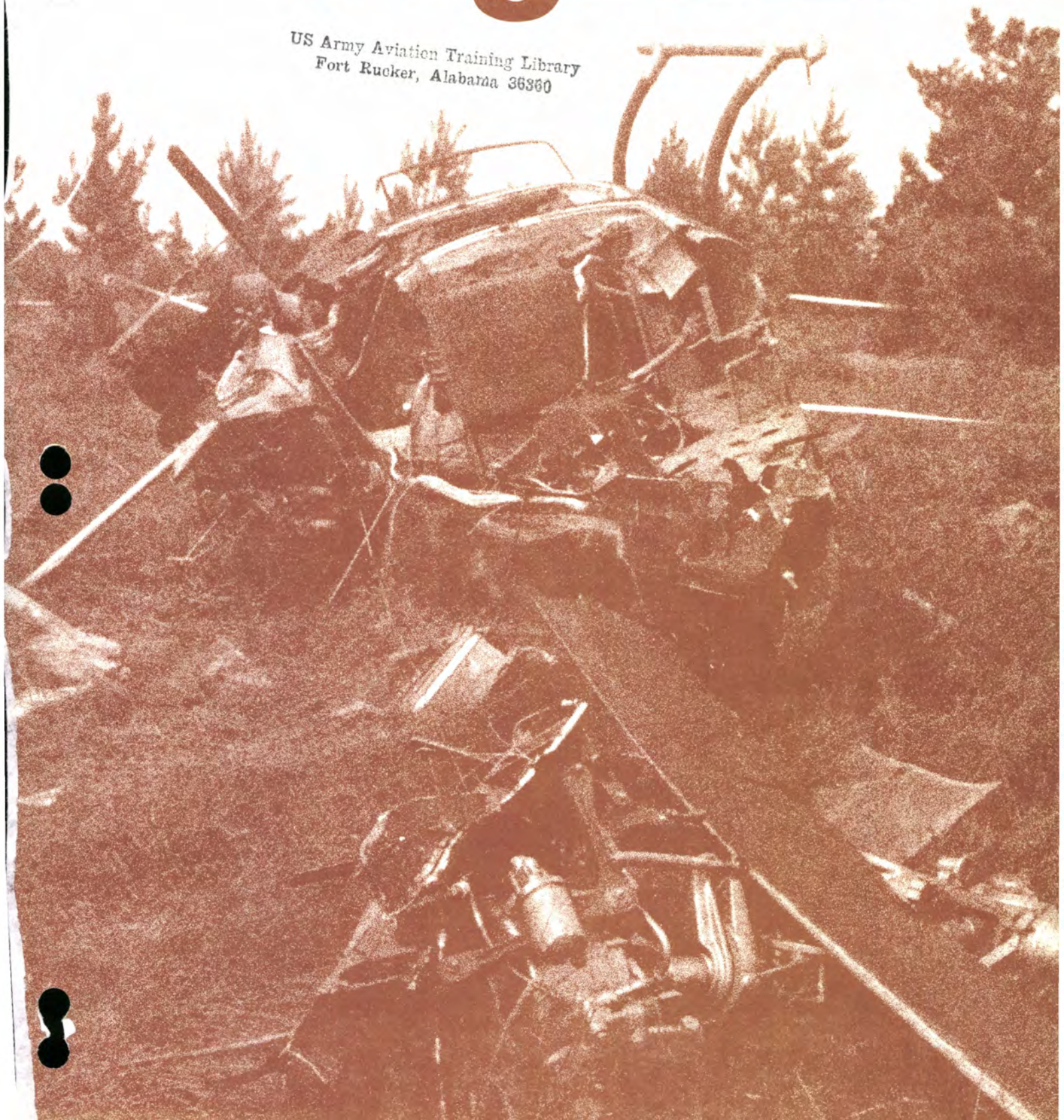


# Mishap review

## Synopsis

While operating at a field location, the pilot of an OH-58A tried to land on a left to right upslope with a right crosswind. After placing the right skid on the ground, the pilot realized the slope was excessive and tried to lift off to a hover. As collective was applied, the helicopter rolled onto its right side and was destroyed.

## History of flight

The crew of the OH-58 was participating in a training exercise. An exercise controller was on board for the first flight of the day. The crew could not establish radio communications with the ground forces they were supporting because of an inoperative FM radio. They landed at field locations to be briefed by ground personnel.

The first flight was uneventful, and the aircraft was landed at a refueling point. The crew refueled and changed FM radios.

A controller was also on board during the second flight of the day. The crew flew 2 hours, supporting the same ground unit. Once again, the radio was inoperative, and the crew had to land at each field location for coordination. Returning to the refueling point, the aircraft was readied for the third flight.

Flight three was a screening mission. En route to the maneuver area, the crew landed to drop off the controller. Arriving in the maneuver area, the crew was again forced to land periodically to brief the supported unit on the situation.

About an hour and 15 minutes into the third flight, the crew needed to coordinate with the executive officer, so the pilot approached the area on a heading of 120 degrees and tried to land. He was unable to land because of an excessive slope and decided to reposition to another area which appeared to be more suitable. The pilot hovered forward about 50 meters and approached the site on a heading of 100 degrees. An attempt at landing was made on a heading of 90 degrees. There was a 6-degree upslope to the right at the intended landing point.

The pilot lowered the collective until the right skid touched the ground. He continued to lower the collective until he reached a point where he decided the slope was excessive. Winds were from 190 degrees at 8 to 10 knots with occasional gusts to about 14 knots. The pilot told the copilot he thought the slope was excessive and he was going to reposition and try another landing. As the pilot increased collective to lift off, he allowed the aircraft to become uncoordinated around the yaw axis. Immediately afterward, a rapid roll to the right developed. The aircraft hit on its right side and was destroyed.

Both crewmembers were unable to exit through the left forward side of the cockpit. Both sustained minor abrasions and contusions.

## Crewmember experience

The 21-year-old pilot had more than 300 rotary wing flight hours, with almost 200 in OH-58As. The 26-year-old copilot had almost 600 rotary wing hours, with more than 150 in OH-58As.

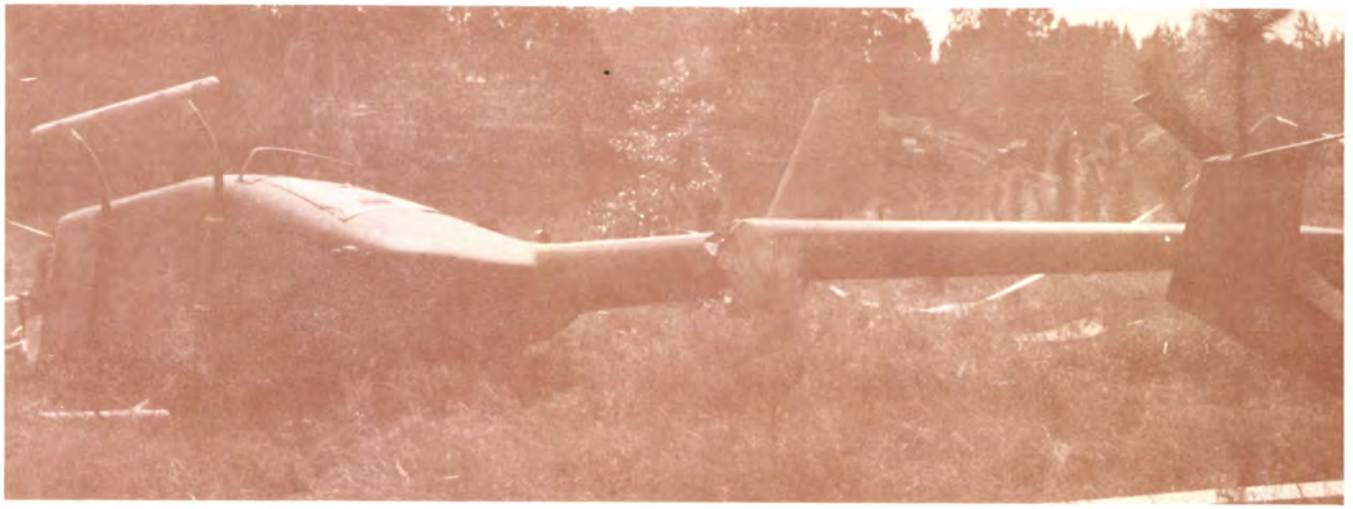
## Commentary

When the roll to the right began to develop, the pilot did not lower the collective to stop the roll. He also did not reduce cyclic input into the slope as collective was increased.

Several factors placed the pilot in a situation in which dynamic rollover could occur. Selection of both the initial and mishap landing sites was questionable because the slope was more than he felt capable of handling. There were several more suitable landing sites available.

The pilot was the youngest officer in the division and a recent flight school graduate. He was in his first operational flight assignment, flying in his first major field exercise. His copilot was his platoon leader. Since he was landing to coordinate with the officer who until recently was his troop commander, he selected a landing location convenient to the platoon leader and the executive officer which was unsuitable for aircraft operations. The pilot did not accurately judge the degree of slope.

The aircraft was marginally suitable to perform an aeroscout mission in support of ground forces because of the inoperative FM radio which forced the pilot to land periodically to coordinate with the support unit. The unit was critically short of qualified avionics personnel. ■



# Shortfax

## Chalk one up for the ELT

The need for emergency locator transmitters (ELTs) has been a controversial topic in both military and general aviation communities during the past few years. Currently, the only Army units authorized to locally purchase and install ELTs in their aircraft are those units in Alaska and Panama. The FAA requires that all civil aircraft (with a few exceptions) have operating ELTs to maintain airworthiness certification.

Arguments against the ELT usually cite the fact that there are a lot of false alarms caused by pilots testing their transmitter at other than the prescribed time (first 5 minutes after each hour) or people inadvertently turning an ELT on and leaving it on. Of course, in the military we hear other arguments such as "it weighs too much," "it costs too much," etc.

Maybe so, but one person is alive today because of an ELT. The person was critically injured in an aircraft crash during a recent joint readiness exercise in Alaska. There were no other survivors. The Flight Coordination Center operated by the 16th ATC Battalion first heard and reported the ELT beeper. Another pilot then heard the ELT and was able to locate the wreckage and guide rescuers to the site.

CW2 Rex L. Prickett, 120th Aviation Company (Assault Helicopter), the pilot who located the crash, is commended for his quick action and professional conduct at the crash site. ■

## MAST pilot placed on hold

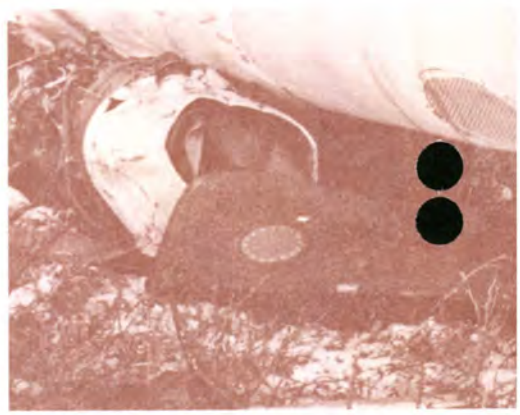
A MAST unit recently sent us an Operational Hazard Report (OHR) about weather briefings. It seems the MAST pilot called an alternate weather service for a briefing before taking off on an emergency mission. The pilot told the weather forecaster that he needed a quick briefing because of the emergency mission. The forecaster was overloaded with weather briefings at the time, gave the MAST pilot a curt reply, and placed him on hold. The pilot quickly called another weather station, received a complete weather briefing, and successfully completed the emergency mission.

Investigation of the OHR revealed the alternate weather station personnel were overloaded because of low ceilings and poor visibility throughout the area. The individual who received the call from the MAST pilot said he placed the pilot on hold before he fully understood the words "emergency mission."

## No fire

Once again, the crashworthy fuel system installed on UH-1 aircraft has proved its reliability. In this instance, it functioned faultlessly following the catastrophic mishap depicted in the accompanying photographs.

Despite the severity of the ground impact which left debris over an area approximately 940 feet long and 600 feet wide, all frangible fittings and breakaway valves functioned perfectly with no evidence of fuel spillage—and no fire. ■



**Extent of damage, including the destruction of cockpit and cabin areas, can readily be seen in this photo.**

As a result of this OHR, an article will be published in the Weather Service Operations Digest reminding forecasters of the MAST program, and weather units providing service to this program will tell their customers to insert the phrase "emergency mission" into their telephonic weather requests.

It is recommended that MAST pilots preface remarks to all sources of weather briefings with the words "This is a MAST emergency mission." ■

**Closeup view shows right fuel cell which tore free from the aircraft without spilling fuel.**

## New pubs available

- Aircrew Training Manual (ATM), TC 1-137, Observation Helicopter, 16 Jan 81.
- Aircrew Training Manual (ATM), TC 1-134, Commander's Guide, 10 Oct 80.
- TM 55-1520-228-23P, AVUM/AVIM Repair Parts and Special Tools List, OH-58A and OH-58C, 22 Dec 80.
- TSARCOM Supply Letter, SL 4-81, subject: Automatic and Directed Returns, Defective CH-47 Rotor Blade ISIS Indicators. ■

## Survival vest zippers available

W01 Danny Jones of the 3d ACR, Fort Bliss, recently tried to requisition a zipper for his SRU-21/P survival vest. He found he could not get the zipper because it had an Acquisition Advice Code of "P" in the Army Master Data File. CDA Pamphlet No. 18, 1 October 1979, indicates that "P" items are stocked only for Military Assistance Program requirements and that bases, posts, camps, or stations will not requisition.

This was brought to the attention of the item manager, who agreed that it was not cost effective to discard a serviceable vest because of an unusable zipper. Therefore, requisitions for zippers (fastener, slide, interlocking, NSN 5325-00-182-9945) will now be filled. Procedures for replacing the zipper are found in TM 55-1680-317-23&P, page 2-18. ■

## Fungus among us

There is a problem with the M24 aircrew protective mask. Small and sometimes not so small black spots appear in the lens and resist all efforts to remove them. They are not fly specks. They are dust particles, bacteria, or fungus.

The face of the M24 mask is made of two pieces of plastic laminated together, and the lamination was apparently not done in a clean room. The dust, fungus, etc., have actually been laminated between two pieces of plastic and cannot be removed.

The next scheduled buy contract will specify a clean room for lamination, but new M24 masks will not be available until 1982. Until then, selectively issue the masks with the least spots to pilots and copilots and issue the masks with the most spots to other aircrewmen.

Point of contact is Ms. Kay Redden, Rock Island, Illinois, AUTOVON 793-3111/3262. ■

# Selected mishap briefs

**uh1** **Class A mishap** □ (H series) No. 2 aircraft in flight of nine was seen to fly into the ground at cruise airspeed. Three fatalities. 8125

**Class C mishap** □ (H series) IP had completed demonstration of 180-degree autorotation. Pilot then tried to do the same. Aircraft touched down nose high and rocked forward. Application of aft cyclic caused main rotor blade to hit drive shaft and cover. Dark sod hindered depth perception. Tower transmission partially blocked out IP's instructions. IP was unable to turn throttle because of pilot's grip.

**Class E mishaps** □ (H series) Crew smelled JP4 fumes in cockpit. Aircraft was landed and shut down. No leaks were found until aircraft was started. Fuel was then seen leaking from fuel valve drain. Caused by failure of fuel relief valve. □ (H series) IP reduced throttle to give pilot simulated engine failure. As pilot felt throttle being rolled off, he rapidly rolled throttle back on, resulting in compressor stall.

**ah1** **Class E mishaps** □ (S series) Master caution and engine oil pressure lights came on during hover. Caused by failure of engine oil pressure switch. □ (TH-1G) $N_1$ dropped to 5 percent during hover. Caused by failure of tachometer generator. □ (TH-1G) Engine oil pressure fluctuated between 15 and 20 psi during flight. Caused by oil leak in bleed band.

**ch47** **Class B mishap** □ (C series) Crew heard noise and felt vibration in airframe during flight. Flight engineer saw smoke coming from No. 2 engine. Copilot secured No. 2 engine and activated extinguisher bottles. Pilot entered autorotation. During autorotation, No. 1 engine fire light came on. Engine was secured. Aircraft touched down in level attitude. No. 1 engine, engine transmission, and combining transmission sustained fire damage. Crew may have misidentified malfunction and engine with which it was associated. 8126

**Class C mishaps** □ (A series) Postflight inspection revealed left aft work platform was open and damaged. Platform came open during flight because of failure of forward latch. Roll pin came out of latch mechanism, allowing latch pin to disengage. □ (C series) During start of No. 1 engine, crew heard noise and felt abnormal vibrations. Start was aborted. Drive shaft support brackets at stations 310, 360, and 410 were damaged. No. 5 drive shaft was also damaged. Caused by ice and water in drive shaft. Aircraft was washed the day before.

**Class E mishaps** □ (A series) Crew chief saw hydraulic fluid leaking from control closet during final approach to confined area. Failure of O-ring caused No. 1 SAS filter to leak. □ (C series) No. 2 engine torque needle increased 76

percent during descent. Caused by failure of precision linear variable resistor. □ (C series) Crew chief saw metal sticking under No. 2 engine drive shaft cowling during postflight inspection. Drive shaft was scored beyond limitations. Metal deicing elbow broke off engine hot air ducting at weld and fell on drive shaft.

**oh58** **Class B mishap** □ (A series) Aircraft was on screening mission. As aircraft slowed during deceleration, it started turning to right. Pilot reduced power and lowered nose in attempt to fly out of spin. Aircraft continued to turn to right. As aircraft neared the ground, pilot rolled off throttle and pulled pitch. Main rotor hit tree and aircraft rolled on left side. 8127

**Class C mishaps** □ (A series) Aircraft lost power at 2,000 feet agl. Pilot landed downslope in soft field. Caused by failure of governor or fuel control. □ (A series) During takeoff from field containing small sagebrush, tail rotor drifted left and hit sagebrush. Pilot was in right seat and could not clear left side. Crew chief was told to clear aircraft straight ahead only.

**Class E mishaps** □ (A series) Tail rotor chip detector light came on. Caused by failure of gearbox assembly. □ (A series) Aircraft was moving down valley at 30 knots and 70 feet above valley floor. Aircraft hit top wire of double set of wires. Wire slid under belly of aircraft and separated on UHF antenna mount. Aircraft was landed without incident. Early morning sun was in the eyes of the pilot flying too low in known vicinity of wires. □ (A series) Master caution and fuel boost pump lights came on during approach. Caused by failure of boost pump. □ (C series) $N_1$ fluctuated during hover. Caused by failure of tachometer generator. □ (C series) $N_2$ dropped to 96 percent during flight. Caused by failure of fuel control.

# Maintenance

**uh1** **Class E mishaps** □ (H series) Aircraft developed moderate to severe one-to-one vertical vibration during takeoff. Crew chief had adjusted trim tabs incorrectly and had not made entry into logbook. Therefore, aircraft had not been test flown. □ (H series) Inspection after flight revealed 90-degree gearbox filler cap was missing and oil was not visible in sight gauge. It could not be determined when the cap came off. Twenty-five-hour inspection, during which cap had been removed, had just been completed. Mechanic making inspection was a temporary hire and had been previously cautioned by technical inspector about placing cap on filler without securing it. Failure of cap itself could not be determined. □ (H series) Master caution and hydraulic lights came on during test flight for engine vibration check. Running landing was made. Tail rotor servo had been replaced, but entry was not made in logbook. Hydraulic fluid trapped in sight gauge did not reflect 2-quart-low condition. Existing fluid was insufficient for hydraulic control in flight.

**ah1** **Class E mishaps** □ (S series) Aircraft had landed and copilot, getting out to coordinate with another crew, found oil on pad. Inspection revealed crimped O-ring on internal transmission oil filter. □ (S series) Master caution and transmission oil bypass lights came on. Caused by incorrectly installed transmission oil bypass switch connector.

*(continued on next page)*

# Mishap briefs

US Army Aviation Training Library
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**ch47** **Class E mishaps** ☐ (C series) Excessive oil was seen flowing from vicinity of No. 2 engine during taxi. Caused by loose line fitting on engine oil pressure transmitter. ☐ (C series) Utility hydraulic pressure gauge decreased to zero, and flight engineer saw fluid spraying from hydraulic cooling fan. Inspection revealed chafed hydraulic tube in cooling fan assembly, causing hole in tube. ☐ (C series) When No. 1 engine was energized for start, crew chief told pilot there was a hydraulic leak from starter motor. Caused by loose hydraulic oil return line quick disconnect fitting. Fitting was incorrectly connected.

**oh6** **Class E mishap** ☐ Engine flamed out during hover. Caused by out-of-rig throttle.

**oh58** **Class E mishaps** ☐ (A series) Aircraft yawed left at 10 feet agl during takeoff from confined area. Pilot applied right pedal and right cyclic to keep from hitting trees. Rpm warning light came on. $N_2$ had dropped to 90 percent. Pilot increased collective to 80 pounds of torque to clear trees. After clearing trees, pilot reduced collective and $N_2$ returned to 109 percent. Aircraft was landed with no damage. Two lines on governor were loose and linear actuator was out of rig. ☐ (A series) IP smelled fuel in cockpit. Caused by loose fuel valve shutoff.

**c12** **Class E mishap** ☐ (A series) Crew saw oil on No. 2 engine cowling during flight. Postflight inspection revealed O-ring was missing from oil scavenge return line. O-ring was apparently not installed during engine rebuild.

**t42** **Class E mishap** ☐ Both loadmeters indicated maximum load after takeoff. Caused by loose battery grounding cable.

## Messages received

- Maintenance notice message on low return rate of unserviceable submerged electric fuel boost pumps (GEN-81-01, 261515Z Feb 81).
- Maintenance notice message on use of AH-1 ground handling wheels (AH-1-81-05, 261400Z Feb 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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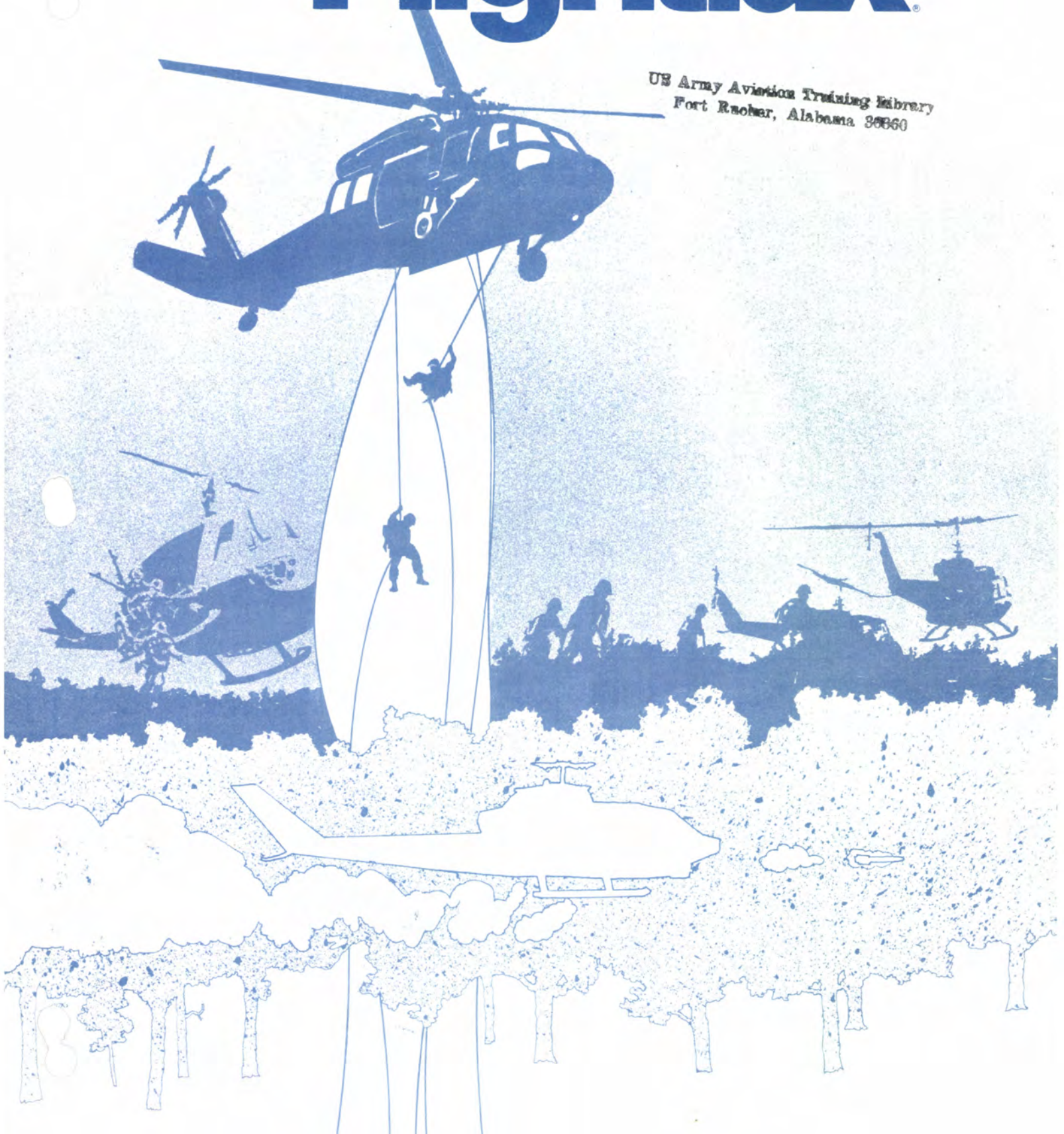


# A realistic approach to realistic training

Sometimes, safety officers are perceived as "bad news" guys who are best suited for surveying hangar safety, checking for FOD, giving safety tips, or conducting required safety meetings. All too often, they are ignored during mission planning because their advice entails things commanders don't want to hear. For instance, commanders don't want to hear a flat statement that they can't do something because it's "unsafe." They need to know how to do it with the least risk. Safety officers who work with commanders this way can be an effective part of the mission planning sequence.

The word safety means different things to different people, but in the end it boils down to **conserving resources.** Resources are conserved by reducing operating risks to the greatest extent possible. Helping the commander do this is the safety officer's real job. He does this best by helping the commander identify risks inherent to a mission and providing recommendations for dealing with those risks. A go-no-go decision for a hazardous mission should be based on a determination of whether or not the mission could reasonably be expected to go under normal circumstances in combat. If so, the unit obviously needs the training and the safety officer can best help by identifying means to deal with the risks.

Good, realistic training is the goal, recognizing that in a training scenario there are certain risks inherent to actual combat that are unacceptable in simulated combat. For example, the risk associated with firing live ammunition at live soldiers during an infantry assault on an aggressor position or real bombs in an air strike on an opposing division command post cannot be logically accepted. Likewise, in Army aviation, a minimal degree of realism is sacrificed by spending an extra 3 or 4 seconds in a pickup zone to get passengers strapped in. The extra time has no effect on aviation crew proficiency or on the passengers' training, and the risk of a possible, though unlikely, forced landing injuring or killing an unrestrained passenger is unacceptable. There are other examples of training realism that must be sacrificed because of unacceptable risks, but, generally speaking, good realistic training missions should be oriented to conditions that will exist in combat. Aircrews must become proficient in all the things they will be expected to do in the combat environment and they must be trained to this end at every opportunity.

Not only should combat training be as realistic as possible, but it must be relevant to the threat. As safety officers, you must not limit your concern to human, environmental, and materiel factors that cause mishaps, but you must be vitally concerned with the threat. The threat often dictates those risks that must be accepted to perform the mission. Terrain flight is a good example of accepting certain risks to reduce the risk caused by the threat. Terrain flight risks are accepted because we know they are minimal compared to flight at higher altitude against threat air defenses.

Knowing that terrain flight must be used to survive, safety officers must try to reduce the inherent risks. How? Well, one way is to fly slower as aircraft get closer to the ground. This gives enough time to react to unforeseen obstacles. Another way is to carefully plan each flight—to know, or at least suspect, where the obstacles (wires, tower, etc.) are. There are obviously other ways to reduce terrain flight risks, but the point is we can't quit flying low just because it's more hazardous.

There's a lot of terrain flight training being conducted, but there's also a lot of aviators who haven't become proficient at it even though they can navigate and avoid detection. The Army is currently averaging about two tree strikes a week and one wire strike every 15 days. Proficient aviators don't hit trees and wires.

Airspace management is another area that receives a lot of "lip service" by aviation units and too little emphasis. This is probably because we don't use live ammunition, so airspace problems during "realistic" training are minimal. Joint readiness exercises allow some opportunity to brush up on airspace management procedures, although this usually involves only the joint use of airspace by aircraft of the different services, without including air defense, field artillery, naval gunfire, etc. Even on these type exercises units are heard to say they can't use the flight following and advisory service provided by ATC units because "it's too complicated" or "we don't have the time" or "it interferes with our mission" or (probably most common) " there's too much chatter on the radio." Excuses such as these don't help make the system work.

If anyone has a better system for managing airspace, he needs to make it known. Until we get something better we have to learn to work with what we have so that when we get in actual combat we don't lose resources to our own gunfire or to midair collisions with fast movers.

It is not unusual for commanders to become so involved in the tactical scenario that they forget the purpose of realistic training is to produce combat-ready crews and equipment. For instance, many commanders, especially ground commanders, don't understand the requirement for crew rest, so they disregard it in the field. Not only are duty day and flying hour restrictions thrown out the window, but efforts are made to make the aviators' living conditions as uncomfortable as possible. All this is supposedly "realistic" training. It's a fact that fatigued crews damage aircraft. They did it in Vietnam when our flying was generally less complicated because we didn't fly NOE and we had less complicated equipment. They are still doing it today.

As long as we are talking about problems emanating from an overzealous quest for realism, let's look at training in marginal weather conditions. There's a point in marginal weather flying where training value ceases and crew proficiency essentially turns into crew luck. Someone has determined this point is a condition of one-half mile visibility, so this is written into the regulation (AR 95-1). However, you know that in the absence of current weather observations or known distance markers, estimating distance, particularly under conditions of poor visibility, is essentially a matter of pilot judgment.

Should we urge pilots to fly in conditions of questionable visibility? Maybe in a combat emergency, but what do we gain in training? In utility and cargo helicopters we are jeopardizing the aircraft and everyone on board. With visibility so low, attack helicopters would probably be too close to their targets to survive and pilots of observation helicopters must be able to see to perform their mission. Marginal VMC is a limitation ground units need to understand and know how to cope with, or plan around. If we press it beyond the limits, we must be prepared to lose assets to the real or simulated battle. In this instance we are not conserving resources.

Realistic training in the 1980s will be safe training because safety is an integral part of all professional operations. We can't throw safety out the window when we get into combat. We should have learned that lesson in Vietnam. ■

# Selected mishap briefs

**uh1** **Class C mishap** ☐ (H series) Copilot, who was flying the aircraft, lost reference with the ground. Aircraft developed high rate of descent. PIC took control but could not stop rate of descent. Aircraft hit the ground hard and bounced. Skids were damaged.

**Class E mishaps** ☐ (V series) Rotor rpm increased to 343 during rollout of autorotation with turn. Aircraft rolled out low and IP was watching altitude. Pilot lowered collective and flared. ☐ (H series) Crew smelled fumes in cockpit. Caused by leaking fuel filter at quick disconnect. ☐ (H series) $N_2$ rpm dropped to 5900 during takeoff. Caused by failure of fuel control. ☐ (H series) Engine tachometer jumped to 6800 rpm, 200 rpm above rotor tachometer. Caused by dual tachometer failure. ☐ (H series) Master caution and hydraulic lights came on, and hydraulics failed. Caused by failure of O-ring on irreversible valve.

**uh60** **Class C mishaps** ☐ As aircraft cleared trees during takeoff from confined area, another UH-60 was seen converging from left. Copilot turned sharply right to avoid collision. Pilot leveled aircraft and landed to check for possible tree strike. Main rotor tip cap was damaged. ☐ Aircraft was slingloading M274 from pickup zone. Load fell from aircraft and was damaged extensively.

**Class E mishap** ☐ Slingload swung up and hit aircraft during pickup. Rigging personnel used two 9-foot slings on front of rigged mule and a 12-foot sling on rear of mule. To make sure 12-foot sling equaled 9-foot slings, riggers knotted 12-foot sling to make it 9 feet. When load was lifted, 12-foot sling came loose.

**ah1** **Class C mishaps** ☐ (S series) While participating in tactical gunnery exercise, crew heard noise and suspected blade strike. Postlanding inspection revealed damage to both main rotor blades. ☐ (S series) Aircraft was in right turn on leeward side of hill. Airspeed was 70 knots. Aircraft began to settle, pilot increased collective to stop descent, and overtorque occurred.

**Class E mishaps** ☐ (G series) Master caution and forward fuel boost lights came on during landing. Caused by failure of forward fuel boost pressure switch. ☐ (G series) Master caution and No. 2 hydraulic lights came on during hover. Flexible line from hydraulic pump to module contained pin hole. ☐ (S series) Loud noise was heard from nose of aircraft during flight. Postlanding inspection revealed turret weight and retaining pins had fallen out during flight. Pins were checked for proper installation during preflight. ☐ (S series) Engine oil pressure light came on during hover and engine oil pressure was zero. Caused by failure of engine oil pump drive shaft.

**ch47** **Class E mishaps** ☐ (B series) No. 2 engine temperature went to 880 degrees during runup. Caused by failure of fuel control. ☐ (C series) After APU was started, crew chief saw hydraulic oil leaking from fitting on No. 1 engine starter motor. Fitting was cracked.

**oh58** **Class C mishap** ☐ (A series) While pilot was looking at map, aircraft drifted into tree limbs during high hover, damaging both main and tail rotor blades. Light drizzle on windshield may have been a contributing factor.

**Class E mishaps** ☐ (A series) Master caution and fuel boost lights came on. Caused by failure of fuel boost pump. ☐ (A series) Aircraft yawed during hover. Caused by failure of governor. ☐ (C series) Transmission oil pressure light came on during runup. Caused by failure of pressure switch.

**th55** **Class C mishaps** ☐ Student pilot on first supervised solo flight picked helicopter up to 3-foot hover. Helicopter settled back to runway. SP applied more power. As aircraft climbed to 5 feet, it began to oscillate. SP added more power and engaged antioverspeed device. Aircraft began to spin to right and, at about 30 to 40 feet, started to settle back to runway. Antioverspeed device was again activated with low rpm and high rotor pitch. Aircraft settled to runway and came to rest upright, with damage to landing gear, landing light, rotating beacon, and frame. ☐ SP was flying aircraft. During practice autorotation, aircraft touched down slightly right of center line and began to slide toward right edge of lane. IP elected to pick up to hover rather than slide onto sod. Aircraft lifted off lane without enough rotor rpm to sustain flight, yawed right, and settled to ground. Main rotor blade hit ground and aircraft came to rest on right side.

**c12** **Class E mishap** ☐ (A series) Smoke and fumes entered cockpit during descent. Caused by failure of brush on forward vent blower. Filter was charred.

**ov1** **Class E mishap** ☐ (C series) No. 2 hydraulic pressure indicated zero. Landing was made without incident. Caused by failure of No. 2 engine hydraulic pump.

**t42** **Class E mishaps** ☐ High frequency vibration occurred during acceleration to 160 knots. Vibrations stopped when speed was reduced. Caused by excessively worn elevator bushing. ☐ Maximum fuel pressure at takeoff was 6 psi, and crew smelled fuel fumes. Caused by failure of No. 1 engine fuel pump.

**u8** **Class E mishaps** ☐ (F series) No. 2 engine failed during climbout. Caused by failure of accessory drive section. ☐ (F series) Left engine chip detector light came on and engine ran rough. Caused by failure of No. 6 cylinder.

# Maintenance

**uh1** **Class E mishap** ☐ (H series) HIT check before takeoff indicated plus 17 above baseline. Previous HIT check had ranged from plus 8 to plus 18. Three or four loud explosions were heard from engine compartment after takeoff. Aircraft yawed left and engine rpm dropped, oscillating plus or minus 200 rpm. Rotor rpm appeared to follow engine rpm. Power was reduced and all systems appeared to stabilize. No additional power was applied. Left turn was initiated and approach was made in "autorotation envelope" in case engine might quit before touchdown. Landing was made without incident. Caused by out-of-adjustment variable inlet guide vane. **Well done to MAJ D.E. Baxley for a well written PRAM and to the maintenance technicians for diagnosing the problem.**

**ah1** **Class E mishaps** ☐ (G series) Oil pressure gauge fluctuated and caution light came on. Caused by loose gravity feed line quick disconnect. ☐ (S series) Master caution and fuel boost pump lights came on. Inspection revealed fuel boost pump pressure switch was damaged during installation. Casings were cracked and probes bent, causing internal short.

*(continued on next page)*

# Mishap briefs

**oh58** **Class E mishap** □ (A series) Low rpm warning system activated during climb, and $N_2$ decreased to 90 percent. Aircraft was autorotated to open field. Fuel control to governor air tubes had been disconnected and incorrectly reinstalled. Loose connection caused power loss.

**u21** **Class E mishaps** □ (A series) When aircraft was leveled off at 9,000 feet, fuel began to siphon from right engine nacelle filler cap. Pilot reduced airspeed to 120 knots and siphoning stopped. Aircraft previously had a maintenance writeup that filler cap was too tight. Corrective action was to loosen retaining nut on cap. Correction did not allow for a sufficiently tight seal, allowing siphoning. □ (RU-21H) Heater failed during flight and pilot aborted mission. Temperature was -32° C. Ram air intake door was not adjusted correctly and stuck closed, causing heater to overtemp and shut down.

## Messages received

• Safety-of-flight message on one-time inspection of T53-L-703 engine, AH-1 aircraft (AH-1-81-06, 060030Z Mar 81). Summary: A T53-L-703 engine recently failed in a test cell at Avco-Lycoming. The cause of failure was found to be manufacturing defects in a gear in the accessory gearbox. The defect is such that during operation the gear transmits abnormal stresses to a smaller mating gear. The smaller gear failed from accumulated fatigue damage. These gears transmit $N_2$ signals to the governor and fuel control. When this gear failure occurs the fuel control receives signals that the $N_2$ is drooping. The fuel control responds by increasing fuel flow. The $N_1$ and $N_2$ will then increase until overspeed or overtorque causes a complete failure. All gears manufactured at the same time as the known defective gears are suspect. The suspect gears have been traced to specific engine serial numbers. All such engines are considered unserviceable at this time. Such engines should be held until the gears can be proven good or until they can be replaced. Contact: R. Lawyer, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

• Safety-of-flight maintenance notice message on UH-1B/D/H/V and EH-1H center frame assembly (UH-1-81-02, 022100Z Mar 81). Retirement life of center frame assembly is changed from 2,400 hours to 3,600 hours.

• Maintenance notice advising maintenance personnel of CH-47C overhaul and retirement schedule changes (CH-47-81-07, 022010Z Mar 81).

• Maintenance notice on low return rate of unserviceable submerged electric fuel boost pumps (GEN-81-01, 261515Z Feb 81). Electric fuel boost pumps used on UH-1 aircraft have an inadequate return rate to depot for overhaul. All units should return unserviceable pumps to depot upon removal. Depot will make the ultimate determination of reparability of each unit returned. OH-58 aircraft submerged electric fuel boost pumps, NSN 2915-00-131-6467 and NSN 2915-00-177-6922, are currently coded nonreparable. These units are now considered reparable. Action is being taken to change parts manuals to indicate these units are reparable. Units should be returned to depot upon removal from aircraft.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Urgent change

Change 14 to TM 55-1520-214-23, Aviation Unit and Intermediate Maintenance Manual for OH-6A has been distributed. Change 14 was distributed before Change 13 because of priority. ■

## Tighten up

It's time to remind you again that you've been leaving your fuel and oil caps loose, and you've been lucky. Since 1 October 1980, eight cases of aircraft leaking fuel and oil in flight have been reported. None have resulted in disaster. Tighten up before one does. ■

## Interpretation of AR 385-40

Paragraph 1-8b(1) of AR 385-40, dated 1 September 1980, states that the president and other members of an investigation board will be appointed from organizations other than the one having the accident. The Safety Center's interpretation of this is that the flight surgeon (medical officer) is excluded from this restriction. The flight surgeon assigned to the unit having the accident may serve on the investigation board. ■

# Stacom

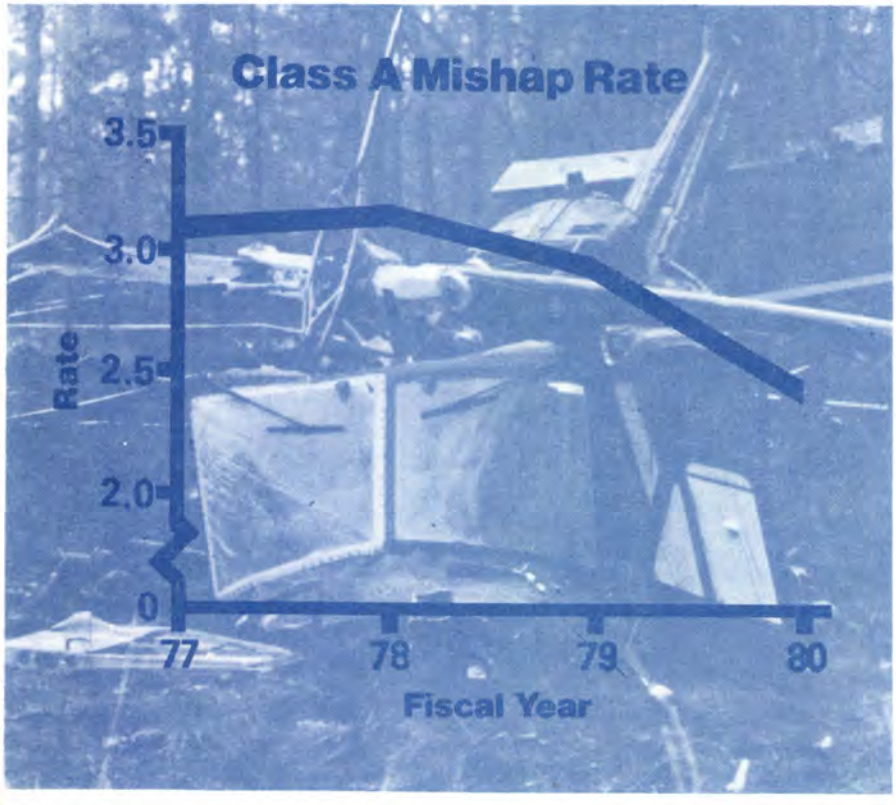
## FY 80—a very good year

There were 37 Army aircraft Class A mishaps and 26 fatalities in FY 80. The Class A mishap rate was 2.41 per 100,000 flying hours—the lowest in the history of Army aviation. The following chart displays the mishap rates for FY 77 to the present, with FY 80 showing dramatic improvement over previous years.

The performance of the Army's instructor pilots during FY 1980 has been laudable. They were involved in only two Class A mishaps—5.4 percent of the total. There were no fatalities involving instructor pilot error (IPE). This appears to be a marked improvement over FY 79, when IPs were involved in 18 major accidents—24 percent of all major accidents—and two fatalities. In that year, there were nine improperly executed autorotations and three decelerations that went awry. There were **no** autorotative or decelerative Class A mishaps in FY 80.

The Army's younger and less experienced aviators were definite factors in FY 80's aviation mishap record. There were 18 Class A mishaps involving aviators with less than 1,000 flying hours. They averaged 491.8 flight hours and 25.9 years of age. The Army-wide average for all aviators involved in Class A mishaps was 1,870 hours and 30.67 years of age.

Terrain flight training is a necessary part of Army aviation's doctrinaire approach to survival in battle. Pilot performance in this environment continues to be an area of concern in the mishap prevention program. FY 79 produced four wire strikes, two tree strikes, and five fatalities. FY 80 produced three wire strikes, three tree strikes, one collision with a jeep, and four fatalities. Poor air discipline was a factor in some of these mishaps.




Flight into IMC also continues to be an area of concern. During FY 79, IMC was a factor in three mishaps with three fatalities. During FY 80, flight into IMC resulted in three mishaps and five fatalities.

It is recommended that commanders, ASOs, and IPs:

- Monitor and assist the less experienced aviators in their development toward excellence and professionalism.
- Continue to emphasize the importance of premission and performance planning when undertaking terrain flight training. They should continue to emphatically discourage indiscriminate, high-speed, low-level flight.
- Take positive action to eliminate IMC-related mishaps. Such action should include emphasis on training, crew selection, and definitive SOPs covering operations in marginal weather.
- Continue to emphasize the four conditions at 100 feet agl which are necessary for a standardized autorotation. ■

*(continued on next page)*

# Stacom

## UH-1 weight and balance

DES assistance visits have revealed a lack of understanding of weight and balance procedures by UH-1 operators. The major error occurs in computing the moment of fuel expended in reference 17 of DD Form 365F.

Because of the asymmetrical layout of the fuel tanks within the UH-1, finding the moment of fuel expended by determining the moment corresponding to its weight will produce an error that could place the aircraft beyond its c.g. limits.

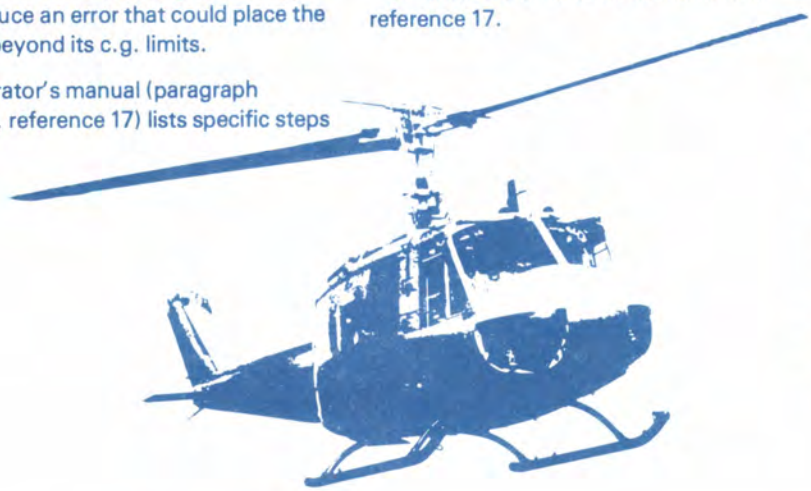
The operator's manual (paragraph 6-7b(20), reference 17) lists specific steps for the correct procedures in completing reference 17. These steps are:

- Estimate and enter weight of fuel which will be expended before landing in reference 17.

a. Determine moment for estimated fuel on board at landing.

b. Subtract this amount from moment established for takeoff fuel in reference 9.

c. Enter the difference as moment in reference 17.



**Example:** Given takeoff fuel - 1300 lbs.
Moment - 1960/100
Estimated fuel expended - 824 lbs.

To compute data for reference 17:

| | |
|---|---|
| 1300 | - Takeoff fuel weight |
| - 824 | - Estimated fuel expended (entered in reference 17) |
| 476 | - Landing fuel, moment 600/100 |

| | |
|---|---|
| 1960 | - Takeoff fuel moment |
| - 600 | - Landing fuel moment |
| 1360 | - Entered in reference 17 as moment of fuel expended |

If the moment of fuel expended had been determined by noting the moment corresponding to its weight, the figure "1160" would have been entered in reference 17—a sizable error. ■

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

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**Professional performance and PICs**
**page 2**

# So you're a PIC!

By designating you pilot-in-command, your commander, or his authorized representative, has deemed you to be knowledgeable and proficient in the operation of a specific type of aircraft, and capable of shouldering the responsibilities associated with any mission he may assign you. In effect, he is expressing his confidence in your abilities and placing his trust in you.

Unfortunately, PICs sometimes unwittingly betray that trust. The reasons for such betrayal are as varied as they are numerous. And the fault does not lie **only** with the PIC. Often it must be shared with his commander or some other superior.

Consider, for example, the PIC of a UH-1 participating in terrain flight. At an altitude of about 100 feet agl, the copilot, who was at the controls, made a steep right turn of approximately 75 degrees.

The aircraft rapidly lost altitude and struck some trees that were 75 to 85 feet tall. The crew then made a precautionary landing in a nearby clearing and shut down the aircraft.

Investigation revealed that the copilot had placed the aircraft in an excessively steep turn at a low altitude, causing the aircraft to settle rapidly and strike the trees. Additionally, his making a right turn at low altitude from the left seat position probably contributed to his misjudgment of the amount of bank he should have applied in the turn.

It was also determined that certain standards and procedures outlined in the ATM, FM 1-1, and the unit SOP were not being followed. For example, although the crew had two area maps available, they had not plotted the actual route of flight on either. So they were not following a preplanned route with all obstacle hazards identified.

Further, crew coordination as outlined in the unit SOP was not being followed. The two pilots were not communicating with each other as to obstacles and other terrain hazards. This was evidenced when the copilot made a steep right turn while flying the aircraft from the left seat. First of all, he was not told to make the turn by

the PIC who was functioning as the navigator; and second, he did not request that the navigator, seated in the right seat, clear him for the turn.

In reviewing this mishap, you might wonder why the PIC failed to take any positive action during the flight—why he failed to be in charge. Could it be that the PIC took no corrective measures nor attempted to caution the copilot as to his handling of the aircraft because the copilot happened to be his platoon leader and the air mission commander?

In another instance, the PIC of a UH-1 may have been the victim of peer pressure when he attempted a maneuver that ended in tragedy. The aircraft involved in this mishap was one of four returning from a mission over rugged, mountainous terrain. The first leg of their return flight was completed. However, while the aircraft were on the ground, weather conditions deteriorated to an extent that instrument takeoffs would have to be made if flight was to be resumed without delay.

Although the pilot of the ill-fated aircraft met the qualifications necessary to be designated a PIC, he was relatively inexperienced as compared with other PICs in his unit. Further, instrument takeoffs had been his chief weakness during flight training. Yet, while reluctant to try the instrument takeoff over mountainous terrain, he didn't want to delay the flight.

At this point, no decision had been made as to whether the flight should be continued or cancelled. The AMC, who was also the PIC of one of the four aircraft, had the option of postponing the flight or replacing the relatively inexperienced PIC with another. However, either decision would cause a delay. So he consulted with the PIC of one of the remaining aircraft. This individual was highly experienced and the senior IP in the unit. After studying the situation and discussing takeoff procedures with the inexperienced PIC, he expressed assurance that an instrument takeoff would pose no problem.

As a result, the inexperienced PIC waived his prerogative to stay on the ground and chose to attempt the takeoff. In the process, his aircraft lost altitude and hit a large tree located on a lower ridge. Both pilots were killed and the aircraft destroyed.

In both of the above examples, "pressure" appears to have played a prominent role in the decisions made by the PICs involved. In the first instance, the PIC chose to take no action; in the second, the PIC chose the wrong action. But "pressure" is not a prerequisite for making wrong decisions. The desire to take part in a particular mission, coupled with overconfidence, can similarly produce a lethal combination.

A pilot may be highly experienced and confident in himself. Yet, the selection of a qualified but less experienced pilot as PIC may sometimes be a better choice for a particular mission assignment. In one such case the pilot selected for a combined reconnaissance and training mission over mountainous terrain was a highly experienced UH-1 IP. Because of his past performance, he was held in high regard by his commander. In addition, he had confidence in his own abilities. The choice appeared to be a logical and good one.

With a copilot, crew chief, and five passengers on board, the PIC flew the UH-1 to the assigned landing area where he tried to terminate his approach to a hover at about 15 feet agl. However, the pressure altitude was more than 8,500 feet. During the hover attempt, the aircraft began to rotate about the mast to the right. This rotation continued even after full left pedal was applied. As rpm started to bleed off, the PIC tried to follow the turn with cyclic and fly the aircraft downhill. Unfortunately, two large trees stood in his flight path. To avoid them, he lowered collective and tried to land the aircraft on the uneven terrain below. The aircraft hit the ground, rolled to the right, and came to rest almost inverted. All occupants, however, were able to exit without difficulty.

*(continued on next page)*

# PIC

Investigation revealed that under the existing conditions of aircraft gross weight, OAT, and pressure altitude, the aircraft was not capable of hovering out of ground effect. The power required for the aircraft to hover under the prevailing conditions was determined to be 44 psi indicated torque. Yet, the maximum power available was only 39.5 psi.

In effect, the PIC failed to adequately plan his flight. He did not determine the power required to hover in the landing area, and he failed to adequately consider aircraft performance in establishing standard loads. The reason he failed to properly plan was deemed to be the result of overconfidence in himself and his equipment. Although he was a highly experienced IP, he had participated in only 2 hours of mountain flying during the preceding 2-year period.

But even when a pilot is fully qualified and current for the mission he is to fly, overconfidence alone can precipitate a mishap. And it doesn't matter whether the pilot is overconfident in himself or in his equipment.

For example, an aviation section operations officer assigned himself to fly a UH-1 on a training flight. Actually, the aircraft selected was about 1 ½ hours away from a scheduled inspection, and the operations officer wanted to get the inspection completed so the aircraft would be available for a forthcoming mission.

With a crew chief aboard, the pilot flew the aircraft at terrain flight altitudes. While flying over a lake, the aircraft hit wires about 40 to 50 feet above the surface and crashed into water that was 12 to 15 feet deep. The crew chief managed to escape but the pilot was killed.

It was determined that the pilot performed a course of action prohibited by his unit SOP and FAR 91.79 when he flew his aircraft at terrain flight altitudes off post in a manner that endangered the lives and property of people on the ground. Further, the pilot had proceeded at terrain flight altitudes without appropriate preflight planning, route map reconnaissance, hazards identification, or required crew complement. In violation of his unit SOP, he had performed flight without a copilot aboard, and had failed to indicate on his flight plan the area in which training was to take place. It is also significant to note that the pilot had been previously reprimanded for violating the policy of flying without a copilot.

After all the evidence was examined, it was concluded that the pilot's actions resulted from overconfidence in his abilities.

In another example, the PIC of a UH-1 made an approach to a tactical landing site in mountainous terrain. Six occupants were aboard the aircraft which was on a resupply mission. While on final approach at about 25 feet agl, the aircraft began descending at an excessive rate and the PIC initiated a go-around. As he applied power and entered a right turn, the aircraft hit several trees, causing the 90-degree gearbox and tail boom to separate from the aircraft. The main rotor blades then hit the ground and the main rotor separated from the aircraft. The aircraft then crashed and rolled inverted. The crew and passengers exited the aircraft shortly before a postcrash fire destroyed it. Four occupants sustained minimal injuries and two sustained minor injuries.

The PIC inadequately performed preflight planning. Although the aircraft was loaded to maximum capacity, the PIC did not compute weight and balance as required by both AR 95-16 and AR 95-1. The PIC also failed to compute power

requirements in accordance with the performance charts in the operators manual. As a result, the aircraft was overgross and exceeded the center-of-gravity limitations. When the aircraft began to fall through on approach to a confined area at approximately 20 knots and 150 feet agl, the pilot turned downwind (with winds at 12 knots gusting to 20 knots) towards climbing terrain in a go-around attempt.

Although the aircraft was not climbing because of the downwind turn combined with the overgross and out-of-c.g. conditions, the PIC maintained 40 psi of torque when 50 psi was available. As a result, the aircraft hit trees, then the ground, after which it caught fire and was destroyed.

Inadequate pilot judgment and overconfidence in equipment were prime factors in causing this mishap.

It becomes apparent that overconfidence, whether in one's self or in one's equipment, can prove to be a definite threat to safety. Even when below the conscious level, overconfidence can induce the most experienced pilot to disregard regulations, inadequately plan flights, and fail to follow proper procedures.

**Lack of communication between pilot and copilot resulted in this mishap that destroyed a properly functioning aircraft.**

Recently, a perfectly "healthy" aircraft was destroyed simply because the PIC neglected to coordinate with his crew as to their specific responsibilities during flight. Even though no real emergency arose, a lack of communication between the PIC and his copilot resulted in antics that are reminiscent of the "Keystone Cops" or some other more modern specialists in situation comedy. Unfortunately, there is no humor to be found in the destruction of a $618,000 aircraft even though the occupants managed to escape virtually unscathed. It happened like this:

The PIC of a UH-1 was assigned a service mission to fly to an airfield, pick up five passengers, and return. After all preliminaries had been completed, the PIC embarked on the mission with copilot and crew chief on board.

The flight to the airfield was uneventful. Following refueling, passengers and crew boarded the aircraft for the return flight. After climbing to an altitude of approximately 4,000 feet msl, the PIC chose to cruise with the $N_2$ set at about 6400 rpm to allegedly conserve fuel. Why he felt this action necessary is not clear. The aircraft had just been refueled and the mission required flight of less than 1 hour to complete. Nevertheless, this was the PIC's decision—a decision that would later spark events which, in turn, would lead to the mishap.

As the aircraft neared the airfield, a layer of clouds hid the ground below. When the aircraft was about 10 miles from the airfield the PIC initiated a GCA and the aircraft entered the layer of clouds at about 1,800 feet msl.

At about 900 feet msl—while still in the clouds—the crew got an audio/visual indication of low engine and rotor rpm. A check of the instruments showed $N_2$ had decreased to 6000 rpm and rotor rpm was down to 300 (needles joined). Promptly, the PIC began to remedy what he thought was a simple beeped down $N_2$ condition. With the throttle in the full on position, he lowered collective.

Meanwhile, the copilot misinterpreted the indication as a low side governor failure. Without telling the PIC, he switched the governor to the emergency position. This produced a severe overspeed that demanded immediate remedial action.

The PIC responded by adding collective and rolling off throttle in an attempt to compensate for the overspeed. However, while these events were taking place, the copilot reconsidered his decision to position the governor switch to

*(continued on next page)*

emergency and decided that maybe he should not have done that. So he returned it to the auto position—again without telling the PIC.

In the resulting confusion, engine and rotor rpm decreased, finally stabilizing at 6000 and 300 rpm respectively. The PIC lowered the collective and began a turn to a forced landing area. Approximately 20 to 30 feet agl, he decelerated but did not apply power until ground contact was made. The aircraft then bounced into the air, struck the ground a second time, bounced in the air again, and finally settled to the ground in an upright position. All occupants escaped with minimal injuries, but the aircraft was destroyed. And all the while, the aircraft was healthy and responding to all control inputs exactly as it was supposed to.

Even from the few mishap briefs related, you can see that the human element plays a predominant role in most mishaps. Unfortunately, the human element is the most difficult one to control. We can beef up a piece of structure we find to be weak, but we cannot make decisions for another or regulate his actions. If a pilot is bent on breaking the "rules," there is little we can do to prevent him from violating ARs and SOPs. At best, we can only reprimand him or resort to more strenuous punitive measures as the situation may demand. But even these actions can only be taken after the fact. So any effective solution to this problem requires the cooperation and active participation of both commanders and PICs.

First and foremost, the pilot must never forget the responsibilities he assumes when he is designated PIC. Not only is his own safety affected but also that of any other occupants who may be aboard his aircraft. And depending on the nature of his mission, additional lives may be at stake if the flight cannot be successfully completed.

Obviously, the need for professionalism is not merely desirable but mandatory. The PIC must be thorough in the performance of all his duties. These responsibilities include flight planning, preflighting the aircraft, performing engine operational and cockpit checks, and briefing crewmembers as well as any passengers. And it goes without saying that ARs and SOPs must be obeyed.

Finally, there are those questions only the PIC can accurately answer. These concern his physical and emotional well being. Is he in good health? Rested? And what about his capabilities? Sure, he has met the qualifications required of a PIC. But what about the specific mission he is to fly? Is he current and proficient in all areas of flight operations associated with the mission? In the final analysis, the PIC must be willing to exercise his prerogative not to embark on a flight he feels will exceed his capabilities.

Similarly, the unit commander must be careful to exercise his best judgment when appointing PICs. Failure to do so can relegate Army aviation to the Vietnam era when the designation "aircraft commander" was in vogue. This title somehow carried with it the assumption that the individual on whom it was bestowed was fully qualified and capable of performing all tasks and operations associated with any mission he might be assigned to fly in a particular type of aircraft. All too often, ACs embarked on missions that demanded performance beyond their abilities. And all too often, the results were catastrophic. The following excerpt taken from a recent mishap report sums it up best:

"AR 95-1 states the commander will designate a pilot-in-command before each flight or series of flights. Blanket pilot-in-command designation, by type aircraft, conveys an expression of confidence by the commander that the individual is fully qualified and capable of performing any mission with any crew configuration in the specified aircraft. This conveyance of confidence could have the psychological effect of motivating aviators to unknowingly exceed the limits of their ability. Blanket designations also have a tendency to downgrade the supervisor's role and negate the emphasis that should be placed on the selection of pilots-in-command. Such selection should only be made after an analysis of the nature of the particular mission, its difficulty and complexity, has ascertained the experience level requirements the crew must meet." ■

# Selected mishap briefs

**uh1** **Class C mishaps** □ (H series) On departure from pickup zone, decision was made to abort mission because of deteriorating weather. Flight of four returned to pickup zone. Lead aircraft landed hard, damaging skids, cross tubes, and skin. □ (H series) Postflight inspection after early morning mission revealed damage to one main rotor blade. Crew determined that blade strike occurred during previous night flight.

**Class E mishaps** □ (H series) Master caution and fuel boost pump lights came on during hover. Caused by failure of boost pump. □ (H series) Compressor stalls occurred during flight. Torque went to zero and all engine gauges began dropping. Caused by failure of fuel control.

**ah1** **Class C mishaps** □ (S series) Tail rotor blades hit tree branch while aircraft was at a 15-foot hover. Both blades were damaged. □ (S series) Postflight inspection after NOE flight revealed damage to underside of one main rotor blade. □ (G series) Crew heard loud bang, airframe shuddered, and shock was felt in controls. Postflight investigation revealed main rotor blade had been hit by mortar round which was fired into an unauthorized area without clearance from range control.

**Class E mishaps** □ (S series) Engine oil pressure fluctuated from 30 to 80 psi during hover. Caused by failure of oil pressure gauge. □ (TH-1G) Cyclic feedback occurred during landing. Caused by failure of servo cylinder.

**ch47** **Class C mishap** □ (C series) During engine runup, crew chief heard sounds from No. 2 engine that he associated with bleed band popping. $N_1$ decreased below 50 percent and egt increased to 740° C. before pilot could shut down engine. Inspection of No. 2 engine inlet revealed FOD to first and second stages of compressor blades. Source of the foreign object could not be identified. Low ambient temperature dictated operation of engines without inlet screens installed. Police of debris on airfield ramp, taxiways, and runway was marginal because of presence of mud and small stones left by unrestricted wheeled vehicle operations.

**Class E mishaps** □ (B series) Airspeed indicator went to 150 knots during hover. Caused by malfunction of pitot tube. □ (B series) Feedback in cyclic during landing was caused by failure of servo cylinder.

**oh58** **Class C mishap** □ (C series) Aircraft was at 20 knots during NOE flight. Bank to left was too steep for altitude, and main rotor blades hit top of sand dune, damaging tip caps. Sudden stoppage inspection revealed damage to main rotor blades, transmission, and rotor head. Aircraft was flying into rising sun and dust created by armored vehicles.

**Class E mishaps** □ (A series) As pilot was flying NOE, he saw TOW control wire move across windshield. Pilot stopped aircraft, backed up, and landed. After shutdown, pilot found wire wrapped about 50 to 60 times around lower clevis. □ (A series) Master caution and fuel boost lights came on during landing. Caused by failure of fuel boost pump.

**c12** **Class C mishap** □ (A series) About 30 minutes after takeoff, pilot opened can of soda and placed it on pedestal guard panel, which was at half-closed position. When copilot reached down to adjust radio, his hand dislodged can. Can turned over and liquid spilled on autopilot mode selector panel and pitch-turn panel. Liquid caused short in both systems. Nose of aircraft pitched up and pilot immediately disengaged autopilot. Postlanding inspection revealed damage to pitch-turn control and mode selector.

**Class E mishap** □ (A series) Crew noticed medium frequency vibration during flight. Instrument indications were normal. During shutdown after landing, as No. 1 propeller passed through 500 rpm, high frequency vibration was felt and scraping sound heard from No. 1 engine. One turbine engine blade on No. 2 power turbine wheel fractured and exited through bottom of right exhaust stack.

**ov1** **Class E mishaps** □ (D series) Hydraulic pressure went to zero during flight. Caused by failure of garlock seal in hydraulic pump. □ (D series) Hydraulic pressure went to zero on both systems after use of speed boards. Caused by cracked hydraulic line flange to speed board actuator.

**u21** **Class E mishaps** □ (A series) No. 1 engine fire light came on and warning horn sounded. Engine was secured and aircraft landed. Moisture was found on No. 3 fire detector element leads. □ (D series) Left main gear indicator light did not come on when gear handle was placed down. Caused by worn down-lock warning light switch.

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishaps** ☐ (H series) $N_2$ dropped to 6400 rpm during takeoff. As collective was reduced, rpm decreased to 6700. Caused by out-of-adjustment droop cam compensator. ☐ (H series) Master caution and hydraulic lights came on during takeoff. Caused by loose hydraulic pressure sending unit cannon plug and attaching point.

**ah1** **Class E mishap** ☐ (G series) Pilot could not apply left pedal during NOE hover. Excessive looseness in short chain caused interference with upper chain guard.

**oh58** **Class C mishap** ☐ (A series) Crew chief was using F-shaped tracking flag to track main rotor blades. One blade hit brace on flag, damaging tip of blade. **The tracking flag is not an acceptable method for tracking the OH-58.**

**Class E mishap** ☐ (A series) Transmission oil hot light came on during flight. Caused by dirty oil cooler fan compartment.

**u21** **Class E mishap** ☐ (A series) Fuel began leaking from main tank cap port after takeoff. Crew chief had readjusted cap before flight because of stiffness in closing.

### Messages received

- Safety-of-flight message on one-time inspection of UH-60 troop/cargo door stops (UH-60A-81-4, 102030Z Mar 81). Summary: On several occasions, cargo/troop door rollers have been forced past the stops when the doors were opened in flight. Door stops will be inspected not later than 20 flying hours or 15 days after the date of this message. Contact: Earl Parsons, TSARCOM, AUTOVON 693-1661, commercial 314-263-1661.

- Safety-of-flight maintenance notice concerning change in daily inspection requirements for UH-1 tail rotor blades (UH-1-81-03, 101945Z Mar 81). Summary: A recent UH-1 mishap has been attributed to tail rotor blade failure. A more detailed daily inspection of tail rotor blades is being incorporated in technical manuals. Contact: Ray Boland, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

- Maintenance notice message advising maintenance personnel of CH-54A transmission support fitting inspection procedures (CH-54-81-02, 111930Z Mar 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

### Urgent change

Change 9, dated 16 Feb 81, to TM 55-1520-210-10, has been released.

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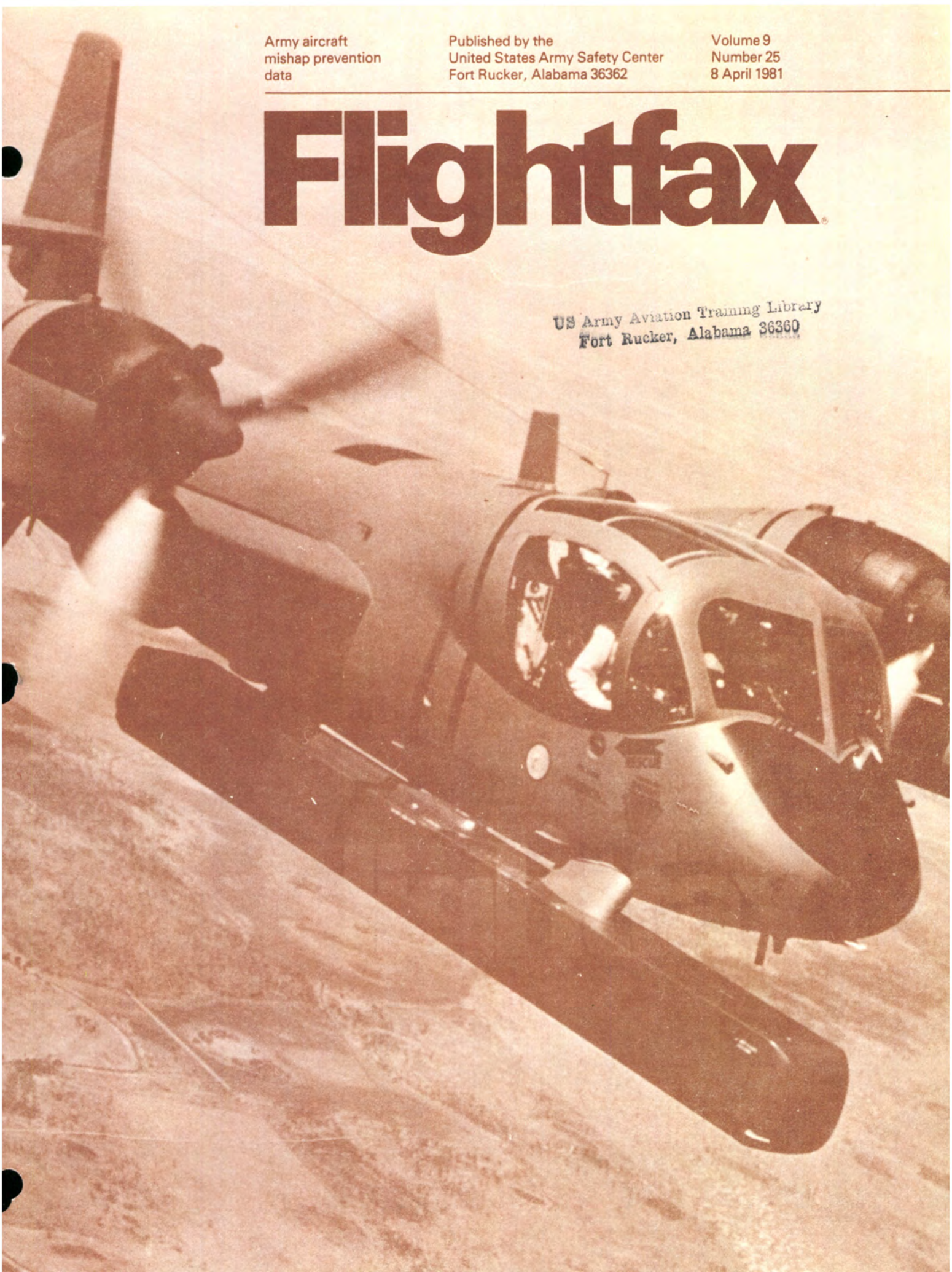


# The Mohawk—friend or foe?

For approximately 8 years—until FY 77—the Class A mishap rate for fixed wing aircraft remained consistently higher than that for rotary wing aircraft. However, in FY 77, as a result of a concerted effort to reduce the number of fixed wing mishaps, this rate began a downward trend; and in FY 79, it decreased below that for rotary wing aircraft. Since then, it has continued to follow a somewhat decelerating downward path in FY 80.

However, while the Class A mishap rate has decreased for fixed wing aircraft in general, it has increased threefold for OV-1 aircraft. As a matter of fact, over the past 3 years there has been only one catastrophic fixed wing mishap involving an aircraft other than a Mohawk. Further, not only does the OV-1 Class A mishap rate remain higher than that for other fixed wing aircraft but also the fatality rate is generally higher as well. This is somewhat surprising since the OV-1 can carry only two occupants and is equipped with ejection seats.

Curiously, most OV-1 catastrophic mishaps do not involve inexperienced pilots nor do they result from hazards commonly associated with the nature of the missions these aircraft are commonly called on to perform. On the contrary, it is the more experienced pilots who are most often involved in these mishaps. And the most common cause factors include pilot overconfidence and complacency coupled with the use of improper procedures. If the overall fixed wing mishap rate is to be reduced further, efforts must be concentrated on reducing the number of OV-1 Class A mishaps. A brief look at the accompanying figures makes this fact obvious.

The zero OV-1 fatality rate for FY 77 shown in figure 2 resulted from the fact that none of the OV-1 mishaps that occurred during that year were catastrophic. In addition, six successful ejections accounted for the lower fatality rate in FY 79.

One common thread that runs through most of the OV-1 fatal mishaps concerns the placement of aircraft in a configuration from which the pilots could not recover because of low altitude. All too often we find that aerobatic maneuvers were being conducted at low altitude when a catastrophic mishap occurred. Although AR 95-1 does not prescribe a minimum altitude for aerobatic flight, FAR 91.71 (which is applicable for Army aircraft) requires a minimum of 1,500 feet. This altitude is

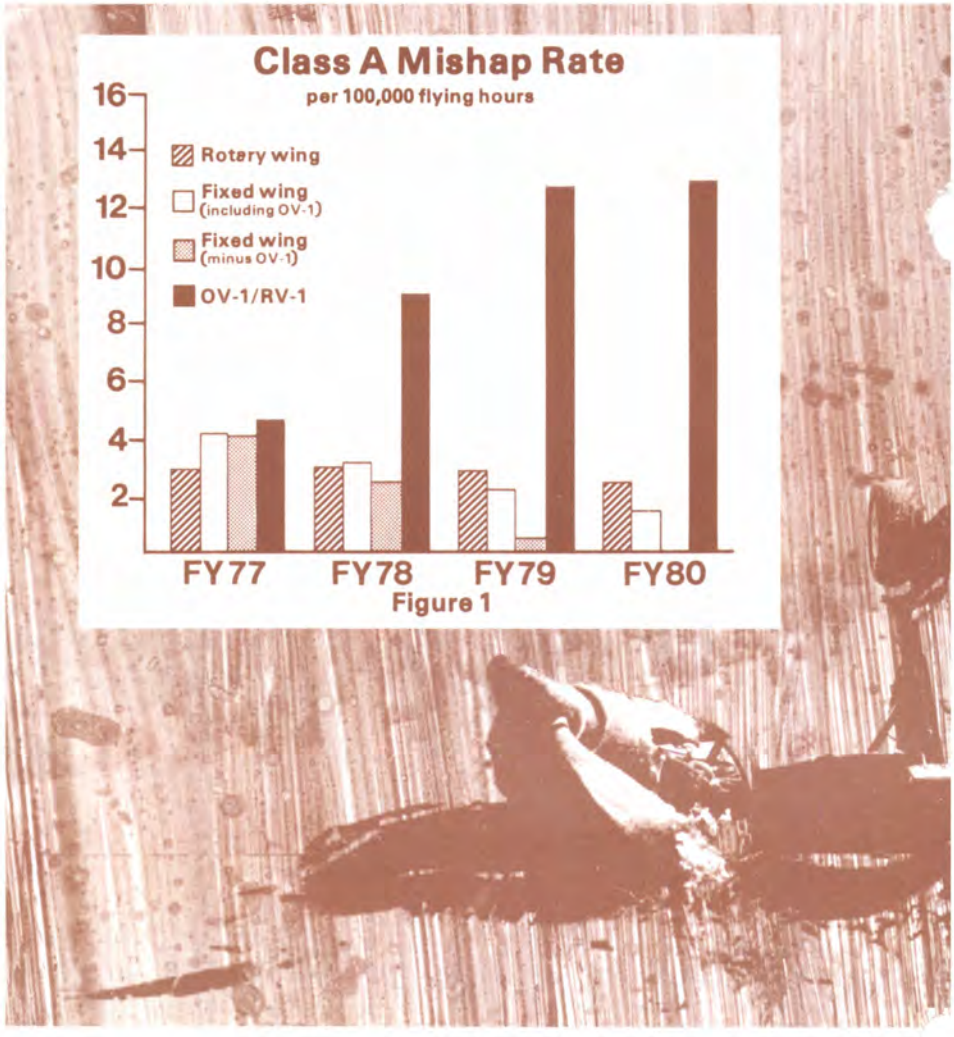


Figure 1

certainly not a safe altitude to conduct all aerobatic maneuvers, but it should be established as an absolute minimum altitude for recovery from aerobatic flight.

More often than not, the particular maneuver that resulted in a mishap was not required for successful completion of the mission being flown. Moreover, the experience of the aviators involved suggests that they should have known better than to engage in these types of maneuvers. The average age of the pilots involved was 41.5 years and their average flight time was 4,302 hours. Again, as in the case of the remainder of the fixed wing mishaps, it is not the young inexperienced aviator who causes the problem; it is the oldtimer who has many years and hours of OV-1 flight experience. Let's look at the OV-1 mishaps that occurred during this 4-year period:

• Early in one flight, although not required by the mission, the IP performed a split S from 2,625 feet agl. This maneuver resulted in a 15,000 feet-per-minute rate of descent and a high g pullout. When the pilot in the other seat exclaimed that the maneuver scared him, the response was in a manner indicative of overconfidence. A few minutes later both crewmembers were killed after their aircraft entered a bank in excess of 90 degrees at an altitude of 865 feet which was insufficient to recover from the maneuver. The pilot had 4,000 hours flight experience.

• During a display of airmanship, the pilot placed the aircraft into a steep climb from 100 feet agl. The aircraft stalled, entered a steep nose-down dive, and crashed, killing both occupants. The pilot had more than 7,000 hours flight experience.

• After mechanical problems caused one engine to fail, the aircraft entered a steep turn (in excess of 90 degrees) on base to final at 100 to 150 feet above ground level, stalled, and crashed. Both occupants were killed. The pilot had more than 8,000 hours flight experience.

• During formation flight at 11,000 feet, two aircraft collided. All crewmembers ejected. The combined flight experience of the two pilots involved was more than 7,000 hours.

(*continued on next page*)

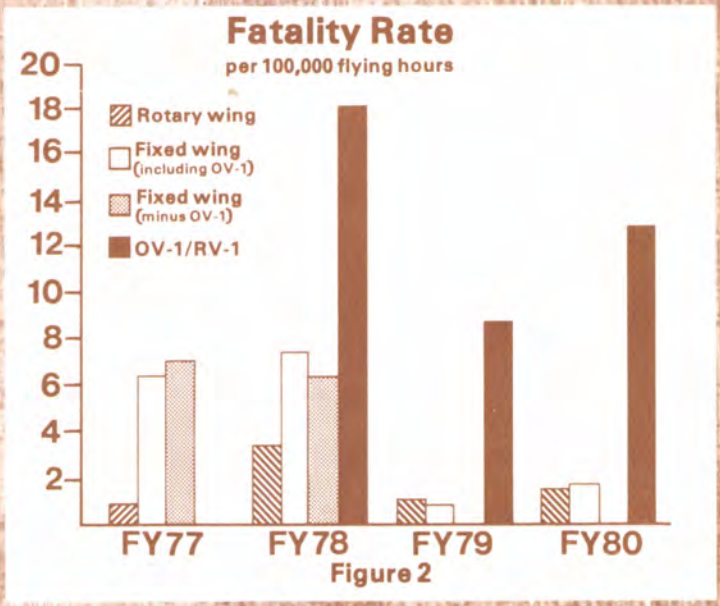


Figure 2

# Mohawk

• Two mishaps were caused by engine failures due to mechanical problems (ice ingestion and planetary gear bearing failure). All crewmembers successfully ejected.

• Although not required by the mission, the pilot performed a series of steep turns at a relatively low altitude. For unknown reasons, the aircraft entered a steep, nose-low dive and crashed. Both occupants were killed. The pilot had more than 3,000 hours flight experience.

• The causes of two mishaps that occurred during this time period are unknown. Teardown analysis revealed all engines were functioning at impact. Both aircraft were at relatively low altitudes and both hit the ground in a steep nose-low dive. These two mishaps resulted in three fatalities.

As can be seen, steep turns or steep dives at low altitudes led to most of these mishaps. During steep turns, or high g pullouts from steep dives, stall speeds increase rather dramatically. Coupled with low altitude this situation becomes potentially hazardous. For example, at a gross weight of 16,500 pounds, the stall speed with wings level, flaps up, and power on is 82 KIAS. The resultant mathematically derived stall speeds now become 139 knots at a 70-degree angle of bank and 197 knots at an 80-degree angle of bank. Also, during a 3 g coordinated pullout from a dive, a 17,000-pound airplane will weigh 51,000 pounds and will stall at 142 KIAS. An actual flight at a gross weight of 17,000 pounds revealed that at 180 KIAS, buffeting began at an angle of bank of 62 degrees.

What about this buffeting—is it always there? Most OV-1 aviators will tell you it is. However, the operators manual states that during all stalls, little or no buffeting occurs prior to the stall. Flight test reports indicate that buffeting is not always present, and when it is, it is not always consistent. For example, sometimes it occurs 8 to 10 knots before a stall and at other times at only 1 knot before a stall.

Clearly, the lesson to be learned is that if you are going to engage in steep turns or dives, make sure you have enough altitude to recover from a steep dive or an unexpected stall. So far we have concentrated mostly on mishap causes. Now let's look at the reason for the fatalities or, more appropriately, the failure-to-eject problem.

In the mishaps that occurred during this period, 19 crewmembers were involved. Of these, 11 sustained fatal injuries while 8 successfully ejected. Four of the eight successful ejections were made after collision occurred at 11,000 feet. The other four were associated with two instances of dual engine failure. In all other cases, either no attempt was made to eject or the ejection was initiated too late (outside the envelope). Failure to eject evolves around the fact that by the time the crewmembers realized they were in trouble, impact was imminent. This problem relates to the common mistake of engaging in unnecessary maneuvers at low altitudes.

As can be seen, the predominant problem does not lie with the machine or the environment. It rests with the man who operates the machine. Lack of flight discipline and failure to follow established procedures are common cause factors in these mishaps. But while the solution is known, it cannot be implemented either at the DA or TSARCOM level. Corrective action must be applied in the cockpit, and that requires the concerted effort of all who are associated with the Mohawk program.

In time of need, the Mohawk can be an invaluable friend. But it can also become a foe—if you should ever forget that these aircraft are not expensive "toys" designed to provide thrills. They are sophisticated platforms engineered to accomplish specific, vital tasks as may be assigned them. And they will do just that—provided you do not exceed their capabilities or your own.

Point of contact for OV-1 matters at the Safety Center is Major White, AUTOVON 558-4198/4202. ■

# Shortfax

## Use the OHR

The Operational Hazard Report (OHR) has been a viable tool in the hands of the aviation community for about 14 years. This tool has brought about many changes in aviation operations, maintenance, and systems during its lifetime, increasing the margin of safety for the aviator.

The OHR is designed so that an individual in a unit can report a safety problem to the aviation safety officer and commander. It also provides a means for the commander to tell the individual what was done about the reported problem.

Currently, the Army aviation community uses more than 13,000 OHRs per year. This is more than double the amount of mishap reports received by the Army Safety Center in one year. This is good because it means that the OHR is doing its mishap prevention job.

The OHR can do a better job only if individuals will take the time to fill out the form and pass it along to the aviation safety officer or operations officer. If there is a signature and address on the form, the commander must return a copy to the originator when corrective actions have been taken. If the originator does not choose to put his name on the form, that's all right, too. The anonymous feature was established so the originator could avoid any problems he might think would arise from the report. It must be remembered that paragraph 5-5 of AR 95-5 states that OHRs are to be used for "accident prevention purposes only."

It would be a good idea for aviation safety officers at battalion or equal levels of command to review OHR files within their units and headquarters to determine a course of action which would improve the aviation safety program. One method of analyzing a group of reports is to use a matrix to determine the trouble spots and growth rates. Such a matrix could look like the one shown below. Use hazards applicable to the unit's mission.

This chart shows the top problem to be near midair collisions and the next to be pilot techniques. A closer look at these OHRs will probably show that the midair collisions are occurring in the same area. Research the circumstances, work out a recommended solution, and send it to the commander for approval and implementation. You will more than likely prevent a catastrophic mishap. The same approach goes for the pilot problem, too.

Use of the OHR program by commanders and aviation safety officers will pay off in fewer mishaps.

Aviators, use the OHR program in your unit. It will save a lot of headaches and could save someone's life.

Point of contact at the Safety Center is Samuel Phillips, AUTOVON 558-3913/3901. ■

| Hazard | 1st Week | 2nd Week | 3rd Week | 4th Week | Etc. |
|---|---|---|---|---|---|
| Near midair collision | 1 | 3 | 5 | 8 | |
| Air Traffic Control | | 2 | 1 | 1 | |
| Traffic pattern | 1 | | | | |
| Powerplants | 3 | | 1 | 1 | |
| Rotor systems | | | | | |
| Transmissions | | | | | |
| Pilot technique | 2 | 3 | 4 | 4 | |
| Publications | | | 1 | | |
| Avionics | | 2 | | 1 | |
| Maintenance | 1 | | 2 | 1 | |

## Compass problems?

Conflicting reports are being received from the field regarding the quality and durability of the compass, MC-1, NSN 6605-00-515-5637, a component of the SRU-21/P survival vest and the hot climate, cold climate, and overwater survival kits. If you are having any problems whatsoever with the compass, submit a Quality Deficiency Report to Commander, TSARCOM, ATTN: DRSTS-MAPL, 4300 Goodfellow Boulevard, St. Louis, MO 63120. ■

## New field manual

FM 55-411, Army Aircraft Quality Control and Technical Inspection, dated January 1981, supersedes TM 55-411, including all changes. ■

## New training films

The following aviation training films are now available from your local Audiovisual Support Center.

- TF 46-6203 - "Inspecting the Overwater Survival Kit"
- TF 46-6204 - "Inspecting the Cold Climate Survival Kit"
- TF 46-6205 - "Inspecting the Survival Vest"
- TF 46-6206 - "Inspecting the Hot Climate Survival kit" ■

# Selected mishap briefs

**uh1** **Class C mishaps** □ (H series) Engine was started with air inlet screen protective cover not removed. Suction created by turning compressor displaced upper and lower baffle assembly, causing it to hit main drive shaft. Particle separator was contaminated with metal shavings, and several second-stage compressor rotor blades were nicked. □ (H series) As aircraft was taking off from LZ, tree branches flexed down and damaged main rotor blades.

**Class E mishaps** □ (H series) Tail rotor drive shaft cover was left unsecured. During flight, cover rubbed against and chafed drive shaft. □ (H series) Aircraft had just been refueled. During takeoff, crew smelled fuel fumes, returned to airfield, and landed. Open port refueling panel had not been closed correctly. Fuel cap had been closed but was loose. □ (H series) Tower personnel told pilot vertical fin tail rotor drive shaft cover was loose. Maintenance test pilot had preflighted aircraft in hangar and did not secure drive shaft cover. He told mechanic to close cover, but he did not check cover to make sure it was closed. □ (H series) Master caution light came on during takeoff. Caused by failure of external power door microswitch.

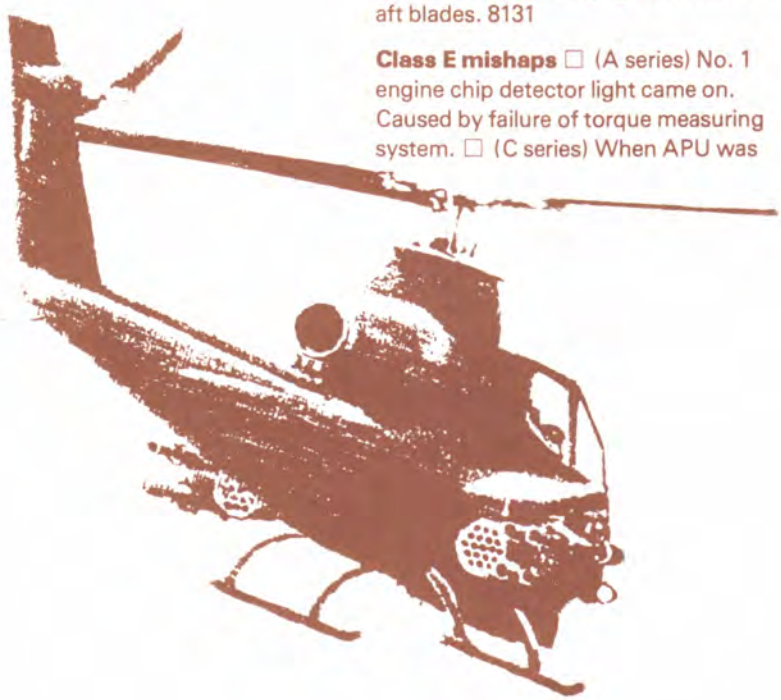
**Aviation-related mishaps** □ As aircraft was being towed between a parked UH-1 and a forklift, right horizontal stabilizer hit forklift. □ Truck was parked on slight incline with parking brake off. Truck rolled down incline and hit parked UH-1.

**ah1** **Class A mishap** □ (S series) During descent, at about 100 knots and 700 feet agl, aircraft began violent vertical bounce. Bounce was so severe that copilot's head repeatedly hit top panel of canopy. Copilot had difficulty keeping hands and feet on flight controls. Pilot was unable to keep his feet from pedal area and tried to put his feet on instrument panel. Aircraft entered excessive bank and pitch attitudes. Copilot tried several times to retard throttle to control yaw. This was ineffective. Copilot then tried to zero ground speed and, about 10 feet agl, retarded throttle and pulled cushioning pitch. Aircraft came to rest upright, with transmission and main rotor separation. Pilot sustained lacerations and sprained back. 8130

**Class E mishaps** □ (S series) As pilot turned aircraft during NOE flight, blade hit tree. □ (S series) Through-flight inspection revealed condensation and water droplets inside sight glass of 42-degree gearbox. Contamination may have occurred when aircraft was washed 48 hours before flight. □ (S series) Engine oil bypass light came on and engine oil pressure fluctuated during hover. Loud popping sound was heard from engine area. Aircraft was landed with power. White smoke poured from engine area and oil streamed down both sides of aircraft. Caused by engine failure.

**ch47** **Class B mishap** □ (C series) Aircraft entered unforecast severe turbulence. As crew was trying to control aircraft, control stops were hit and aft rotor blades struck tunnel covers, damaging both covers and aft blades. 8131

**Class E mishaps** □ (A series) No. 1 engine chip detector light came on. Caused by failure of torque measuring system. □ (C series) When APU was



shut down during runup check, No. 1 and 2 generator and rectifier lights came on. Caused by internal failure of aft transmission. ☐ (A series) Smoke was seen coming from transmission oil pressure selector switch during runup. Caused by failure of selector switch. ☐ (C series) Pilot felt inputs in pitch axis of cyclic controls at 1,500 feet agl. There was also a 100 psi fluctuation in No. 1 flight boost hydraulic pressure. Caused by air in system. ☐ (B series) Rotor rpm fluctuated during runup. Caused by failure of tachometer generator.

**Aviation-related mishaps** ☐ Three maintenance technicians were towing CH-47 from hangar to parking ramp. One person was driving, one was in cockpit, and one was walking outside to clear aircraft. As aircraft passed between washrack and hangar, it became apparent that rotor blades would not clear aft blades of a CH-47 parked on washrack. Ground guide rotated forward rotor blades to maintain clearance. He then released forward rotor blade rope to grab aft rotor blade rope. When forward rotor blade rope was released, aft rotor blades rotated backward into aft rotor blade of parked aircraft. ☐ As aircraft was being towed into hangar, aft rotor blade hit hangar doors.

**oh58** **Class C mishap** ☐ (A series) POL handler noticed rock on pad while hot refueling aircraft. As handler tried to throw rock from pad, he inadvertently hit main rotor blade of aircraft he was refueling.

**Class E mishaps** ☐ (A series) Engine oil bypass light came on. Caused by incorrectly secured engine oil filter cap. ☐ (A series) Engine failed during landing. Inspection of fuel filter bowl revealed water and paint chips. ☐ (C series) $N_1$ went to 62 percent during start and then fluctuated from 50 to 62 percent. It was determined that during recent MOC required after engine cleaning that pilot failed to operate anti-icing and bleed air systems, which allowed water to remain trapped in lines. This caused $N_1$ fluctuation on next attempted start.

**Aviation-related mishaps** ☐ As aircraft was being guided into parking position inside hangar, horizontal stabilizer hit right rear of parked jeep. ☐ Tug driver made left turn at high rate of speed in front of aircraft and lost control of tug. Tug hit nose of aircraft. Instead of stepping on brake, tug driver hit accelerator. Driver was wearing gloves, causing his hands to slip on steering wheel.

**th55** **Class C mishap** ☐ As student pilot approached his first checkpoint, he turned to a heading of 30 degrees instead of 345 degrees. Aided by strong westerly winds, SP proceeded to the northeast, became disoriented, and tried to land in a field. After completing approach to a hover, SP tried to select a better landing site, lost control of aircraft, and landed hard.

**Class E mishaps** ☐ As student was getting out of aircraft, his foot hit and broke right lower windshield. ☐ Rotor tachometer cable broke during flight.

**c12** **Class E mishaps** ☐ (A series) Crew smelled electrical odor during flight and saw flame behind copilot instrument panel reflected in copilot's shoes. Dense black smoke filled cockpit and cabin, flowing up through copilot's windshield defrost vents. Aircraft was landed at airbase. Caused by burned-out windshield anti-ice high/low temperature control relay. ☐ (A series) Shortly after takeoff, No. 2 engine torquemeter fluctuated, then dropped to 50 percent. All other instruments were normal. Postflight inspection revealed No. 2 engine oil cap was unsecured. Pilot said he did not visually check position of cap locking device but physically felt locking device snap into locked position. Suspect internal damage to No. 2 engine.

**ov1** **Class C mishap** ☐ (D series) Left main landing gear wheel assembly half retaining bolt sheared during landing rollout. Bolt slid into brake assembly disc's locking wheel, destroying tire, wheel, and brake assembly.

**Class E mishap** ☐ (D series) After takeoff, aircraft pitched nose high toward stall attitude with high power setting. Pilot felt heavy aft stick pressure and had to reduce power to hold forward stick pressure enough to level off aircraft. Postflight inspection revealed rod end bearing in actuator mechanical trim had stripped threads and had come out of actuator assembly. **OV-1 SOF message 81-02 dated 20 Mar 81 was issued as a result of this mishap.**

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishaps** ☐ (H series) Crew heard whistling noise during flight. Postlanding inspection revealed scissors lever was touching swashplate. Caused by incorrect rigging of flight control system. ☐ (H series) Engine oil pressure dropped from 90 pounds to 42 pounds and stabilized during climb. Caused by incorrect torque on engine oil line fitting. ☐ (H series) Aircraft yawed left and $N_2$ fluctuated. Bleed band closure range was set too high. ☐ (H series) Grinding noise was heard and feedback felt in controls. Master caution and hydraulic lights came on. Running landing was made. Caused by incorrectly positioned hydraulic line. Line chafed on lower push-pull tube of left cyclic servo.

**uh60** **Class E mishap** ☐ Master caution, No. 1 hydraulic pump, and No. 1 reservoir low lights came on during landing. Postflight inspection revealed clamp separating return hydraulic lines chafed against pressure and return lines, causing rupture and release of hydraulic fluid.

**ch47** **Class E mishap** ☐ (C series) No. 2 engine fire light came on after takeoff. Caused by chafed sensing element.

### Messages received

• Safety-of-flight maintenance notice on high performance utility helicopter hoist (HPH-81-1, 251600Z Mar 81). Summary: Medical units receiving the HPH are not always removing a 3- or 4-inch long plastic sleeve normally located at the hook end of the hoist cable. The sleeves were intended to protect the hoist cable during initial shipment of the hoists from the factory. If the sleeve is not removed, it could accidentally become jammed with the boom sheave and result in cable damage. Contact: Robert Martin, AVRADCOM, AUTOVON 693-1617, commercial 314-263-1617.

• Maintenance notice on AH-1 receiver-transmitter antenna (AH-1-81-07, 251330Z Mar 81). Receiver-transmitter antennas are failing after being subjected to excessive amounts of hydraulic fluid and water which are collecting in the area of the antenna box. The fluid is seeping through the antenna box seals, causing failure of the unit.

• Technical information message for all AH-1S aircraft concerning short bolts holding the fuel control temperature compensating bellows, T1, to the engine inlet housing (AH-1-81-08, 261900Z Mar 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

### Urgent change

Change 10, dated 17 Feb 81, to TM 55-1520-210-10, has been released.

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# Blade tracking, the Vibrex, and you

An old story tells about a man fired from his job at the height of the Great Depression. When asked what his reaction was on learning that he had lost his job, the man replied: "Why I just laughed and laughed. In fact, I laughed so hard, tears filled my eyes." Then after a brief pause, he added: "As a matter of fact, there were so many tears, you couldn't hardly tell I was laughing!"

Well, it's somewhat the same with maintenance these days. At least when it comes to tracking main rotor blades. Although the TM is supposed to be the mechanic's bible, when you look at the results of some of the blade tracking attempts—especially those involving the OH-58—you "can't hardly" tell that the TM has been consulted. If you have any doubts about this, a brief look at some OH-58 blade tracking mishaps will quickly dispel them. Following are a few examples:

- During blade tracking operations, a mechanic raised the tracking flag into the main rotor blade path, causing it to strike and damage one main rotor blade.
- While conducting blade tracking operations, a crew chief allowed the tracking flag to strike a main rotor blade, damaging the tip cap fairing. The blade had to be replaced.
- During tracking of the main rotor blades, a crew chief inadvertently allowed the tracking flag to contact and damage one rotor blade tip cap fairing, necessitating replacement of the blade.
- When a mechanic positioned the tracking flag, he thought it would be too short to make blade contact, so he lifted the flag pole approximately 2 feet off the ground. The steel shaft hit the main rotor blades.
- A mechanic was trying to take the main rotor high track when the tracking flag struck the red main rotor blade tip cap.
- Maintenance personnel allowed the tracking "pole" to strike the main rotor blades during tracking operations.

**When this unauthorized "pole" was used to track the blades of an OH-58 . . .**

**. . . one main rotor blade struck the top of the metal pole . . .**

- Maintenance personnel allowed the tracking flag to contact one main rotor blade tip cap.
- When the main rotor track was being checked by means of an F-shaped tracking flag, one main rotor blade struck the brace on the flag.

Reading these briefs is somewhat like listening to a broken record that keeps repeating one segment over and over again. And while these mishaps may appear somewhat insignificant, collectively they cost $44,292 or an average of $5,537 per mishap—in addition to the time required to make the necessary repairs. But what really makes these mishaps unique is that they all involved OH-58 aircraft. And that fact alone should tell you something.

For starters, the use of a tracking "pole" to check blade track, as was done to one of the damaged OH-58s described, is strictly taboo. Where and how this method was conceived, we don't know. Probably, it was used as a field expediency measure for some other type aircraft. Nevertheless, it is not authorized for use in conjunction with **any** Army helicopter.

**. . . causing damage that resulted in blade replacement.**

Next, consider the "flag." While it may be used for checking blade track of other helicopters, its use is **not** authorized for the OH-58—and for good reason. The main rotor blades of the OH-58 are equipped with tip caps that can be damaged very easily should they hit the flag pole or a brace. What, then, is the answer?

According to the TM, the only authorized method for checking the blade track of an OH-58 is by means of the tracking light (strobe) known as the "cateye" system. Yet, chances are excellent that you have no such equipment in your unit. Or, if you do, it is probably not in working order. The answer lies in a piece of equipment known as the Chadwick-Helmuth Vibrex system.

This piece of equipment was adopted by the Army several years ago to replace the older "cateye" tracking light system. MTOEs and TDAs currently reflect the Vibrex kits required, and a sufficient number have been issued to satisfy these requirements. Should special circumstances create a need for more kits, they may be obtained under the provisions of paragraph 2-18 of AR 310-34.

But having the kits and knowing how to use them are two different matters. One of the problems common among units is maintaining knowledgeable maintenance personnel to operate the Vibrex. When the Vibrex was first introduced to the field, a New Equipment Training Team (NETT) traveled worldwide to train key personnel in its use. At each installation visited, the NET team left a Vibrex training package with the local field maintenance technicians (FMTs). This package consisted of a cassette, slides, and lesson plans for use in training other unit personnel.

In addition to the training initially provided by the NET team, "30" skill level courses conducted at Fort Eustis now include instruction on the use of the Vibrex. This training is also provided to AMOC qualified maintenance officers and school-trained test pilots. Part of the reason the Vibrex is not being extensively used is that the skill levels of the operators in some units have, for one reason or another, been allowed to deteriorate to a point where the operator is no longer proficient. Evidence currently suggests that units may need to upgrade their unit training in the use of the Vibrex. Toward this end, the use of the training package left with the FMTs is recommended, especially the Chadwick cassette entitled "Vibrex Systems." FMTs who may not have this training package can obtain one by requesting it from TSARCOM. If needed, units may also request any training assistance required from the next higher level of maintenance or from the FMTs.

Another problem area concerning blade tracking lies with our current technical manuals. These can sometimes be a source of confusion. Some are more specific and detailed than others. The AH-1 maintenance manual, for example, provides a detailed description of the Vibrex and its use. On the other hand, the OH-58 maintenance manual contains no reference to the Vibrex. Instead, it indicates that tracking is to be done with a tracking light and "cateye" reflectors.

However, the Vibrex kit comes with operator instruction pamphlets for each type of Army helicopter. These instructions will eventually be incorporated in the appropriate maintenance manuals. Until this is done, TSARCOM has stated that the pamphlets that come with the Vibrex must be used for all blade tracking operations—regardless of contradictory instructions that may currently be found in some of the TMs.

In short, the Vibrex is the **primary** method to be used for blade tracking—for **all** Army helicopters. The alternate method for the AH-1 and the UH-1 is the tracking flag. Either the Strobex or the flag may be used as an alternate means of tracking the blades of a CH-47. An alternate method for tracking the OH-58 is now being developed, but bear in mind that the tracking flag **cannot** be used on the OH-58 because of damage that may result to the blade tip caps.

Also, the Operators Maintenance Manual, TM 55-4920-402-13&P, Vibrex Balancing Kit, was published in August 1980. However, the Repair Parts and Special Tools List was omitted at the time of issue. This list should be available sometime in April 1981.

*(continued on next page)*

# Blade tracking

Finally, there is a third problem associated with the Vibrex—that of keeping it in proper operational condition. Although the Vibrex is sturdily constructed, it can only withstand just so much abuse. So, to maintain its reliability, it must be handled with care. Curiously, most of the Vibrex systems being returned for repair are functioning properly. As a matter of fact, about 8 out of every 10 units returned for repair are found to be functionally suitable. Of the remaining two that actually need repair, one is usually found damaged as a result of abuse. This means that with proper care, approximately 9 of every 10 units presently being sent for repair could remain in the units where they are needed.

Some of the most common types of damage noted are broken IPS meters, smashed switches, and broken Strobex lenses. In many instances, this damage results from placing connectors, cables, or brackets on top of the balancer and then attempting to close the lid—a procedure, by the way, that takes a great deal of physical effort to accomplish. Nevertheless, abuse of this equipment appears to be widespread; so much so that it prompted one maintenance officer to state that if someone should want to borrow his Vibrex, they would have to "borrow" him along with it.

The large number of Vibrex systems being returned for repair has also caused units to voice numerous complaints concerning turnaround time. Keep in mind that when Vibrex systems are shipped for repair—even though they may not require maintenance—they must be inspected and tested before being returned to the sender. Part of the bottleneck has resulted from units returning Vibrex systems to the repair facility for scheduled calibration. Yet, no requirement exists for sending the Vibrex for calibration on a recurring schedule.

Unless damaged, a Vibrex system should not be shipped for repair unless it fails in a function test on the Calibrator, Model 11, which is included in every kit delivered. In fact, the Calibrator was designed to screen repairs that are unnecessary, costly, and time-consuming.

When you look at the inordinate number of Vibrex systems being sent for repair—80 percent of which are operating properly—you can better understand the backlog that results. Consequently, a new procedure has been established for turning in the Vibrex for repair. This procedure is outlined in TSARCOM Message 271615 Feb 81, subject: Vibrex Repair Program, NSN 4920-01-040-7816. Basically, it requires the field unit to contact the Vibrex item manager by calling AUTOVON 693-3312/3313 before returning a Vibrex system for repair.

The Vibrex is a valuable tool for both tracking and balancing main and tail rotor blades. It can further be used to accurately diagnose and identify sources of abnormal vibrations produced by other aircraft components, such as drive shafts, oil coolers, engines, and engine accessories. Such abnormal vibrations caused by defective or failing parts can result in premature component failures some of which could prove disastrous. Therefore, for safety as well as for accuracy, it is to your advantage to exploit the full capability of the Vibrex. How about doing just that? ■

# Stacom

## Operators Manual and Checklist update

Listed below are the effective dates of the current aircraft operators manuals and checklists with the number and date of the latest change. Please check your weekly AG Publication Center Bulletin for subsequent changes.

| Fixed Wing TM 55-1510 | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 201-10/4 | RU-8D | | | | |
| | U-8D/G | 3 Apr 78 | | Jul 78 | |
| 201-10/5 | U-8F | 21 Mar 78 | 1, 18 Dec 78 | Jul 78 | |
| 204-10/3 | OV-1B | 9 Mar 79 | 1, 14 Jan 80 | Feb 79 | |
| 204-10/4 | OV-1C | 10 Apr 79 | 2, 14 Jan 80 | Apr 79 | |
| 208-10 | T-42A | 27 Feb 79 | | Feb 79 | |
| 209-10 | U-21A | 25 Mar 77 | 5, 6 Oct 80 | Feb 77 | 5, 12 Jun 80 |
| 209-10-1 | RU-21A/D | 28 Feb 77 | 5, 24 Jul 80 | Mar 77 | 2, 23 Aug 78 |
| 213-10 | OV-1D/RV-1D | 4 Aug 78 | 3, 17 Nov 80 | Nov 78 | |
| 214-10 | RU-21B/C | 15 Mar 77 | 6, 1 Aug 80 | Apr 77 | 4, 12 Jun 80 |
| 215-10 | U-21G | 11 Mar 77 | 4, 26 Jun 80 | Apr 77 | 3, 12 Jun 80 |
| 215-10-2 | RU-21H (GR-V) | 29 Dec 78 | 1, 28 Jun 80 | Dec 78 | 1, 12 Jun 80 |
| 216-10 | U-3A/B | 11 Dec 78 | 1, 3 Jul 80 | Dec 78 | |
| | C-12A | 8 Jan 80 | | Jan 80 | |
| | C-12C | 1 Dec 78 | | Jan 79 | |

| Rotary Wing TM 55-1520 | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 209-10 | CH-47A | 9 Jan 79 | 1, 17 Apr 79 | Dec 78 | 1, 2 Feb 79 |
| 210-10 | UH-1D/H | 18 May 79 | 10, 17 Apr 81 | Feb 79 | 2, 1 Apr 80 |
| 214-10 | OH-6A | 17 Dec 76 | 9, 6 Jun 80 | Dec 76 | 3, 20 Jun 80 |
| 217-10-1 | CH-54A | 8 Apr 77 | 2, 1 Oct 80 | Mar 77 | 1, 13 May 77 |
| 217-10-2 | CH-54B | 15 Apr 77 | 2, 10 Oct 79 | Mar 77 | 2, 22 Aug 79 |
| 219-10 | UH-1B | 16 Jan 69 | 17, 11 Feb 81 | Dec 68 | 8, 11 Apr 79 |
| 220-10 | UH-1C/M | 8 Sep 80 | 4, 22 Jan 81 | Sep 80 | |
| 221-10 | AH-1G | 18 Mar 80 | 1, 6 Nov 80 | Mar 80 | |
| 227-10-1 | CH-47B | 23 Aug 78 | 3, 14 Nov 80 | Dec 78 | 3, 30 Oct 80 |
| 227-10-2 | CH-47C | 23 Aug 78 | 4, 16 Sep 80 | Nov 79 | 1, 27 Jan 81 |
| 228-10 | OH-58A | 7 Apr 78 | 9, 20 Nov 80 | Jul 78 | 4, 14 Jan 81 |
| 233-10 | TH-55A | 30 Sep 76 | 2, 14 Jul 78 | Oct 76 | 4, 17 Oct 78 |
| 234-10 | AH-1S (MOD) | 17 Nov 76 | 11, 6 May 80 | Nov 76 | 3, 30 Nov 79 |
| 235-10 | OH-58C | 7 Apr 78 | 16, 17 Feb 81 | Jul 78 | 5, 20 Nov 80 |
| 236-10 | AH-1S (PROD) | 11 Jan 80 | 2, 20 May 80 | Jan 80 | |
| 237-10 | UH-60A | 21 May 79 | 7, 7 Oct 80 | Dec 78 | 8, 19 Nov 80 |

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Selected mishap briefs

**uh1** **Class A mishap** □ (H series) Student pilot was attempting instrument takeoff from sod. With skids level on the ground, SP abruptly applied collective. IP placed his left hand on top of collective to limit its travel. Left skid came off ground and aircraft rolled right. IP lowered collective and applied full left cyclic. Aircraft continued to roll right. Main rotor blades hit ground and aircraft came to rest on right side. 8132

**Class E mishaps** □ (H series) Crew chief saw hydraulic fluid coming from hydraulic filter during shutdown. Hydraulic line going to hydraulic test stand fitting chafed at clamp at bulkhead on right side of transmission. □ (H series) As fuel sample was being taken, leak was seen in drain line coming from fuel filter. Caused by failure of hose.

**ah1** **Class E mishaps** □ (S series) Pilot heard unusual noise, followed by illumination of alternator rectifier light. Caused by failure of alternator generator. □ (S series) During start, as throttle was increased to 75 percent $N_1$, engine quit. Electrical wire to cutoff valve had come loose at splice. □ (S series) When aircraft was brought to hover, several SCAS hardovers were felt. Caused by failure of SCAS amplifier. □ (G series) Rod end bearing of lower forward portion of pilot's door came loose during flight and door opened.

**ch47** **Class C mishaps** □ (C series) As pilot was flying aircraft, copilot placed his hand on cyclic to talk to pilot and inadvertently pushed load release button. Load dropped from about 100 feet agl. Seventy-five cases of C rations were destroyed. □ (C series) At 1,500 feet and 95 to 100 knots over water, flight engineer noticed that one lockdown device on reflector was loose. The other lockdown devices appeared to be holding the reflector securely and load was stable. About 20 minutes later, pilot descended to 1,000 feet and was cruising at 100 knots. Five minutes later, pilot felt abrupt shudder in aircraft. Flight engineer told pilot reflector had separated from radar and had landed in water. Sling load was still intact, and aircraft was flown to LZ. Inspection of radar equipment revealed that manual lockdown device for reflector might have worked loose, allowing wind blast to cause separation.

**Class E mishaps** □ (B series) Before-landing check indicated that both speed trims were retracted. After landing, crew smelled smoke coming from speed trim amplifier box. Although indicators showed that actuators were retracted, they were still extended. Caused by internal short in speed trim amplifier box. □ (C series) Transmission oil pressure light came on during flight. Caused by defective transmission pressure selector switch. □ (C series) When No. 1 and No. 2 engine condition levers were moved to ground position, No. 1 engine failed to respond. Caused by defective $N_1$ control box.

**oh58** **Class E mishaps** □ (A series) Engine oil bypass light came on during hover. Caused by worn fitting (nipple tube) on engine oil input line to power and accessory gearbox. □ (A series) Master caution and hydraulic pressure lights came on during landing approach. Caused by worn hydraulic pump drive shaft gear splines. □ (A series) Pilot did not monitor rotor rpm during descending right turn, and main rotor oversped to 420 rpm.

**u21** **Class A mishap** □ (D series) Aircraft was on training flight when it crashed and came to rest inverted. Details unknown. Pilot and IP sustained lacerations, abrasions, and fractures. 8133.

**Class C mishap** □ (A series) Aircraft was struck by lightning during flight in IMC. Postflight inspection revealed damage to trailing edge of one propeller blade of No. 1 engine. Burn damage similar to arc welds was found on leading edge of left wing, left wing flap, and right wing tip. Weather conditions were conducive to lightning.

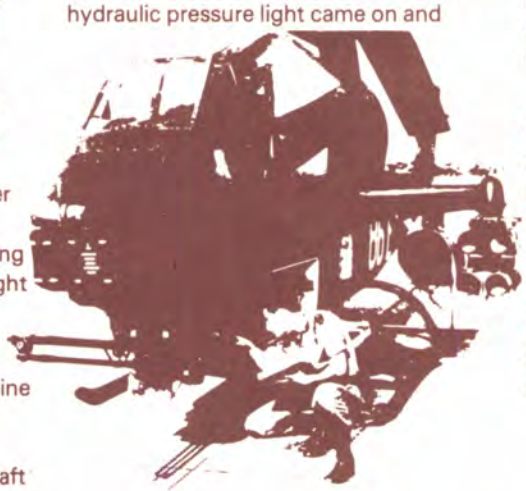
**Class E mishap** □ (D series) Left engine failed during flight with no warning or instrument fluctuations. Postflight inspection revealed fuel pump drive shaft sheared and fuel control shaft bearing failed and separated.

**c12** **Class E mishap** □ (A series) As aircraft was passing through 19,000 feet during climb, outer part of left rear cabin window cracked. Pressurization differential was 5.9 psi when window cracked.

# Maintenance

**uh1** **Class C mishap** □ (H series) While aircraft was on ground at refueling site, KY-28 came out of bracket and fell through chin bubble. Caused by incorrectly installed KY-28.

**Class E mishaps** □ (H series) As engine reached 70 percent $N_1$ and stabilized, pilot smelled and saw smoke coming from left side of overhead console. Caused by incorrect connection of cannon plugs to mission equipment console. □ (H series) Pilot felt stiffness in pedals during landing. When aircraft touched down, hydraulic pressure light came on and complete loss of hydraulic control occurred. Fitting on collective servo hose where it hooks to airframe came loose, causing loss of hydraulic fluid.



**ah1** **Class E mishaps** □ (S series) Master caution, transmission oil pressure, and transmission oil bypass lights came on during takeoff. Transmission oil pressure gauge went to zero. Caused by installation of two internal transmission oil filter gaskets instead of one. □ (G series) High side rpm light came on during takeoff. Pilot increased collective and tried to decrease rpm with actuator, with no response. Pilot took manual control of throttle and landed. Caused by loose ground wire on forward top linear actuator.

**ch47** **Class E mishap** □ (C series) Drop in No. 1 flight boost system was noticed during takeoff. O-ring on flight boost manifold was found to be leaking. Incorrect O-ring was installed.

**oh58** **Class E mishap** □ (A series) Torque gauge became inoperable during flight. Caused by stopped-up bleed line.

*(continued on next page)*

# Mishap briefs

## Messages received

• Safety-of-flight maintenance notice on high performance utility helicopter hoist (HPH) (GEN-81-03, 011500Z Apr 81). Summary: All medical personnel operating the HPH with the UH-1H/V or UH-60A should be aware of the importance of inspecting all hoists for permanent removal of the plastic sleeve from the hoist cable. It is also important to inspect hoist at the boom sheave to assure a sleeve has not become entrapped at the sheave. Contact: Robert Martin, AVRADCOM, AUTOVON 693-1617, commercial 314-263-1617.

• Safety-of-flight message concerning change to SOF message on one-time inspection of OV-1B, OV-1C, OV-1D, and RV-1D aircraft fuel systems for contamination (OV-1-81-03, 311745Z Mar 81). Summary: Experience with the continuing inspection of the fuel system on OV-1/RV-1 series aircraft has indicated that inspection at every 25 flying hours is not required. This change cancels the 25-flying-hour inspection contained in SOF message OV-1-80-07. Contact: Robert Clark, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

• Maintenance message concerning rezeroing of aircraft altimeters (GEN-81-02, 301415Z Mar 81).

• Maintenance message advising CH-47 users of MWO 55-1520-241-50-1 and MWO 55-1520-241-30-4 application schedule (CH-47-81-10, 311750Z Mar 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Changes to TMs

The following changes have been distributed:

• Urgent change 7, dated 6 Mar 81, to TM 55-1520-228-PM, OH-58A/C Aircraft Phased Maintenance Checklist.

• Change 4, dated 14 Jan 81, to TM 55-1520-228-CL, OH-58A Operator's and Crewmember's Checklist. ■

## Oil cooler shield inspection requirement

Item 1, page 2-55, TM 55-1520-210-PMS, requires a 200-hour inspection interval for the IR suppressor oil cooler shield on the UH-1H/V. This was discussed in more detail in the 9 Apr 80 issue of FLIGHTFAX. ■

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# Flightfax

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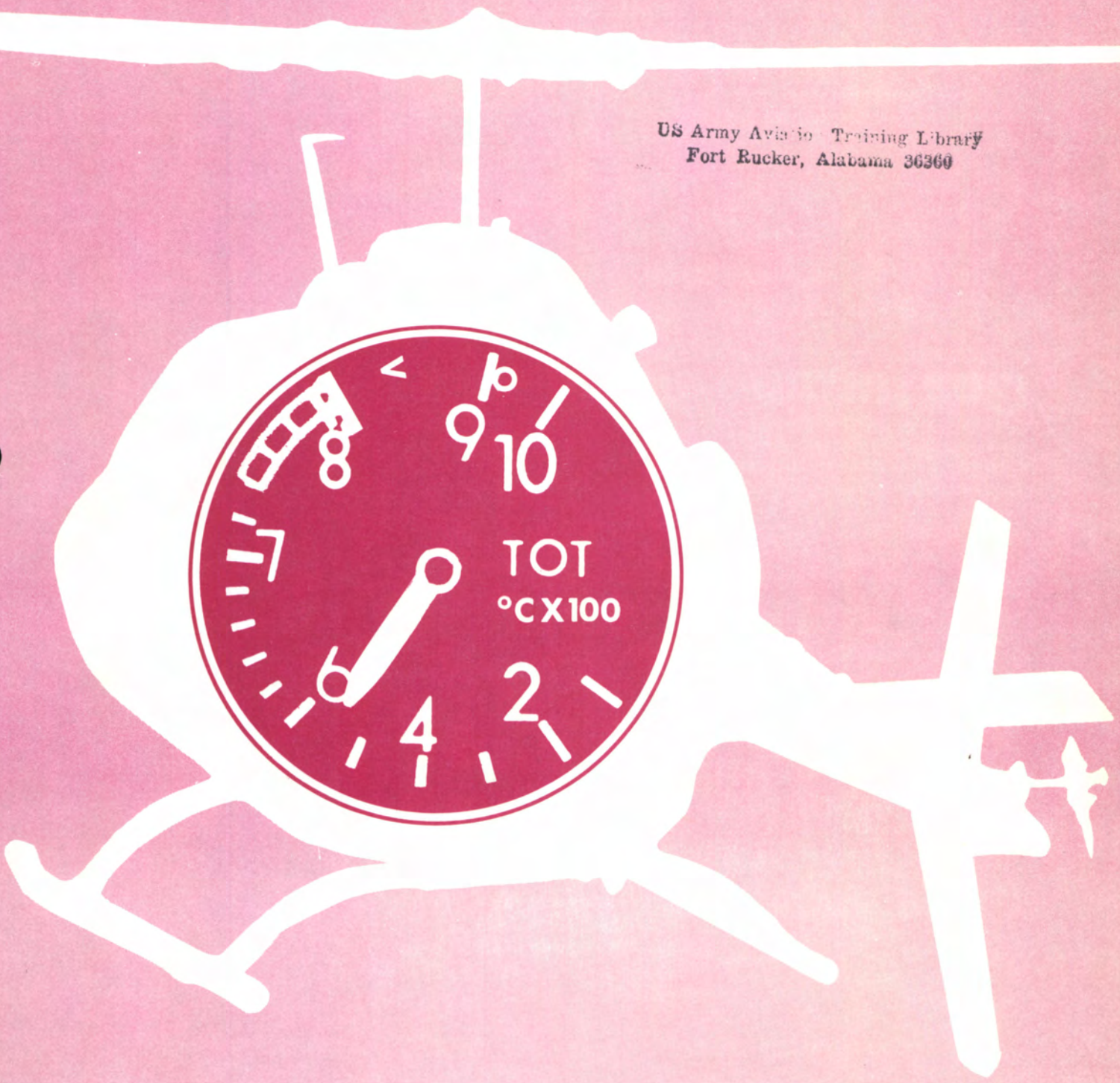
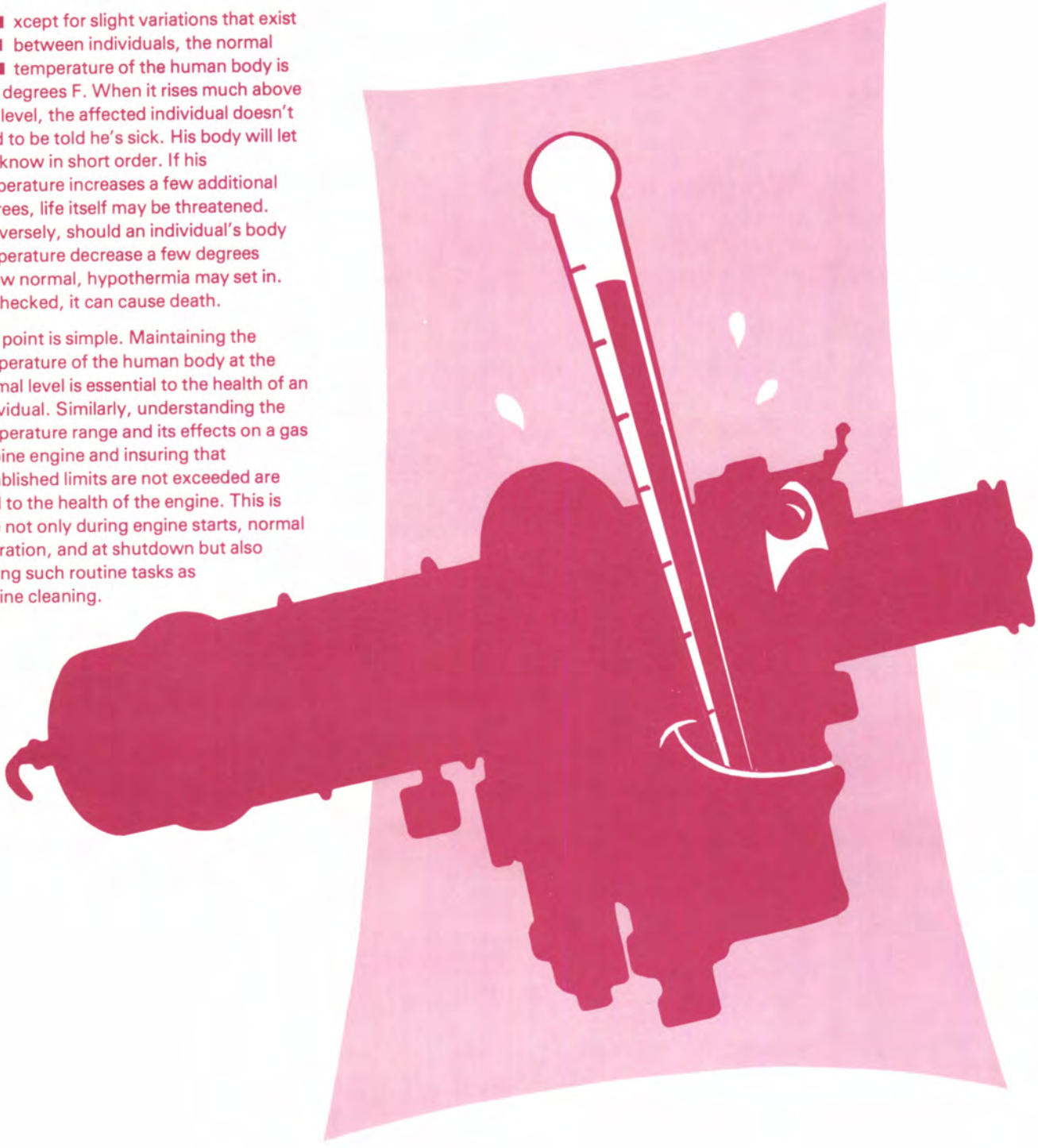


# Temperature — life to a gas turbine engine

Except for slight variations that exist between individuals, the normal temperature of the human body is 98.6 degrees F. When it rises much above that level, the affected individual doesn't need to be told he's sick. His body will let him know in short order. If his temperature increases a few additional degrees, life itself may be threatened. Conversely, should an individual's body temperature decrease a few degrees below normal, hypothermia may set in. Unchecked, it can cause death.

The point is simple. Maintaining the temperature of the human body at the normal level is essential to the health of an individual. Similarly, understanding the temperature range and its effects on a gas turbine engine and insuring that established limits are not exceeded are vital to the health of the engine. This is true not only during engine starts, normal operation, and at shutdown but also during such routine tasks as engine cleaning.



Unlike the relatively constant internal temperature of the human body, that of a gas turbine engine, and of the air flowing through it, changes drastically during the different stages of engine operation. In addition, it varies dramatically from section to section. For example, regardless of the OAT, air entering the engine usually drops in temperature as much as 15 degrees when it reaches the inlet guide vanes. In fact, this is the coolest section of the entire engine and the critical area for ice formation. Consequently, this section is heated by bleed air on all gas turbine engines.

However, airflow from this point on is accompanied by a rapid rise in temperature as it progresses through the compressor. This increase is so dramatic that any water entering the compressor is changed to vapor by the time it reaches the third stage.

At the final stage of compression, air attains a temperature of about 600 degrees F. or nearly three times that at which water will boil. And remember, this temperature is reached before the air enters the combustion chamber. This dramatic rise in temperature is the result of compression and is in accordance with a physical law. In effect, this law states that any time a gas is compressed, its temperature will increase; and any time a compressed gas is released, its temperature will decrease. Both a diesel engine and an air conditioning unit embody these principles in their operation. The diesel engine takes advantage of the first principle to provide ignition while the air conditioner uses the second principle to cool. When you consider the tremendous volume of air that is compressed and moved through a gas turbine engine in a short period of time, you can readily understand the reason for the high temperatures that are generated in the compressor.

Because of this rapid rise in temperature of the air flowing through the compressor, you cannot clean the engine by spraying water or cleaning solution into it while it is being operated on the ground. Neither do you get any cleaning benefit from flying the aircraft through rain. In fact, any attempt to clean an engine by either of these methods will cause more harm than would result if no attempt was made to clean the engine at all.

Water or cleaning solution sprayed into an operating engine will dislodge dirt, oil, and other matter that may have accumulated on the front portion of the engine. This material will then be carried by the airstream into the first stages of the compressor where the water will vaporize. The sediment that remains will be deposited on the smaller high pressure blades and other components downstream of the first stages of the compressor. On inspecting the inlet area of the engine, it will appear to be clean. Consequently, you may be fooled into thinking the entire engine has been cleaned when, in reality, you have simply piled dirt on top of dirt in the aft stages of the compressor and beyond them.

When it comes to cleaning a gas turbine engine internally, you must be careful to observe certain precautions. First of all, make sure the engine has been shut down for at least 45 minutes before beginning cleaning operations. This is to ensure the temperature of all internal components is below 212 degrees F. Since water will boil at this temperature, any water sprayed into a hot engine will vaporize just as it would if the engine were running, and no cleaning will result.

Next, all parts of the cleaning equipment to be used should be inspected for loose clamps, bolts, nuts, and any other foreign objects that might possibly come loose and be ingested by the engine.

*(continued on next page)*

# Gas turbine engine

In addition, before beginning spray operations, the engine inlet should be inspected for grass or hay blockage. If any has accumulated in this area in such a manner as to interrupt the smooth flow of air to the compressor, serious damage can occur to the compressor blades. This can later result in fatigue failure (see TM 55-2840-241-23, par. 12-5, page 12-3 for T63 engines and TM 55-2840-229-24, par. 12-40, page 12-11 for T53 engines).

The liquid dispensing nozzle should now be checked to make certain it is dispensing a spray and not a solid stream. A solid stream of liquid striking the compressor blades—even when the engine is operating at starter cranking speed—will induce cyclic loading of the blades and cause the onset of fatigue failure.

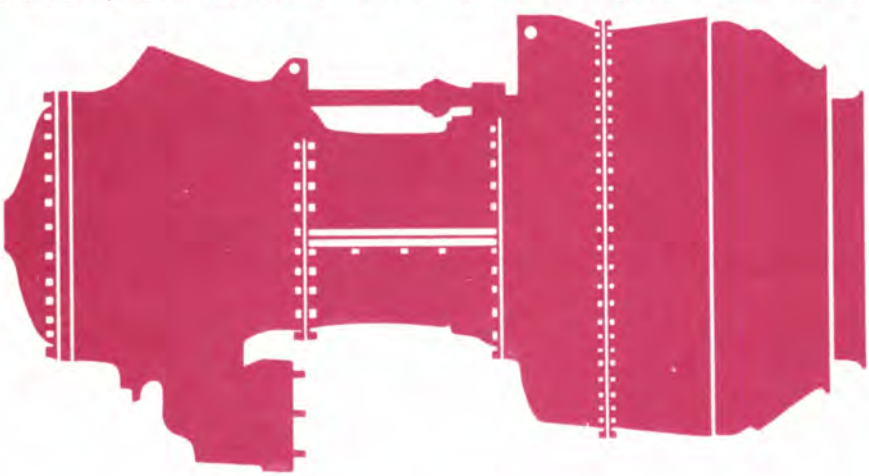
Now you must consider temperature once again. Even if the engine is cold when you begin your cleaning operation, starter cranking speed will raise the airstream temperature in a hurry. In fact, excessive $N_1$ speeds (above 10 percent) will generate airstream temperatures high enough to cause the cleaning fluid to vaporize before it reaches the aft stages of the compressor. Yet, not only must the cleaning fluid reach all stages of the compressor in its liquid state but also the hot end of the engine to do its job there.

Bear in mind that during engine operation, only 25 percent of the air passing through the engine is used for combustion. The remaining 75 percent is used for cooling the hot end components. This cooling air is directed through many small passages, holes, and louvers that are subject to blockage by sand and dirt. If these parts are not kept clean and open, the hot end components will overheat and burn out. The exhaust gas temperature measurement systems (EGT, TOT, TIT, PTIT, etc.) actually measure **gas stream** temperature—not the temperature of the hot end components. Therefore, if cooling air passages are plugged or partially restricted with dirt, the hot end components can overheat and burn away while the exhaust gas temperature indicator shows the gas stream temperature to be within limits.

One final caution: If you are to **start** an engine that is still hot, never motor it in an attempt to cool it to acceptable start limits. Again, the indicator is showing the temperature of the gas stream and not component temperature. Either starting an engine without allowing it to cool in a normal manner or attempting to cool it to a safe start temperature limit by means of the starter will cause parts to warp, rub, and crack. This, in turn, will result in internal air leaks that rob the engine of critically important cooling air. Soon, the engine is out of HIT limits and no amount of cleaning will help. In short, engine components will burn out long before their normal life expectancy.

Temperature, in great measure, represents the very life of a gas turbine engine. The best insurance against premature engine failure lies in giving it proper care. This means keeping it clean and running cool, heating and cooling it slowly in a normal manner, and satisfying the necessary inspection and maintenance requirements. Treat your engine right, and it is not apt to let you down when you may need it the most.

Point of contact at the Safety Center is Jack Carter, AUTOVON 558-3913/3901, commercial 205-255-3913/3901. ■



# Shortfax

## UH-1 indicator disks

Some units are installing incorrect oil level indicator disks in UH-1 90-degree gearboxes. The correct indicator disk for the 90-degree gearbox is NSN 1615-00-975-7131, P/N 204-040-508-9, noun: disk, indicator, oil level. The correct indicator disk for the 42-degree gearbox is NSN 6680-00-580-0724, P/N 204-040-508-1, noun: indicator, sight, liquid.

These disks are not Murphy-proof and can be interchanged. If a 42-degree gearbox indicator disk is installed on a 90-degree gearbox, the 90-degree gearbox will indicate full, yet will be operating in a low oil condition. ■

## Nicad battery inspection

Some units are exceeding nickel-cadmium battery inspection intervals. Organizational preventive maintenance checks and services are required every 30 days or every 25 flight hours, whichever occurs first, and 120 days or every 100 flight hours (or phase maintenance inspection closest to but not exceeding 100 flight hours), whichever occurs first.

The inspection interval starts from the time the mechanic/electrician finishes the battery services and checks, **not when the battery is installed.**

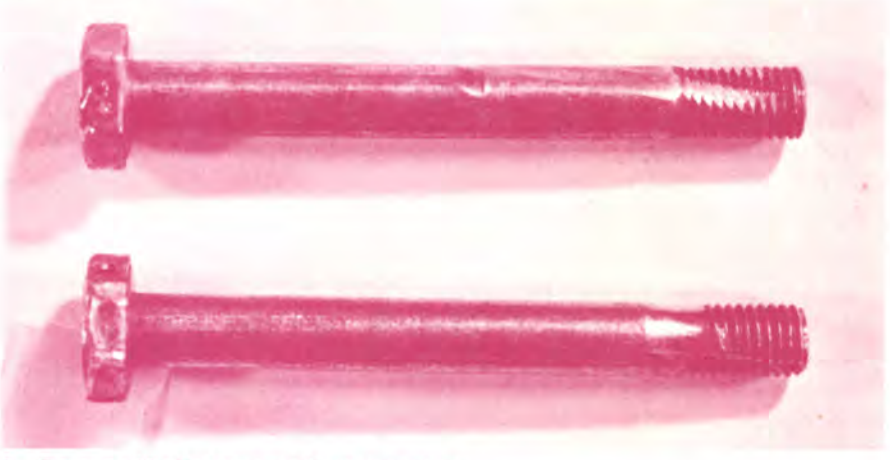
TM 11-6140-203-14-2 contains inspection instructions and intervals for aircraft nickel-cadmium batteries. TM 11-6140-203-14-1 contains general guidance for aircraft and nonaircraft nickel-cadmium batteries.

Point of contact at the Safety Center is SFC Toler, AUTOVON 558-4202/4198. ■

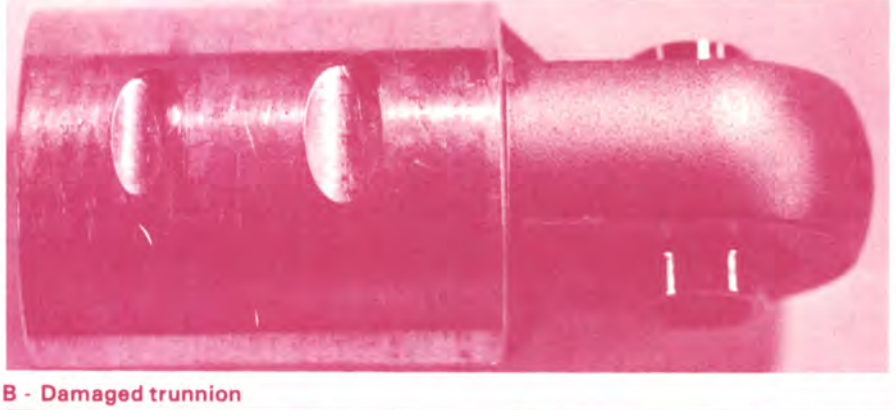
## UH-1 trunnion installed wrong

Another unit recently reported incorrect installation of a UH-1 trunnion assembly. Photo A shows damaged bolts removed from a trunnion located on the outer swashplate. Six flight hours had been logged in the aircraft since replacement of the trunnion before it was discovered that one of the self-locking nuts to the bolts holding the trunnion in place did not have quite enough threads showing through the head of the nut. While the bolt was being replaced, movement of the bolt was impossible. Subsequent inspection revealed that both bolts, trunnion, and swashplate had been damaged during previous installation. Photo B shows damaged trunnion caused by bolt holes and trunnion slots being improperly aligned.

Correct trunnion bearing installation is vital. The procedures and cautions outlined in the dash 23 for removing and installing trunnions must be followed to the letter. If they are not, in-flight failures of these components can result. ■



A - Damaged bolts removed from trunnion



B - Damaged trunnion

# Selected mishap briefs

**uh1** **Class C mishaps** □ (H series) Just before throttle was rolled off during engine shutdown, individual carrying back-type radio walked under main rotor blades. Rotor blade was punctured by radio whip antenna. □ (H series) Main rotor blade hit tree limbs during takeoff from confined area. PIC had directed his attention toward another aircraft, and pilot did not maintain necessary rotor disk clearance from treeline.

**Class E mishaps** □ (H series) Crew chief left cap off after servicing 42-degree gearbox. Pilots did not notice this on preflight and flew for more than 1 hour with cap off. □ (H series) Pilot smelled fumes in cockpit and landed. Caused by failure of main transmission tail rotor output quill seal.

**ah1** **Class E mishaps** □ (G series) Pilot heard rpm audio and saw engine $N_2$ needle drop to zero during takeoff. Caused by failure of engine tachometer generator. □ (S series) During autorotation with turn, rotor rpm increased rapidly during last 80 degrees of turn. Collective was applied initially, but combination of turn and deceleration caused rpm to go to 342. IP was late with corrective action. Aircraft was landing into sun, causing pilot to spend more time looking outside aircraft. □ (TH-1G) Rpm increased to 6800 during flight, and torque decreased to 50 psi. Caused by failure of linear actuator.

**ch47** **Class E mishaps** □ (B series) No. 2 engine $N_2$ fluctuated during HIT check. Caused by failure of $N_2$ actuator. □ (C series) Copilot's No. 2 torque needle began revolving 360 degrees during runup. Caused by failure of torque gauge. □ (C series) Transmission oil hot light came on and transmission oil temperature indicated 150 degrees C. Caused by defective temperature sensing bulb assembly.

**oh6** **Class C mishap** □ During MOC for engine starting problem, when $N_1$ speed passed through 70 percent with throttle at idle stop, maintenance technician closed throttle and shut off engine, which caused rotor to autorotate at about 150 rpm for 3 to 4 minutes. Maintenance officer then got in aircraft to discuss starting problem. Wind gust caused one main rotor blade to hit tail boom.

**oh58** **Class A mishap** □ (A series) Aircraft was being flown in a draw at about 300 feet agl and 60 knots. Pilot initiated 180-degree turn. Before completing turn, aircraft encountered estimated 20- to 25-knot winds from right rear quadrant. Aircraft began to spin uncontrollably to right. Pilot lowered collective full down and applied forward cyclic but control could not be regained and aircraft crashed. 8134

**Class E mishaps** □ (A series) Loud squealing sound was heard during landing. Caused by failure of compressor support bearing. □ (A series) Left passenger door came off as aircraft was flying at 90 knots and 1,000 feet agl. Door had separated from aircraft at jettison point, but door jettison handle safety wire was intact. Door was reinstalled and safetied 82.9 flight hours before mishap. Suspect rollpin was sheared during jettison pin installation but was not noted by technical inspector. It was revealed that some pilots, during preflight, grasped the door near the hinges and moved the door up and down. This allowed jettison pins to pull out if rollpin was broken or jettison handle was not safetied. Suspect this preflight action allowed jettison pins to slowly pull out and rotate cam assembly without moving jettison handle.

**u21** **Class E mishaps** □ (A series) No. 1 engine vibrated and failed to respond to power application during landing. Engine responded after third attempt to add power. Caused by failure of compressor bleed valve. □ (YU-21) Landing gear would not retract after takeoff. Light in gear handle did not extinguish and gear position indicators showed gear in transit. Gear was manually extended and aircraft landed. Inspection revealed spur gear was stripped and would not engage gear motor.

**c12** **Class E mishap** □ (A series) Fuel was seen coming from left auxiliary tank cap after takeoff. Fuel cap was not completely secured.

**u3** **Class E mishap** □ (A series) Oil was seen to be seeping from under top left engine nacelle during climbout. Engine was shut down and landing made. Oil filler cap and gasket were worn and oil cap had come loose. Oil cap and retaining tabs were visually checked before flight but may not have been physically checked for security.

# Maintenance

**uh1** **Class E mishap** □ (H series) Battery began to overheat during flight and fumes and acid were seen coming from battery vents. Battery check was 45 days overdue.

**ch47** **Class E mishap** □ (C series) While waiting for pilots to come to flight line and preflight, crew chief closed covers and cowling but forgot to secure tunnel covers with dzus fastener. Aircraft on next pad was cranked and taxied out. Rotorwash caused two tunnel covers to be torn loose. Small hole was punched in aircraft.

**ch54** **Class E mishap** □ (A series) When IP retarded No. 1 engine to ground idle for practice emergency procedures training, engine stopped. Caused by out-of-adjustment microswitch in $N_1$ lever handle.

**oh58** **Class E mishaps** □ (A series) Hydraulic light came on during hover. Caused by loose cannon plug on hydraulic pressure switch. □ (A series) Fuel boost light came on during flight. Caused by loose electrical connection to fuel boost pump. □ (A series) Engine oil bypass light came on during hover. Oil was leaking from loose B nut on oil line going from accessory gearbox to external engine sump. Nut was not correctly torqued.

**ov1** **Class E mishap** □ (D series) Right main landing gear would not completely retract into wheel well after takeoff. Caused by overserviced landing gear strut.

## Messages received

• Safety-of-flight message concerning one-time inspection of UH-60A gearbox assembly (UH-60A-81-5, 062220Z Apr 81). Summary: A one-time inspection has been requested by the UH-60A prime manufacturer to purge the supply system of any input module assembly free wheel nuts with excessive wear. Any free wheel nuts showing wear up to .060 inch will be inspected within 15 flight hours or 7 days from receipt of this message, with a repeat inspection every 50 flight hours thereafter. Any free wheel nuts showing wear in excess of .060 inch will be replaced immediately in accordance with the instructions in this message. Contact: Earl Parsons, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight message concerning one-time inspection of UH-60A troop/cargo door lower stop (UH-60A-81-7, 062225Z Apr 81). Summary: On three occasions the troop/cargo doors have been forced past the upper door stop while the aircraft was on the ground. To prevent recurrence of this, the upper door stop thickness was doubled. In addition, some UH-60 aircraft have had another stop installed on the lower track. The purpose of this message is to determine by inspection which aircraft have the lower stops installed and to assure that the remaining aircraft have this safety feature incorporated. Contact: Earl Parsons, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight message concerning one-time inspection of UH-60A axial fan (UH-60A-81-8, 062230Z Apr 81). Summary: A number of axial fans (main transmission assembly oil cooler) have been discovered with cracks in the brazing between the hub and bulkhead and/or blades and rotor. The cracks are the result of a processing problem that occurred during manufacturing and are not caused by any operation of the oil cooler fan. However, continued operation of oil coolers with such cracks could lead to an oil cooler fan failure. Fans with cracks less than 50 of the circumference of the hub and/or cracks in the blade brazed area less than 1 inch in cord length can remain in service until the aircraft's next 500-hour periodic inspection. Fans with cracks in excess of the above are to be removed and replaced immediately. Contact: Denise Bouchard, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

# Mishap briefs

- Safety-of-flight maintenance notice concerning an addition in the daily inspection requirements for the UH-1D/H/V and EH-1H Kamatics drive shaft (UH-1-81-05, 101745Z Apr 81).
- Maintenance notice on AH-1 tail rotor drive shaft bearings (AH-1-81-09, 031630Z Apr 81).
- Maintenance notice advising maintenance personnel of CH-47 lubrication changes (CH-47-81-11, 091430Z Apr 81).
- Maintenance notice concerning inspection of the AH-1 pitch link tube (AH-1-81-10, 102030Z Apr 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Urgent TBs and changes

The following urgent technical bulletins and changes have been distributed:

- TB 55-1520-241-20-14, 30 Mar 81, One-Time Inspection of Engine Mechanical Transmission Chip Detector Circuits for CH-47A, CH-47B, and CH-47C Helicopters.
- TB 55-1520-244-20-3, 19 Mar 81, One-Time Inspection of Gear, P/N 1-070-072-3, and Gear, P/N 1-070-062-04, in the Accessory Gearbox on the T53-L-703 Gas Turbine Engines for all AH-1S Helicopters.
- Urgent Change 12, 31 Mar 81, to TM 55-1520-219-PMS, UH-1B Preventive Maintenance Services.
- Urgent Change 4, 6 Apr 81, to TM 55-1510-204-10/4, OV-1C Operators Manual.
- Urgent Change 24, 20 Mar 81, to TM 55-1520-219-20, Organizational Maintenance Manual for UH-1B Helicopter.
- Urgent Change 2, 20 Mar 81, to TM 55-1520-220-23-1, Aviation Unit and Intermediate Maintenance Instructions for UH-1C/M Helicopters. ■

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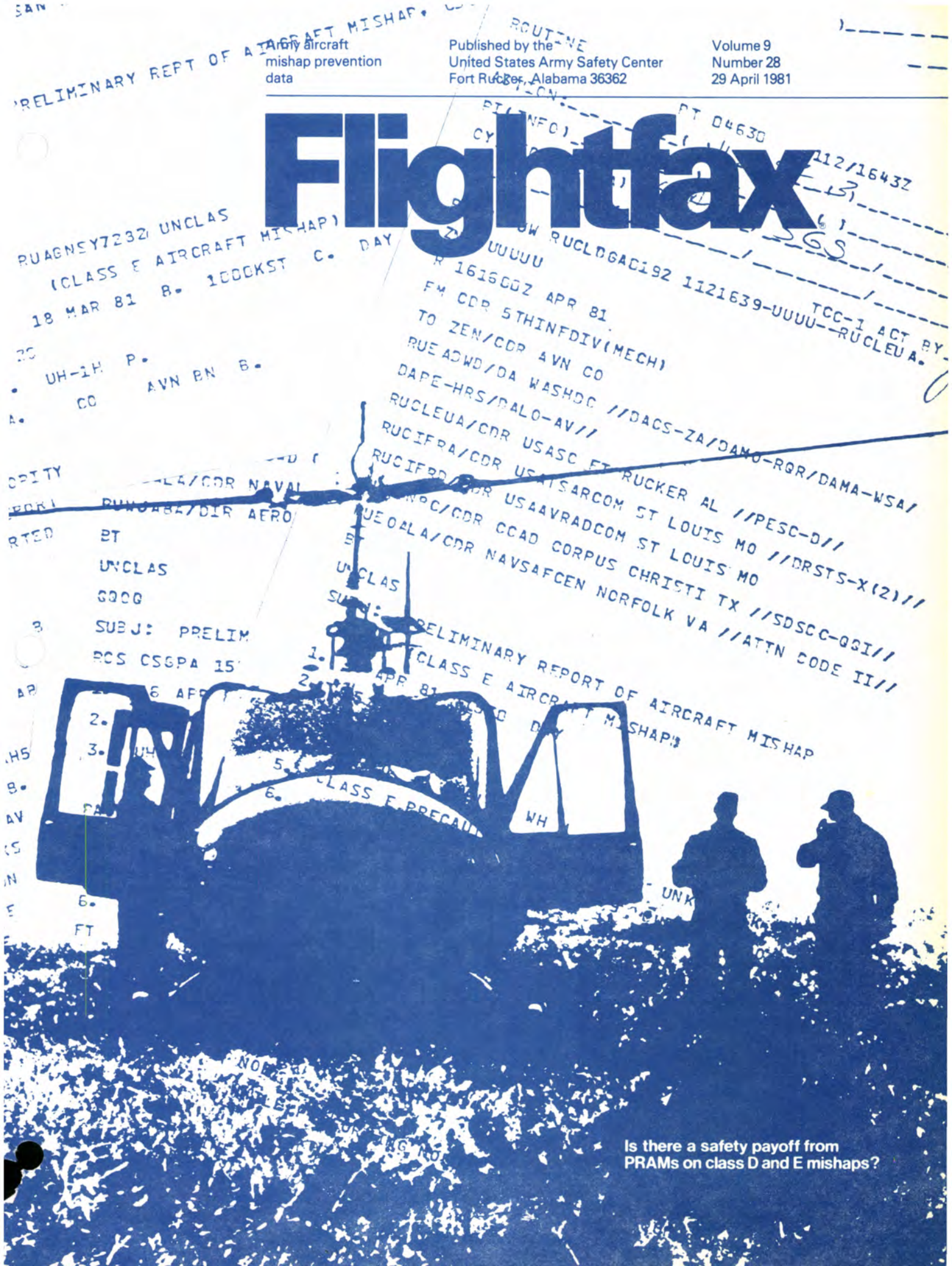


Is there a safety payoff from PRAMs on class D and E mishaps?

# The PRAM paperwork payoff

Is there a safety payoff from PRAMs on Class D and E mishaps? And if there is, does the payoff justify the time and effort spent in reporting these mishaps?

Feedback from the field suggests that many commanders think not. Since the majority of the PRAMs involve precautionary landings with little or no damage and no injuries, commanders feel the reports offer information of little value to the mishap prevention program.

This is understandable considering that the commanders who have to do the reporting rarely see firsthand evidence of any benefit from these PRAMs. What they do see is the almost daily recurring chore of complying with the regulatory requirements for reporting Class D and E mishaps.

But the fact is that PRAMs on Class D and E mishaps are vital from a safety of flight standpoint. This information, when properly recorded and analyzed, points out flight safety problems **before** they kill an aircrew and passengers and destoy an aircraft.

A seemingly isolated and insignificant event in one unit takes on a whole new perspective when combined with similar events Army-wide. This combined PRAM data forms the basis for preventive actions and fixes with a high safety payoff. Consider the following:

• Fifty-five mishaps caused by the malfunction of the mechanical-type double check valve on the OH-58A and OH-6 helicopters were reported. Thirty-one of these mishaps were precautionary landings, 23 were forced landings, and 1 produced significant damage. Based on this, the Safety Center got TSARCOM to reduce the inspection and cleaning interval time of the valve from 150 to 100 hours, and the aircraft were restricted from terrain flight until the problem was corrected by replacing the double check valve with a diaphragm-operated check valve.

• PRAMs pointed up the high failure rate of the shiny and dull brown silent chains for the UH-1 tail rotor pitch change mechanism and brought about the development and installation of the new tail roller chain.

• PRAMs on the malfunction of the UH-1 engine fuel control caused by faulty P1 multipliers, P1 bellows, and T1 bellows led to inspection procedures to locate bad fuel controls. At this time, the TA-25 fuel controls on T53-L-13B engines are being replaced.

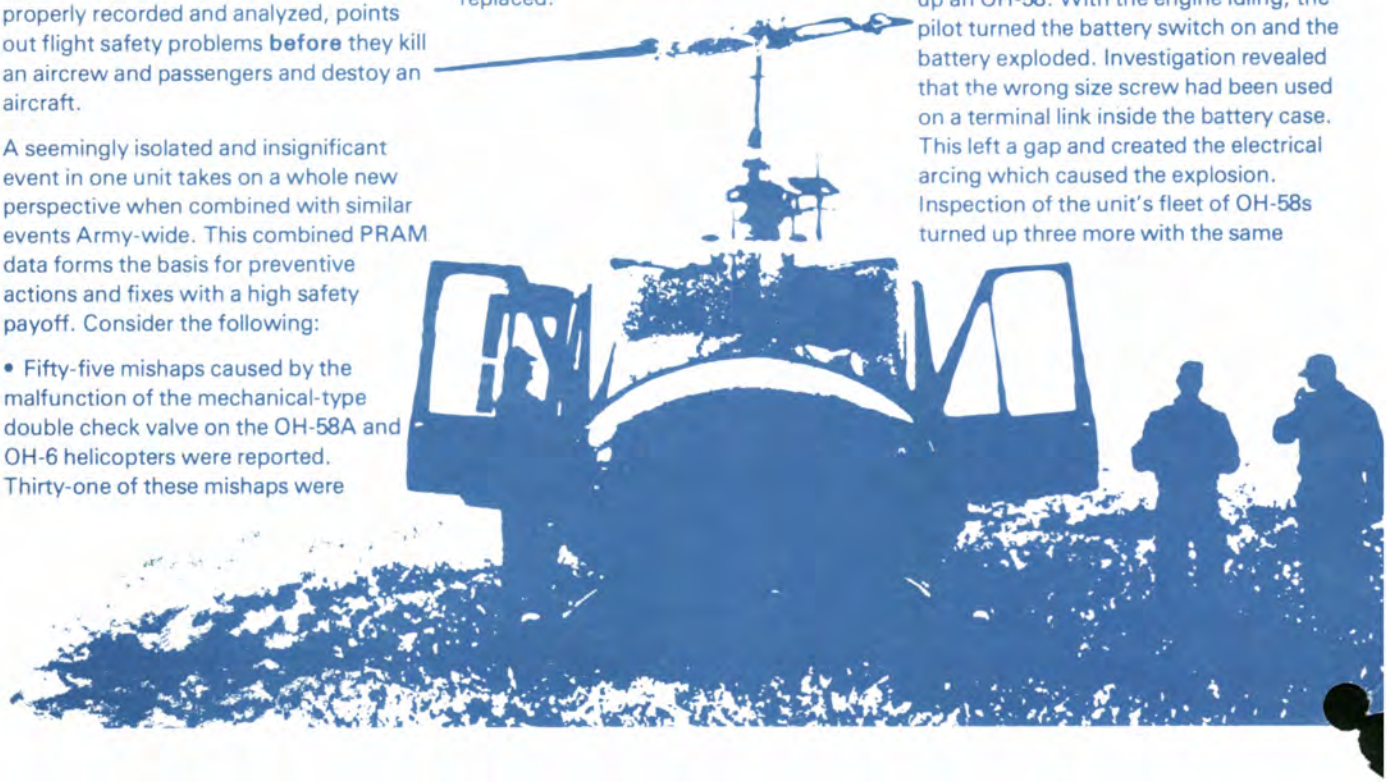
• PRAMS on dual generator shaft failures on the Chinook led to a directive to depot for a 100-percent changeout during overhaul with new parts for the accessory gearbox quill shaft and sprag clutch assembly.

• PRAMs showed a high number of bearing liners in the 10KVA alternator on AH-1S helicopters failing during start and flight. This resulted in the bearings overheating and causing a fire. This PRAM information was used to generate an ECP that corrected the defective parts.

• A flurry of PRAMs from various units reporting C-12 landings with frozen brakes led to the installation of hot wheel kits on the C-12 fleet.

There have been cases where a single PRAM has led to a fix for a worldwide problem.

• A maintenance test pilot was running up an OH-58. With the engine idling, the pilot turned the battery switch on and the battery exploded. Investigation revealed that the wrong size screw had been used on a terminal link inside the battery case. This left a gap and created the electrical arcing which caused the explosion. Inspection of the unit's fleet of OH-58s turned up three more with the same



defect. After receiving a PRAM on this mishap, the Safety Center got with the Communications Electronics Readiness Command and the Troop Support and Aviation Materiel Command to come up with a fix. A safety-of-flight message requiring an immediate one-time inspection of all OH-58 batteries—and the corrective actions required—was sent to the field. Also, this single case led to improvements in the identification of all aircraft parts by part number.

• A single precautionary landing PRAM identified a hazard caused by the length of the lapbelt in the OV-1/RV-1 aircraft. When the lapbelt was pulled snug, several inches of webbing extended from the buckle. This excess length, if accidentally locked in the canopy, could foul an ejection attempt since the lapbelt is part of the pilot's parachute harness and becomes part of the ejection seat when fastened. Based on this PRAM, DARCOM recommended that the excess length of lapbelt be folded and tack-stitched to prevent the possibility of the belt getting caught in the canopy.

Because of the frequency of Class D and E mishaps and the fact that they involve so little damage, their importance to the prevention program gets lost in the routine process of reporting.

But the few cases cited here—and there are many more—where fixes were the result of Class D and E PRAMs clearly show that there is a safety payoff from all the paperwork. The payoff is in lives and aircraft saved, and that's what this safety business is all about. ■

# Getting the 3Ws in your PRAMs

AR 385-40 tells you how to prepare a PRAM but leaves a lot of latitude as to how to describe what happened, what caused it to happen, and what can be done to keep it from happening again. These three items of information—the 3Ws as we call them—are what is needed to get something done about a problem. Most units are doing a good job of telling us what happened, but the last two Ws (what caused it and what to do about it) are usually lacking.

Take this one for instance: "During demonstration of straight-in autorotation with aircraft having high gross weight, AH-1S IP did not use sufficient pitch application to minimize the already fast rate of descent and forward speed, causing a hard landing." OK, we know what happened, but why did it happen? Did the IP lack recent experience in the aircraft? Was he not properly trained? Does the aircraft design make depth and speed perception difficult in autorotations? Did the sloping runway give him misleading visual cues? What can be done about it, either at unit level or Army-wide? Do maneuver guides or IP training need some changes? Do aircraft configuration restrictions for autorotations need to be changed?

As you can see, this PRAM leaves a lot of questions unanswered. Now, here's what we would like to get. "During demonstration of a straight-in autorotation, AH-1S IP did not use sufficient deceleration to slow aircraft's forward speed and aircraft landed hard. IP did not allow for the high gross weight (9,000 pounds) and failed to use sufficient pitch application to reduce the high rate of descent and forward speed because he was relatively inexperienced as an IP (50 hours IP duty) and had not performed this task during the previous 5 weeks. As a result, IP inaccurately estimated his rate of closure and did not take proper corrective action in time to prevent a hard landing. Unit IP training will be upgraded to insure IPs are familiar with the flight characteristics of the unit's aircraft in all weight configurations and flight modes. IP performance, qualifications, and selection will also be closely monitored."

This information could then be broken out in the same 3W mishap reporting format we use for analyzing the more severe mishap reports. This format allows quick identification of what happened, what caused it, and what to do about it. This mishap experience is then combined with worldwide experience and used to identify inadequacies and improvements needed in aircraft, materiel, regulations, field manuals, management, and unit and school training. Lessons learned are disseminated Army-wide. Inadequacies are rank ordered in terms of risk to determine which ones require immediate corrective actions.

In writing PRAMs, it's important to think them through in these terms: what happened—the task error or materiel failure or malfunction; what caused it—the system inadequacies which allowed the error, failure, or malfunction; what to do about it—the corrective actions needed to prevent repeat occurrences. This may take a few minutes longer during PRAM preparation, but it should save some time in the long run by answering all the questions about the mishap before they are asked. ■

# Followups

## Additional information on mishap briefs previously published

**uh1** **Class B mishap** in 20 Aug 80 issue (8057) ☐ Failure of power shaft support bearing caused loss of power about 60 feet agl during confined area takeoff. IP tried to fly backwards into LZ and aircraft turned 720 degrees to right. IP entered autorotation about 10 feet agl, stopping the turn. Aircraft landed left skid low and rolled on left side.

**Class B mishap** in 3 Sep 80 issue (8061) ☐ During termination of practice autorotation with turn, pilot applied excessive, abrupt collective pitch and aft cyclic control. Excessive collective pitch resulted in low rotor rpm condition. As aircraft rocked forward following touchdown, excessive aft cyclic control resulted in main rotor severing tail boom. Pilot was attempting a maneuver he considered to be extremely difficult during what he believed to be his final checkride to obtain operational unit pilot status. IP took corrective action beyond the point of safe recovery.

**Class B mishap** in 22 Oct 80 issue (8101) ☐ Engine stopped at 300 feet agl during climb after takeoff. Pilot turned left away from powerlines and autorotated to plowed field. Aircraft landed hard. Engine stoppage was caused by failure of bearing assembly.

**Class A mishap** in 19 Nov issue (8106) ☐ During hovering autorotation, student pilot applied excessive collective pitch at touchdown, causing aircraft to become airborne again. IP attempted power recovery but was unsuccessful, and aircraft crashed.

**Class A mishap** in 26 Nov 80 issue (8109) ☐ Crew attempted instrument takeoff from ridgeline pinnacle in remote area of mountain. Climb was not established and aircraft descended 300 feet and hit some trees located along a ridge three-tenths of a mile from the point of takeoff. Aircraft was destroyed and all three crewmembers were killed.

**ah1** **Class A mishap** in 22 Oct 80 issue (8102) ☐ Airframe shuddered during flight over water, and pilot turned toward shore. A few seconds later, there was a loud bang. Pilot made a left, nose-low turn. There was no pedal control. Aircraft crashed nose low into the water. Canopy was jettisoned and both crewmembers egressed with no injuries. Aircraft was not recovered. Tail rotor control system may have malfunctioned.

**Class A mishap** in 12 Nov 80 issue (8104) ☐ Engine failed during night VFR flight. Pilot entered autorotation with turn and descended to about 150 feet agl, where he terminated the autorotation. Aircraft

lost all effective lift and fell to the ground. Both crewmembers were killed and aircraft was destroyed. CCAD determined engine was not producing power at time of impact, but cause could not be determined. Pilot did not accurately judge his height above the ground during autorotational descent. Collective pitch was applied and main rotor rpm was bled off to a low state, resulting in loss of areodynamic lift about 150 feet agl. This error in judgment may have been caused by the lack of natural or artificial illumination and lack of recent night autorotation proficiency training. On previous occasions, the searchlight switch would not break the circuit, and the circuit breaker had to be used to turn off the light. Sometime during the mission, the pilot probably pulled the circuit breaker and then was unable to turn the light back on when the emergency occurred. Both aviators were low-time pilots. The pilot had logged about 670 rotary wing hours and the copilot about half that many. Both aviators had a little more than 100 hours in the AH-1S.

**Class B mishap** in 12 Nov 80 issue (8105) ☐ No. 2 hanger bearing failed during night vision goggle training flight. Antitorque control was lost, and underside of fuselage, tail boom, and cross tubes were damaged during landing. Hanger bearing failure was caused by lack of lubrication.

**ch47** **Class A mishap** in 3 Sep 80 issue (8064) ☐ At an estimated ground speed of 20 to 30 knots and altitude of 85 feet agl, with a 500-pound sling load and near maximum available power, pilot turned to fly down mountainside. This placed the aircraft in a downwind/downdraft condition of 20 to 30 knots, which resulted in the need for more power to maintain altitude than was available. When ground contact became inevitable, aircraft was turned upslope into the wind. On impact, aircraft ascended vertically to 50 to 75 feet agl. Pilot reduced thrust to stop ascent which allowed rotor rpm to continue to build and caused aircraft to momentarily come to an unstable hover. In this flight mode, pilot again turned aircraft to take off downwind and downslope with less than normal operating rotor rpm to reach a suitable landing area on the valley floor. In this critical flight condition, aft rotor system ceased to produce enough lift to maintain flight, and the aircraft crashed.

8057

8068

**oh58** **Class A mishap** in 1 Oct 80 issue (8068) ☐ As aircraft was flying about 10 feet agl toward moving jeep, tail rotor blade hit antenna of jeep, causing tail rotor blade separation. Aircraft yawed right, crashed, and came to rest on right side. Pilot, who was killed, incorrectly estimated distance to and rate of closure with jeep. Mission did not require such a maneuver.

**Class A mishap** in 19 Nov 80 issue (8107) ☐ Loud bang was heard and engine failed as aircraft was flying at 30 knots and 35 feet agl. Aircraft crashed in a level attitude and rolled on right side. Cause of failure of the third-stage compressor section could not be determined. ■

# Shortfax

## Ground wires for safety

You don't need to be reminded of the importance of grounding aircraft and other equipment, especially during hangar or shop maintenance as well as during servicing operations. However, there is another hazard commonly associated with ground wires that is seldom considered. Oddly enough, it results from their proper use—not from failure to use them. This safety hazard is posed by the ground wires themselves.

In certain applications, failure to disconnect and remove ground wires before equipment is repositioned or operated can result in damage to the equipment, to the ground wires themselves, and even to nearby personnel. Also, personnel working around aircraft and other properly grounded equipment can be injured by accidentally running into these wires or tripping over them.

**Use of yellow-coated ground wire invites attention and helps reduce the possibility of personal injury and damage to equipment.**

One way to help counteract this hazard is to see it. And one way to help see it is to make it more visible. Currently, ground wire coated with a highly visible yellow plastic insulation material is available. It is listed as Rope, Wire, NSN 4010-00-286-2681; and the unit cost is $110.67 per 1,000 feet.

To help enhance personal safety as well as that of equipment, it is recommended that as present supplies of ground wire are depleted or as ground wires become worn or damaged, they be replaced with the yellow-coated variety. ■

## ALSE school update

The ASI-producing course for ALSE maintenance personnel has been approved and details are presently being finalized. The course, culminating in the award of the "Q2" ASI, will be 5 weeks in length and taught exclusively by Army personnel at the U.S. Army Transportation School, Fort Eustis. The target audience for the course will be personnel with the 67-series MOSs only, in grades E4 and E5.

Personnel already trained in ALSE maintenance via the Air Force or Navy life support schools are eligible for award of the "Q2" ASI now, under the provisions of Change 15 to AR 611-201 (Enlisted Career Management Fields and Military Occupational Specialties) dated 15 February 1981. ■

## Check your UH-1 master caution panels

Master caution panels installed on some UH-1s are not the correct ones. To insure that the correct panel is installed on your aircraft, you must first identify the aircraft by serial number, then turn to page 1063 of TM 55-1520-210-23P2 to locate the applicable "wiring installation." Next, turn to pages 1076 and 1077. Now you must match the wiring installation to the correct "caution panel assembly."

Example:

UH-1D 65-9687
Page 1063: Use P/N 205-075-018-1

Page 1077: Use P/N 204-075-705-19
interchangeable with
4408-100-19
NSN 1680-00-915-5869
interchangeable with
1680-00-904-2442

Be sure you have the correct master caution panel because of the incompatibility of wiring resistance and the numerous changes in caution segment wording. There are 19 different wiring harnesses for UH-1s.

**Thanks to CW3 Harold Hintze, 3d ACR, Fort Bliss, for this info.** ■

# Selected mishap briefs

**uh1** **Class E mishaps** □ (H series) Fire warning light came on during takeoff. Caused by failure of control alarm box. □ (H series) Crew smelled fumes after takeoff. Caused by broken fuel transfer line. □ (H series) Egt indicated zero after takeoff. Caused by failure of connector adapter. □ (H series) Transmission hot light came on during flight. Caused by failure of thermostatic switch. □ (EH-1H) Crew heard two loud bangs and rumble from engine compartment during hover. Caused by engine compressor stall.

**ah1** **Class C mishap** □ (S series) During tactical maneuver about 60 feet agl in river valley, pilot made shallow left turn at 50 to 60 knots. Front windscreen hit two wires. Hole was knocked in windscreen.

**ch47** **Class C mishap** □ (C series) Shortly after takeoff, pilot received call that object was hanging from left side of aircraft. Left aft work platform had torn from hinge. Forward latch on platform may have been left open.

**Class E mishaps** □ (C series) APU speed decreased during engine start. Pilot released start push button and APU completely shut down. Flight engineer reported hydraulic leak from line leading to hydraulic oil cooling fan. Adapter tube leading to utility hydraulic cooling fan had cracked. □ (C series) No. 2 engine chip detector light came on during hover check. Caused by failure of No. 6 and No. 7 power output shaft bearing. □ (B series) High frequency vibrations in No. 1 engine during runup were caused by out-of-balance engine drive shaft.

**ch54** **Class E mishap** □ (A series) First attempt to start No. 2 engine was aborted because of no ignition. During second attempt, it was noted that ignition circuit breaker on No. 2 engine had pulled. Spilled fuel around engine ignited as engine started. Aircraft was shut down while crew chief extinguished fuel fire. Pulled circuit breaker was overlooked during cockpit check.

**oh58** **Class E mishaps** □ (A series) After leaving forward area refueling point and hovering to designated parking location, aircraft was maneuvered into downwind configuration. Power necessary to accomplish downwind hover resulted in TOT indication of about 800° C. for 15 seconds. Terrain and wind condition were not suitable for immediately setting the aircraft down or getting out of the downwind configuration. □ (A series) $N_1$ gauge needles moved to zero during hover taxi. Caused by internal failure of $N_1$ tachometer generator.

**c12** **Class E mishaps** □ (A series) No. 2 engine torque dropped from 97 percent to 20 percent and prop rpm dropped from 2000 to 600 during takeoff. Caused by failure of engine oil pump. □ (A series) Copilot felt incorrect response in rudder pedals during takeoff roll and aircraft yawed to left. Caused by failure of shutoff valve.

**ov1** **Class E mishaps** □ (D series) No. 1 engine oil pressure gauge became erratic during flight. Visual check of engine revealed substantial flow of oil streaming from all parts of engine cowl at latch seams. Failure of bearing in generator caused splined shaft to shear. Western gearbox and hydraulic pump were damaged. □ (RV-1D) During climb, technical observer complained of stomach pains and nausea. Pilot noticed that TO had signs of hypoxia and that he was still on normal oxygen. Pilot told TO to select 100 percent oxygen and mission was continued. Requirement for prebreathing was not complied with.

**u8** **Class C mishap** □ (F series) While throttle was being advanced to 34 inches of manifold pressure, aircraft hit unforecast turbulence, causing pilot to inadvertently move throttle to about 45 inches of manifold pressure. This caused overboost of both engines.

**t42** **Class E mishap** □ Fuel was seen coming from around filler cap of main tank on right wing. Filler cap had been inspected and secured on preflight but did not seal properly.

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishaps** ☐ (H series) Compressor stall occurred as power was increased during engine response check portion of maintenance test flight. Caused by out-of-rig inlet guide vanes. ☐ (H series) Transmission oil pressure fluctuated between 40 and 60 psi during before-takeoff check. Caused by failure of locally manufactured hose assembly.

**uh60** **Class E mishap** ☐ No. 2 engine oil pressure dropped below normal operating range. Incorrectly secured oil filler cap had vibrated loose.

**ah1** **Class E mishap** ☐ (S series) During refueling operation, pilot noticed oil on side of aircraft and on pad. Opening transmission door, pilot saw large amount of transmission oil. Maintenance checked internal transmission oil filter and found small tear in O-ring.

**oh58** **Class E mishaps** ☐ (A series) During flight, IP initiated hydraulic-off procedure by turning hydraulic switch to off position. All systems reacted normally for 1 minute, then segment caution light went out and hydraulic power restored itself. Hydraulic power could not be turned off manually. Oil on hydraulic solenoid valve caused electrical shortage. Hydraulic system had just been flushed for scheduled maintenance and oil was spilled on solenoid. ☐ (A series) Crew chief incorrectly installed collective/throttle controls at copilot's station. This caused aircraft to bleed off rotor and engine rpm as pilot tried to lift aircraft to hover.

**u21** **Class E mishap** ☐ (A series) During engine runup, HIT check for No. 1 engine indicated plus 50. Caused by loose ITT harness at engine interior terminal.

### Messages received

- Safety-of-flight message concerning one-time inspection of UH-60 gearbox assembly (UH-60A-81-9, 151605Z Apr 81). Summary: Since message UH-60A-81-5 was issued, several questions have arisen regarding inspection frequencies. This message clarifies inspection frequencies based on the amount of wear on the free wheel unit nut tangs. Contact: Dennis Schumacher, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.
- Maintenance notice on OH-58A jet assembly bleed valve removal (OH-58-81-03, 141920Z Apr 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# "T" is for thunderstorms

As it appears in caps, the letter "T" is symbolic of an ancient cross. To the modern aviator, it is a cross he must bear, especially during the hot, humid months of summer. That cross, of course, relates to thunderstorms and turbulence that prevail during this season of the year.

One source estimates that about 44,000 thunderstorms churn daily over the earth's surface, and at least 1,800 of these are in progress at any given moment. These thunderstorms may be either airmass or frontal type. While airmass thunderstorm cells usually build up over land during the heat of the day and break up in the early afternoon or evening, either airmass or frontal type thunderstorms may be encountered at any time. And their incidence increases during the summer months.

Since no aircraft can withstand the full impact of tornadic forces often generated by thunderstorms, avoidance is the best policy. With all the facilities such as weather forecasts, advisories, special advisories, pilots' reports and radar coverage available to the pilot, coupled with alert flying on his part, the chances of accidentally flying into a thunderstorm are almost nonexistent.

Nature provides numerous clues to warn of impending thunderstorms. Clouds themselves can often serve as effective signposts. When billowy white "puffs" begin to increase in number and size, take heed. These clouds can change in form and become cumulonimbus, with varying degrees of turbulence, rain, lightning, and, sometimes, hail. A towering cumulus can change into a raging thunderstorm in just a few minutes. Excessive radio static may also indicate the approach of a storm.

One positive sign of a thunderstorm is the squall or roll cloud that extends downward from the main base of the storm. This highly turbulent cloud is located along the front and bottom of a violent thunderstorm. Its appearance means plenty of severe weather lies within the storm. An aircraft flown too close to the roll cloud could be inadvertently hurled into the storm. The possibility of this happening is greatest at night or when the roll cloud is hidden behind other clouds surrounding the storm. While radar can provide the pilot with a picture of what lies ahead, it is important to remember that clear air outside the clouds can contain severe turbulence that even radar cannot detect.

Storms that are scattered can generally be circumnavigated. However, no attempt should be made to climb over, slip under, or penetrate a solid squall line. Bear in mind that **no procedures exist**

**that can guarantee safe flight through a thunderstorm**, including those found in the operators manual for any given type of aircraft.

In addition, gusty surface winds and downdrafts that precede a thunderstorm can be exceptionally violent and have caused fatal mishaps. Trying to take off or land when a thunderstorm is approaching an airfield is an extremely hazardous practice.

When faced with deteriorating weather during flight, deciding the best course of action is not always easy. Can you safely circumnavigate the storm? Should you land at an alternate airfield? Or should you turn back? One important criterion that can help you reach the right decision is to ask yourself whether or not a decision to continue flight would rely, in part, on the element of chance to insure your safety. If the answer is yes, then you had better make another decision. And the importance of your decision cannot be emphasized too strongly. If you are to head for an alternate field or make a 180-degree turn, the time to do it is before you become caught inside a storm. Once trapped, you are committed to continue. There is no turning back.

Although turbulence caused by thunderstorms is the most violent variety, that associated with heat and terrain should not be overlooked. Heated air rises in the form of thermals, drawing cooler air along the ground. Air "boils" and "bubbles" as it flows over hills and hits peaks and ridges. While under normal conditions, turbulence is little more than an added irritation; when teamed with high density altitude, it can result in a combination hazardous to flight safety.

Anticipating this kind of turbulence and knowing where you are most likely to encounter it can keep you on guard. Areas bare of vegetation, hilly or broken terrain, and an abrupt change from one kind of terrain to another all lend themselves to turbulence. Waving branches, smoke trails, and blowing dust serve as positive indicators that the air below is acting up. When it comes to summer flying and the turbulence often associated with it, you should remain constantly alert. Forewarned, you are less likely to run into trouble. ■

# Selected mishap briefs

**uh1** **Class E mishaps** ☐ (H series) Master caution and right fuel boost lights came on after takeoff. Caused by failure of submerged pump. ☐ (H series) Needles would not split during simulated forced landing. Caused by malfunction of dual tachometer. ☐ (H series) Crew noticed fumes coming from top battery vent during flight. Caused by thermal runaway.

**uh60** **Class C mishap** ☐ Student pilot was completing run-on landing to stagefield lane. Aircraft touched down on tail wheel, with nose slightly left of center line. IP took control and applied collective and aft cyclic to take pressure off of tail wheel. As aircraft came to a hover, it began a turn to the right. As turn increased in speed, IP applied full left pedal. Turn continued and IP elected to land. Tail wheel separated from aircraft on touchdown.

**Class E mishaps** ☐ On final at about 50 feet agl, passenger tried to open troop cargo door but instead pulled window jettison handle. Window jettisoned and fell to ground. ☐ Stabilator failed to program in automatic mode during takeoff. Caused by defective linear servo accelerator.

**ah1** **Class C mishap** ☐ (G series) Left skid hit ground hard during night approach to LZ. Aircraft pitched nose down and right. Pilot leveled aircraft, made go-around, and landed. LZ was lit by one beanbag light. Approach path had slight downwind condition.

**Class E mishaps** ☐ (S series) Master caution and No. 2 hydraulic lights came on during hover. Running landing was made. Caused by failure of hydraulic pressure switch. ☐ (S series) D.c. generator failed during flight. Caused by malfunction of electromagnetic relay. ☐ (S series) Copilot in rear seat was engaging targets with direct fire. Scout directed copilot to remask. After initiation of remask maneuver, FAC told copilot to reengage targets. During resulting abrupt maneuver, copilot saw torque reach 59 psi. Trunnion bolts were replaced.

**ch47** **Class E mishaps** ☐ (B series) Thrust rod magnetic brake failed during flight. Caused by malfunction of thrust switch. ☐ (C series) No. 2 engine chip detector light came on during approach. Caused by internal failure of engine. ☐ (B series) $N_1$ gave no indication during runup. Caused by failure of tachometer generator.

**oh58** **Class E mishaps** ☐ (A series) During hydraulics-off maneuver, crew noticed collective lever was excessively stiff. Caused by failure of hydraulic servo actuator. ☐ (A series) IP was demonstrating engine start from left seat. TOT exceeded 749° C. for more than 10 seconds. IP's thumb snagged in shirt sleeve cuff, causing delay in executing proper emergency procedures. ☐ (A series) Pilot landed at field site. When passenger exited front seat, aircraft rocked aft. Pilot made rapid cyclic input to keep aircraft level. Pilot suspected spike knock and shut down. Spike knock had occurred, but no further damage was found. Pilot did not assure aircraft was level and stable before passenger exited. Cyclic input may have been excessive. ☐ (C series) D.c. amp gauge went from 20 amps to 130 amps during landing. Vapor and fluid were seen coming from battery vents. Caused by bad cell in battery.

# Summer Forecast

# Beware

U.S. ARMY SAFETY CENTER MAY 1981

# Maintenance

**ah1** **Class E mishap** □ (S series) Master caution and transmission oil pressure lights came on during climbout. Wiring was found frayed and shorting out on No. 1 hydraulic pump drain line. Wires were incorrectly positioned.

**ch47** **Class E mishap** □ (C series) During runup after phase inspection, pilots noticed a.c. beep trim was mushy on pilot's thrust control rod. Electricians removed thrust rod and changed beep trim switches. Thrust rod was replaced. As aircraft was being run up for MOC, when engine condition levers were removed to flight, rotor rpm rapidly increased to 262 before condition levers could be brought back to ground. Cause of overspeed was shorted wire in No. 1 and 2 beep switch on pilot's thrust stick. No. 1 beep switch on same thrust stick was wired backwards. These were the switches the electricians had replaced.

**oh58** **Class E mishaps** □ (C series) Amperage rose to 125 amps during flight. Battery switch was placed in off position and ammeter indicated decrease. Caused by internal failure of battery. Service had been performed on battery 3 days before and two bulged cells were found. Battery had been in service 36 months without any cell changes. Cells were not torqued correctly. □ (A series) Master caution light and tail rotor chip detector light came on during approach. Caused by frayed wire on cannon plug to chip detector light.

**ov1** **Class C mishap** □ (C series) During MOC on engine following hot-end inspection, fuel began seeping from fuel manifold nut and sprayed on exterior fire extinguishing system and fire bottle. Torque setting on fuel manifold nut was probably incorrect.

**u21** **Class E mishaps** □ (A series) When gear was lowered, left main gear light did not come on. Aircraft was flown to airfield and gear was manually extended en route with same indication. Low pass was made by tower, and gear appeared to be down. Aircraft was landed without further incident. One wire in wire bundle was cut by down-lock pins about 5 inches from switch because of excess length of wire between clamp and switch. □ (YU-21) Left main landing gear would not indicate down and locked during descent. Light was on in gear handle and gear warning horn sounded when power was reduced. After several attempts to recycle gear to obtain safe indication, emergency procedures for manual extension were followed and gear indicated down. Caused by incorrectly rigged landing gear system.

## Messages received

• Safety of use one-time inspection message concerning inspection and replacement of split retainers in rescue hoist assembly (GEN-81-04, 231500Z Apr 81). Summary: Some split retainers installed in hoists which are designed to function as mated pairs and are used together to retain the swedge ball/hoist cable in the cable hook assembly are dimensionally discrepant. Inspection of fielded hoists has revealed retainers which do not match and, therefore, do not provide a smooth continuous spherical cavity to properly retain the swedge ball. Technical evaluation and tests indicate no immediate hazard, but continued use could cause fatigue damage to the swedge ball and cable and eventual failure. Contact: W.W. Lake, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

• Safety-of-flight maintenance notice concerning UH-60A troop/cargo door track and track wear strips (UH-60A-81-10, 222119Z Apr 81). Summary: If a sortie is initiated with the troop/cargo doors open, the doors are required to remain open for the duration of the sortie. If a sortie is initiated with the troop/cargo doors closed, the doors are required to remain closed for the duration of the sortie. The doors will not be opened or closed in flight except in emergency. Contact: Earl Parsons, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

*(continued on next page)*

# Mishap briefs

• Safety-of-flight maintenance notice for UH-60A elastromeric gimble mount (UH-60A-81-11, 222119Z Apr 81). Summary: The allowable depth and length of elastomeric bond separation has been increased beyond that specified in change 9 to TM 55-1520-237-23-4. Contact: Frank Hunleth, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Maintenance notice concerning removal of main rotor blades from AH-1 helicopters (AH-1-81-12, 231510Z Apr 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Urgent change

Urgent change 5, dated 1 April 1981, to TM 55-1520-228-CL for OH-58A has been released. ■

# From National Transportation Safety Board

On June 12, 1980, a Swearingen SA-226 Metro crashed near Valley, Nebraska, killing 13 persons and seriously injuring 2 others. The aircraft encountered an area of severe thunderstorms while at an altitude of less than 6,000 feet and lost power to both engines because of massive water ingestion. During its investigation of the accident, the National Transportation Safety Board found numerous deficiencies in the implementation of air traffic control procedures which affected the acquisition of weather data and the dissemination of that information to sector air traffic controllers and pilots. The Safety Board also discovered that the capabilities of airborne weather radar on the aircraft to detect severe weather echoes were limited significantly by rain-induced two-way attenuation, but that the pilots were probably not aware of the reduced capability of the radar.

The thunderstorm activity had been in the vicinity of the accident site for several hours, and a severe storm warning had been issued for the Omaha area. The meteorologists in the Minneapolis Air Route Traffic Control Center (ARTCC) had alerted supervisory air traffic control personnel of the severity of the weather conditions at various times before the accident; however, that information was not disseminated to the controllers or to the flight crew. Furthermore, the two team supervisors and the two flow control/weather coordinators did not determine if the severe weather was affecting the air traffic in the low-altitude sectors, although the flow controllers had acknowledged that the high-altitude traffic was rerouted because of the thunderstorms.

The Safety Board is concerned since adequate personnel, procedures, and units were available to provide adequate ATC services to the flight crew. However, the weather information that was critical to the sector controllers was not passed by the ATC supervisors, who assumed that other supervisors had passed the information along. In addition, the four supervisors were not in agreement regarding the responsibilities for assessing the impact of severe meteorological conditions on low-altitude air traffic flow. Finally, one weather coordinator indicated that he was not trained properly to fulfill the weather coordinator duties.

The aircraft separation requirements of the ATC system were also examined during the investigation. Controllers and air traffic control supervisors testified at the public hearing that the air traffic system was not required to separate aircraft from hazardous weather conditions. The Safety Board agrees that the avoidance of hazardous weather conditions is a pilot responsibility. However, the future ATC system should consider the feasibility of actively separating aircraft from known meteorological conditions when adequate weather intelligence exists. We urge the Federal Aviation Administration to undertake an experimental program to analyze and evaluate the technical and operational feasibility of the ATC system providing separation between aircraft from severe meteorological conditions.

The Safety Board is also concerned by the limitations of airborne weather radar. Testimony at the public hearing indicated that the capability of the aircraft radar was limited severely by rain-induced two-way attenuation. Based on the circumstances existing at the time of the accident, the attenuation limited the range of the radar set in contour mode to about 15 miles in moderate rainfall and to about 1 mile in heavy precipitation. Consequently, the flight crew, which probably depended on the airborne radar to avoid the strongest weather echoes, had no way to determine the location or the intensity of the weather echoes ahead of the aircraft until they were too close to avoid the hazardous conditions. The Safety Board believes that further study on the effects of attenuation is required and that airline and general aviation training programs must be changed to provide additional information to pilots about the effects of attenuation on X-band airborne weather radar. . . . ■

# Recap of TSARCOM and AVRADCOM messages

Following is a list of AIG 8881 addressed messages transmitted by TSARCOM and AVRADCOM from 1 January through 31 March 1981.

**OV-1-81-01** Maintenance notice for OV-1/RV-1D T53-L-701 and T53-L-701A engines primary planetary bearing change and oil analysis program

**OV-1-81-02** Technical one-time inspection for all OV-1/RV-1 series aircraft, actuator mechanical trim for loose ends

**OV-1-81-03** Change to safety-of-flight message on one-time inspection for all OV-1B, OV-1C, OV-1D, and RV-1D series aircraft fuel systems for contamination

**CH-47-81-01** Safety-of-flight maintenance notice concerning changes to operating procedures for CH-47 aircraft with T55-L-11 engines

**CH-47-81-02** Maintenance notice advising maintenance personnel of a revision to TB 55-1520-241-30-1

**CH-47-81-03** Safety-of-flight message on one-time inspection of CH-47 T55-L-11ASA engine variable inlet guide vanes

**CH-47-81-04** Maintenance notice advising maintenance personnel of CH-47 overhaul and retirement schedule changes

**CH-47-81-05** Maintenance notice advising CH-47 users of a change to MWO 55-1520-241-30-4

**CH-47-81-06** Maintenance notice advising maintenance personnel of CH-47 fire extinguisher cartridge retirement schedule change

**CH-47-81-07** Maintenance notice advising maintenance personnel of CH-47C overhaul and retirement schedule changes

**CH-47-81-08** Safety-of-flight message on one-time inspection of CH-47A/B/C aircraft engine mechanical transmission chip detector circuits

**CH-47-81-09** Safety-of-flight maintenance notice concerning change to operating procedures for CH-47 aircraft with T55-L-7 and -11 engines

**CH-47-81-10** Maintenance notice advising CH-47 users of MWO 55-1520-241-50-1 and MWO 55-1520-241-30-4 application schedule

**CH-54-81-01** Maintenance notice advising maintenance personnel of CH-54 tail rotor balancing procedures

**CH-54-81-02** Maintenance notice advising maintenance personnel of CH-54A transmission support fitting inspection procedures

**OH-58-81-01** Maintenance notice on OH-58A jet assembly bleed valve removal

**OH-58-81-02** Maintenance notice on OH-58A and C tail rotor rigging instructions

**AH-1-81-01** Maintenance notice to provide information on the AH-1S modernized fire control system

**AH-1-81-02** Maintenance notice conerning information on AH-1 ground handling wheels

**AH-1-81-03** Maintenance notice on the AH-1 engine tail pipe ejector

**AH-1-81-04** Maintenance notice concerning the ultrasonic inspection of 540 main rotor blades

**AH-1-81-05** Maintenance notice on use of AH-1 ground handling wheels

**AH-1-81-06** Safety-of-flight message on one-time inspection of T53-L-703 engines

**AH-1-81-07** Maintenance notice on AH-1 receiver-transmitter antenna

*(continued on next page)*

# Recap

**AH-1-81-08** Technical information message for all AH-1S aircraft having short bolts installed on the T53-L-703 engine which connects the fuel control temperature compensating bellows to the inlet housing

**AH-1-81-09** Maintenance notice on AH-1 tail rotor drive shaft bearings

**UH-1-81-01** Maintenance notice concerning ultrasonic inspection of 540 main rotor blades

**UH-1-81-02** Maintenance notice on center frame assembly

**UH-1-81-03** Safety-of-flight maintenance notice concerning change in daily inspection requirements for UH-1 tail rotor blades

**UH-1-81-04** Safety-of-flight operational changes to operational use of noncrashworthy auxiliary fuel tanks

**GEN-81-01** Maintenance notice message on low return rate of unserviceable submerged electric fuel boost pumps

**GEN-81-02** Rezeroing of aircraft altimeters, three pointer type and counter drum pointer type

**U-21-81-01** Incorrect wiring of the fuel level transmitter in RU-21H aircraft

**UH-60A-81-1** Inspection of troop/cargo door and upper and lower tracks

**UH-60A-81-2** Safety-of-flight message maintenance notice on main rotor blade tip cap screws

**UH-60A-81-3** Safety-of-flight message maintenance notice on main rotor blades

**UH-60A-81-4** Safety-of-flight message concerning one-time inspection of troop/cargo door stops

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Addresses requiring copies of messages should contact their next higher headquarters. ■

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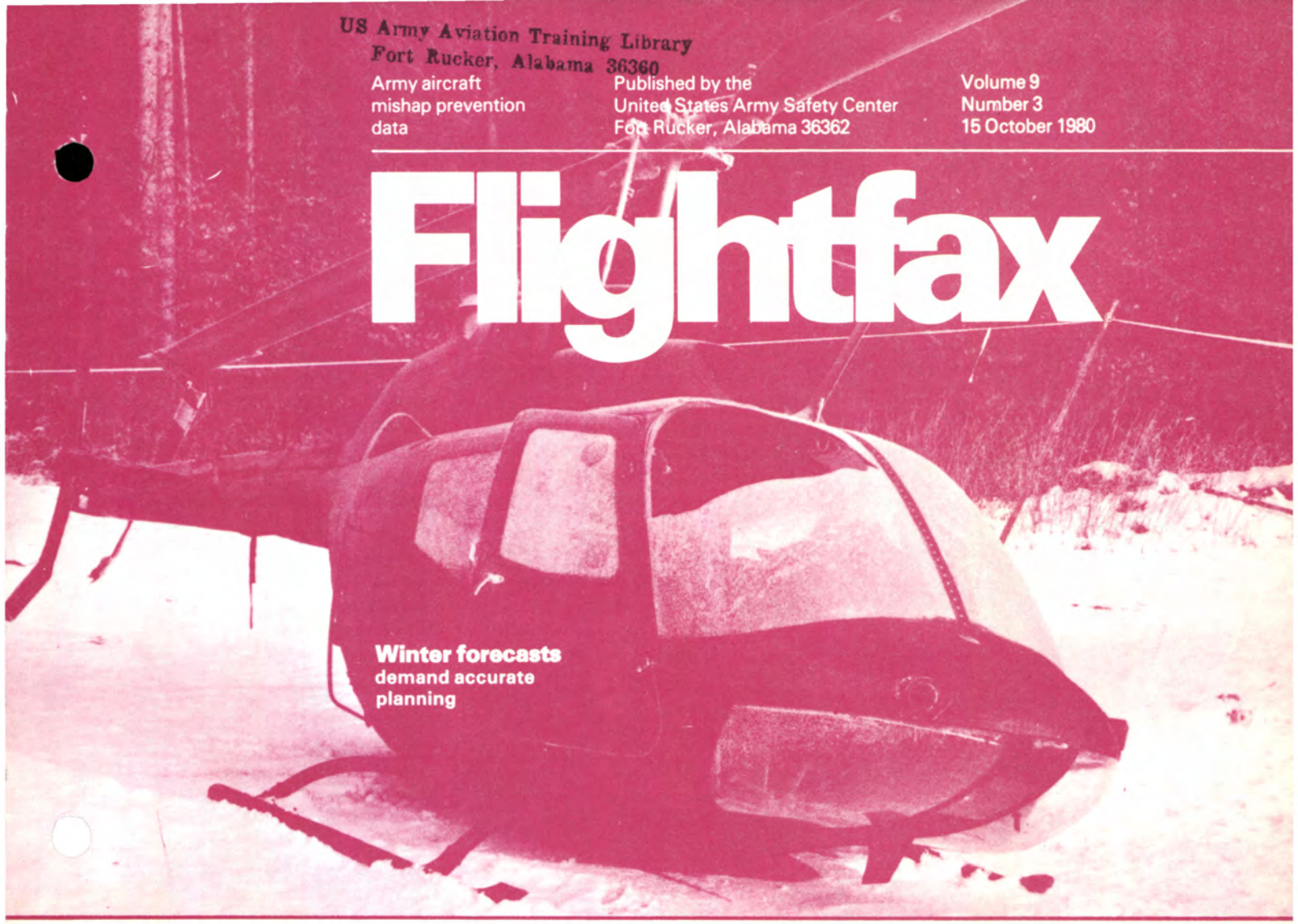
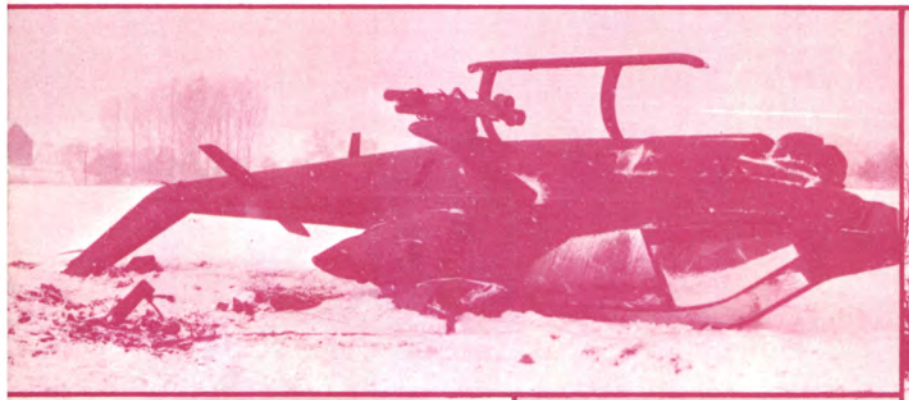
15 October 1980

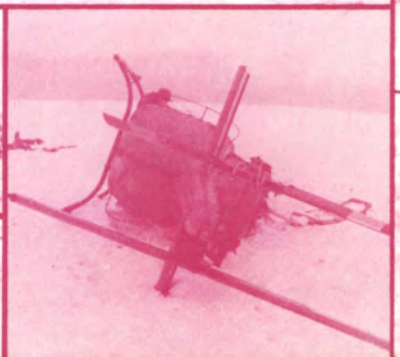
# Flightfax



**Winter forecasts**
**demand accurate planning**

TURBULENCE ICING CLOUDS FOG SNOW SHOWERS FREEZING RAIN





# Preparing the team for the Super Bowl

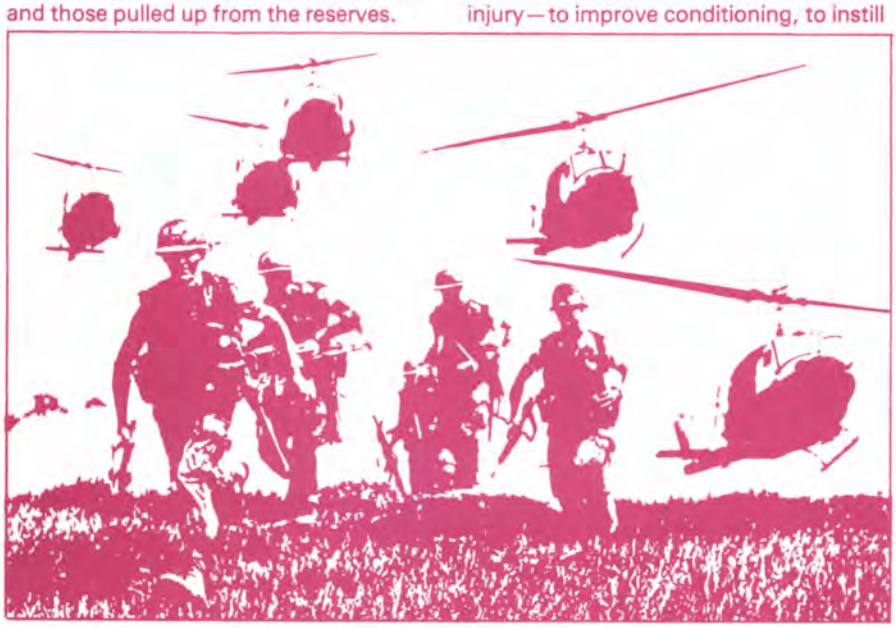
On the surface, the goals of readiness and safety appear to be mutually exclusive. But are they?

Realistic training to meet expanding mission requirements in today's threat environment has inherent risks. Some tradeoff decisions between force preparedness and "acceptable" risk are inevitable; they must be based on how imminent we perceive combat to be, and against what odds, in what place, and to meet what objectives. Resource protection—people and equipment—is equally important in peace and war; attrition unrelated to an **achieved** objective is equally abhorent in each. Yet losses will take place if we're serious about meeting the objectives of either.

In some respects, the apparent dichotomy between readiness and safety can be equated to the problem faced by a pro football coach at the start of the season. The owners demand a winning team, and so do those of the competition. The player selection process is over except for the final cuts, the injury losses, and those pulled up from the reserves. You know what the old heads could do **last** year, and you know what the rookies—trained against different standards—could do in a different league.

The front office has set the budget, and your resources are finite—only a few deep in most positions. Your scouts give you a feel for the competition, but you know you must adjust your game plan as their—and your—strengths and weaknesses are demonstrated. Most of the players are in good physical shape, but few are game-ready. Some old heads hope to rely on past experience, and some new heads aren't prepared for the rigors ahead. You must determine how to train and motivate them all.

As a coach who has been through previous league playoffs, you know what it takes to win. You also know that if you push too hard, too fast, you'll commit the worst possible sin: needlessly injure the players in an exhibition game or, worse yet, in scrimmage—neither of which count in league standings. You also know that everything done—short of a major injury—to improve conditioning, to instill the basics, to learn the plays, to know the competition, to build personal confidence, to create team spirit, and to stimulate judgment and flexibility will get the best out of what you have. It takes drill and more drill to get it right; but too much will burn them out, increase injuries, and peak them on Wednesday instead of Sunday.



Our "games," of course, are not scheduled; we could be called to play any day. We hope that enemy scouts in watching our scrimmages will advise their coaches to postpone the challenge match week after week. To keep game-ready, we employ a surrogate enemy (e.g., aggressors), drill the specialty teams, occasionally play exhibition games with the whole team, and have even been known to play in the minor leagues (and perhaps learned some wrong lessons). Our owners, however, insist we remain in the big leagues. Only super powers play in the Super Bowl.

In preparing for the game we hope won't come, we work on new and tougher tactics, buy new and expensive equipment, and try to learn from those who played in games that counted. Many of those old—and not so old—heads retire from the active rolls or are transferred to the front office and leave the training of the yearly influx of rookies to those they themselves have trained. They remember many bright young face who soon left the field grimacing in pain. They feel personally responsible for not preparing them better—showing them how to survive. And yet, they feel equally as strong about having a winning team.

Fortunately for their peace of mind, they know that those they have taught to survive and forced to learn the basics will have a better chance to play in future games—and win them.

**—from AEROSPACE SAFETY**

# What you should know about Nomex

Nomex is an uncomplicated material, but it has been the subject of many questions, misconceptions, abuses, and just plain untruths. Hopefully, this article will answer any questions you may have and tell you what you should know about your Nomex uniform.

## The material

Nomex is a unique man-made material that is permanently fire retardant. It is a type of nylon that will not melt and stick to the skin as other types of synthetic fibers do. Because other synthetics such as nylon and dacron melt at about 300° F., they should not be worn next to the skin while flying. Female aircrewmembers particularly should remember that heat transfer through Nomex could be high enough to melt synthetic undergarments.

Nomex is resistant to temperatures up to about 700° F. and then begins to char and form a dry, brittle residue that can be brushed away when the heat source is removed. Nomex will not support combustion as other natural and man-made materials will. For example, if a flame is placed directly on cotton, nylon, dacron, etc., the material will burn and continue to burn when the heat source is removed. In contrast, Nomex will char as long as the heat source is applied directly to the fabric but will not char or burn when the heat source is taken away. Nomex will burn if contaminated with flammable substances such as petroleum products or household starch. If your Nomex does become contaminated with any flammable product, simply launder or dryclean and the material will be restored to its original fire retardant state.

At this time, there is no wear-out criteria established for Nomex in Army TMs or FMs. According to the U.S. Army Natick Research and Development Command, even thin Nomex provides protection.

## Uniform fit

The Nomex uniform was designed to be worn rather loosely to provide an airspace between the fabric and the skin. This airspace acts as insulation from heat sources. Do not alter your Nomex uniform because snugly fitted Nomex negates the effectiveness of the airspace.

For those of you who may require special measurement uniforms for a proper fit, refer to AR 32-4 and AR 700-84. These regulations authorize uniforms for individuals who cannot be fitted with readily available sizes.

## Static electricity

Tests for static electricity buildup were conducted at Wright-Patterson AFB on a variety of materials, including Nomex. There were no significant differences in the generation of static electricity among the materials tested. One of the most important safety procedures in preventing an accident caused by static electricity during refueling or rearming is proper grounding of the aircraft. Another equally important safety procedure is plugging in the bonding wire from the fuel nozzle to the aircraft before the fuel cap is removed. Replace the fuel cap before unplugging the bonding wire.

If your Nomex becomes saturated with fuel, the saturated area should be thoroughly soaked or deluged in water before removal of the uniform to prevent static electricity from igniting the fumes. One crewmember received first- and second-degree burns when his fuel-soaked clothing was ignited by static electricity as he tried to remove them without first washing the saturated area with water.

## Cleaning

Nomex can be drycleaned safely without altering its fire retardant qualities. Any drycleaning solvent remaining in the garment is soon dissipated into the air, thus eliminating any fire hazard. Nomex can also be laundered as many times as necessary and still be fire retardant. Since it is an easily cleaned synthetic fiber, you probably won't need a full wash cycle. Simply set the washing machine on a short cycle, e.g., "delicate" or "wash and wear," and use a good brand of detergent. "Spray and wash" can be used for removing spots. Close the zippers to prevent damage and fasten the velcro to avoid picking up lint.

The water temperature you use to wash your Nomex and how you dry it is strictly up to you. Home hot water heaters and dryers do not get hot enough to harm the material. Remember, Nomex is high-temperature-resistant and has even been boiled without damage. However,

*(continued on next page)*

# What you should know about Nomex

to conserve energy, we suggest a warm wash and cold rinse.

When you remove your uniform from the washer or dryer, hang it up so the wrinkles will fall out. You can even iron your Nomex if you want to.

If Nomex is tumble dried separately from other materials, an antistatic strip probably will not be required to get rid of static electricity. The rubbing together of dissimilar materials causes the buildup of static electricity. If you live in a cold, dry climate and static electricity is a nuisance, you can use a good brand of fabric softener in the wash or a strip in the dryer.

Detergents, fabric softeners, and antistatic strips leave a residue which accumulates on Nomex. This affects the fabric's "wickability," i.e., the ability to transport water (sweat) to aid in evaporation and cooling. You can test your uniform's "wickability" by placing a drop of water on a clean uniform. If the water soaks in within 10 to 12 seconds, fine. If it takes 30 seconds or longer for the water to soak in, or it simply beads on the material, your Nomex needs to be drycleaned to remove the residue. If you have ever wondered why it was so difficult to dry yourself with a towel from a hotel or motel, it's because they use strong detergents and softeners which greatly decrease the ability to absorb water.

## Potpourri

Whether patches, name tags, insignia, rank, etc., are worn on your Nomex depends on your commander. If they must be worn, the best choices are those made from natural fibers rather than synthetic materials. However, patches, etc., made from synthetics are not necessarily forbidden as most synthetics do not melt before reaching about 300° F. This temperature is considerably higher than the human skin can stand without damage. With heat intense enough to melt a synthetic patch, the victim will already be in very serious condition.

Commanders of certain installations require the Nomex uniform to be tucked or bloused inside the leather boot. This is the commander's prerogative, but it should be remembered that neither the flight suit nor the leather boot was designed to be worn in this manner. During flight, the uniform should be fastened over the boot. Sleeves should be down, zipper zipped to the top, and collar turned up. Of course, Nomex gloves should be worn. Wear the gloves under the sleeve cuff to prevent accidental snagging of the center console switches. In several instances, the governor switch has been caught by the edge of the glove and switched from the automatic position to the emergency position.

Many of you have complained because the turned-up collar of the Nomex uniform does not completely cover the neck. This is no longer considered a significant safety factor for two reasons—the low incidence of thermal injuries to the throat and neck area and the high success rate of the crashworthy fuel system which has virtually eliminated the fireball accidents. There has been one thermal injury (first- and second-degree burns) to the neck since FY 73. With the possible exception of a few helicopters, all rotary wing aircraft except the TH-55A and CH-54A are equipped with the crashworthy fuel system.

The unprotected neck area comprises less than 1 percent of the total skin area. In contrast, the skin of the face makes up about 5 percent of the total skin area and is not protected by Nomex. The unprotected face has not received the consideration and publicity the neck has and yet covers five times the skin area of the unprotected neck area. The helmet visor offers the upper portion of the face only limited protection in a flash fire or a full-fledged, raging inferno. Some enterprising individuals have fabricated scarves and dickeys from Direct Exchange Nomex for neck protection at practically no cost.

Nomex is Nomex regardless of the weave, color, or article of clothing. Take care of it and it will take care of you when you need it most.

Point of contact at the Safety Center is Laurel D. Sand, AUTOVON 558-3913/3901, commercial 205-255-3913/3901. ■

# Selected mishap briefs

**uh1** **Class C mishap** ☐ (H series) Main rotor blades hit tree branch during takeoff, damaging blades. Pilot's visibility was reduced because of blowing dust.

**Class E mishaps** ☐ (H series) Crew noticed kite string on left M20 gun mount. Aircraft was landed and string was found on main and tail rotor hubs and 42° gearbox area. ☐ (H series) Hydraulic power was lost during flight. Caused by broken line at filter. ☐ (H series) Aircraft was involved in paradrop operations. As No. 2 and No. 3 jumpers exited, they became entangled. One jumper was hanging inverted and one was upright facing each other at 10 to 15 feet under aircraft. Aircraft was at 70 knots and 1,750 feet msl. Main chutes did not deploy and reserve chutes could not be used. Aircraft descended and ground personnel detached jumpers. There were no injuries except minor bruises. ☐ (H series) Pilot saw liquid coming from battery exhaust vent. Battery switch was turned off and no more liquid was expelled. Nicad battery either overfilled or was defective.

**ah1** **Class C mishap** ☐ (S series) Pilot noticed high frequency vibration in antitorque pedals during hover. Postflight inspection revealed damage to both tail rotor blades. Tail rotor was apparently lowered into trees while aircraft was hovering in firing position.

**Class E mishaps** ☐ (TH-1G) Engine oil pressure and master caution lights came on. Caused by faulty oil pressure switch. ☐ (TH-1G) Fuel boost pump and master caution lights came on. Caused by faulty forward boost pump.

**ch47** **Class E mishaps** ☐ (C series) No. 2 engine had static beep failure on short final. Caused by failure of $N_2$ control box. ☐ (B series) Combining transmission hot oil light came on during flight. Caused by defective oil temperature sensing bulb. ☐ (C series) Cyclic trim actuator indicator fluctuated rapidly. Caused by defective actuator.

**oh6** **Class E mishaps** ☐ (A series) Crew smelled burning odor and saw smoke rising from console. Postflight inspection revealed landing light relay contacts did not function properly when landing light was turned off, causing relay to overheat. ☐ (A series) Crew saw oil leaking onto instrument panel. Oil was coming from cracked oil line from engine to torquemeter.

**oh58** **Class C mishaps** ☐ (C series) Postflight inspection revealed damage to main rotor tips. Damage was probably caused by tree strike during NOE flight. ☐ (C series) Pilot was descending down north side of narrow valley during NOE flight. As he reached valley floor, aircraft hit three power cables. Cables rolled up over pilot's windshield and snapped when they hit No. 2 FM antenna. Aircraft was landed with no further damage. Neither pilot nor copilot saw the wires because they

*(continued on next page)*

# Mishap briefs

blended with the slope of the south side of the valley.

**Class E mishaps** ☐ (A series) Daily inspection revealed head of bolt in pillow block had broken off. Excessive corrosion was found on bolts removed from pillow block. ☐ (A series) IP demonstrated autorotation with turn and then allowed pilot to practice the maneuver. While in right turn, pilot placed aircraft in excessive nose-low attitude and rate of turn, allowing main rotor rpm to build to an excessive speed. IP did not take corrective action in time to prevent overspeed. ☐ (A series) Transmission oil pressure light came on. Caused by failure of transmission pressure switch.

**th55** **Class E mishaps** ☐ Inoperative cyclic trim during hover was caused by defective circuit breaker. ☐ Engine ran rough during landing. Caused by failure of fuel injector and right magneto.

**c12** **Class E mishap** (A series) Right main gear light did not come on. Gear was manually extended and light still did not come on. Visual check by tower personnel and crew of another aircraft revealed gear appeared to be down. Aircraft was landed without incident. Caused by failure of landing gear position switch.

**ov1** **Class E mishap** ☐ (D series) No. 1 propeller stuck in reverse during taxi. Caused by failure of propeller auxiliary motor.

**u21** **Class E mishaps** ☐ (A series) Pilot noticed power fluctuations on No. 2 engine. Caused by failure of main fuel control. ☐ (RU-21H) Right fuel transfer light came on. Caused by failure of fuel transfer pump.

**c7** **Class E mishap** ☐ (YC-7A) No. 1 engine ran rough during climb. Caused by broken high tension lead to magneto.

## Maintenance

**uh1** **Class E mishap** (H series) Application of power resulted in aircraft turning to right during short final approach. Left pedal was applied but was ineffective in arresting right spin. Aircraft spun to right 2½ times before pilot autorotated to landing. Retaining nut had backed off tail rotor control rod, and crosshead bearing was popped out. Left pedal authority was lost because control rod was allowed to travel through crosshead bearing. There was no evidence of cotter pin being installed in retaining nut.

**ch47** **Class E mishaps** (C series) White smoke was seen coming from No. 2 engine compartment as aircraft was hovering. Postflight inspection revealed hose assembly was installed incorrectly, allowing hose to chafe on hot air gallery coupling and to eventually rupture.

**oh58** **Class E mishaps** (A series) Engine failed during autorotation. Caused by loose

double check valve air line. ☐ (A series) Main transmission oil low pressure light came on. Caused by nut on terminal backing off, allowing wire to ground out. ☐ (A series) Aircraft would not start. Pilot released starter and turned off battery. Fluid was seen seeping from battery vents. Voltage regulator was set at 30 volts. High output combined with high temperatures caused battery to overheat. Voltage regulator was adjusted to 27 volts.

**ov1** **Class E mishaps** ☐ (D series) During climbout, pilot heard loud popping sound and saw bright orange flame coming from front end of No. 1 engine. Pilot brought both power levers back to about 35% torque and leveled off. Egt remained high for about 1 minute and then returned to normal before aircraft was landed. Variable inlet guide vane feedback rod was chafing on spiral wrap tape, restricting movement. ☐ (D series) Both main gear indicators showed unsafe when handle was placed in down position. Actuators were not adjusted correctly.

**u21** **Class E mishap** ☐ (A series) Smoke was seen coming from behind copilot's circuit breaker and fuse panel during preflight check. Battery was disconnected and smoke stopped. Plastic electrical wire was used instead of standard aircraft electrical wire. Plastic wire was installed to overhead dome light with no fuse protection. Wire shorted to airframe over a period of time and caused smoldering fire.

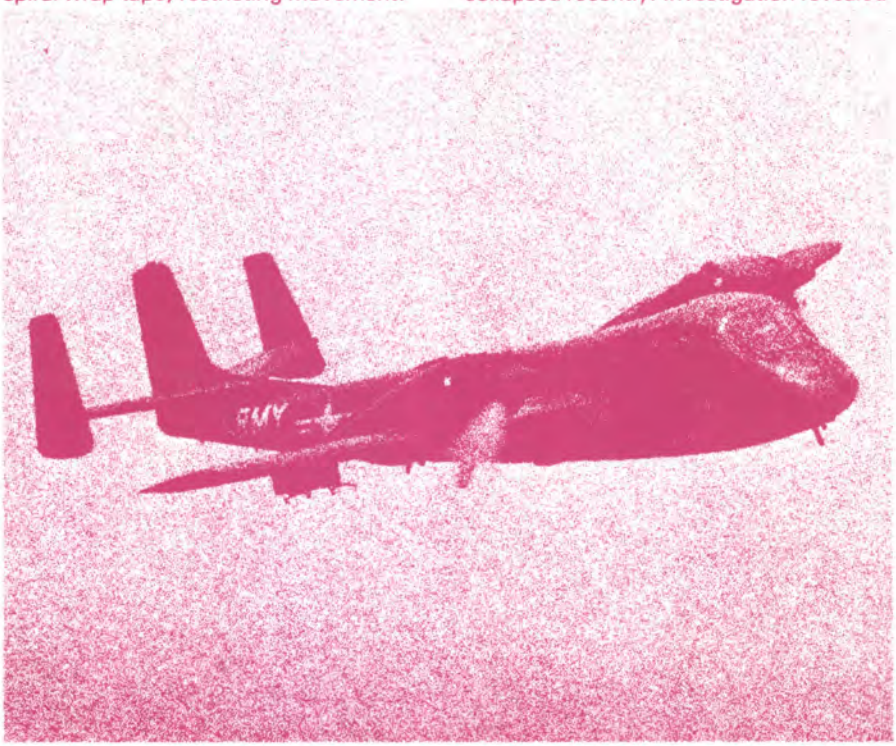
## Messages received

• Safety-of-flight message concerning one-time inspection of all OV-1D/RV-1D nose gear assemblies for cracking (OV-1-80-09, 012150Z Oct 80). Summary: The nose gear assembly of an aircraft collapsed recently. Investigation revealed that the outer cylinder had cracked in the area of the attaching bolt hole. Inspection revealed similar cracks in nose gear of another aircraft. This SOF message gives instructions for an inspection of the nose gear in all OV-1D/RV-1D aircraft. Contact: Robert Clark, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Maintenance notice concerning proper procedures and use of proper tools when installing flexible hose assemblies on all Army aircraft (GEN-80-25, 021605 Z Oct 80).

• Safety-of-flight maintenance notice concerning UH-60A main rotor blade (UH-60A-80-34, 031505Z Oct 80). Summary: A potential misunderstanding may cause unnecessary rejection and removal from service of UH-60A main rotor blades. A crinkling sound in the trailing edge of the blade is normal and not cause for rejection of blade. Contact: Dennis Schumacher, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**



# The preflight was hurried
# One thing was missed
# They relied on memory
# Instead of the checklist

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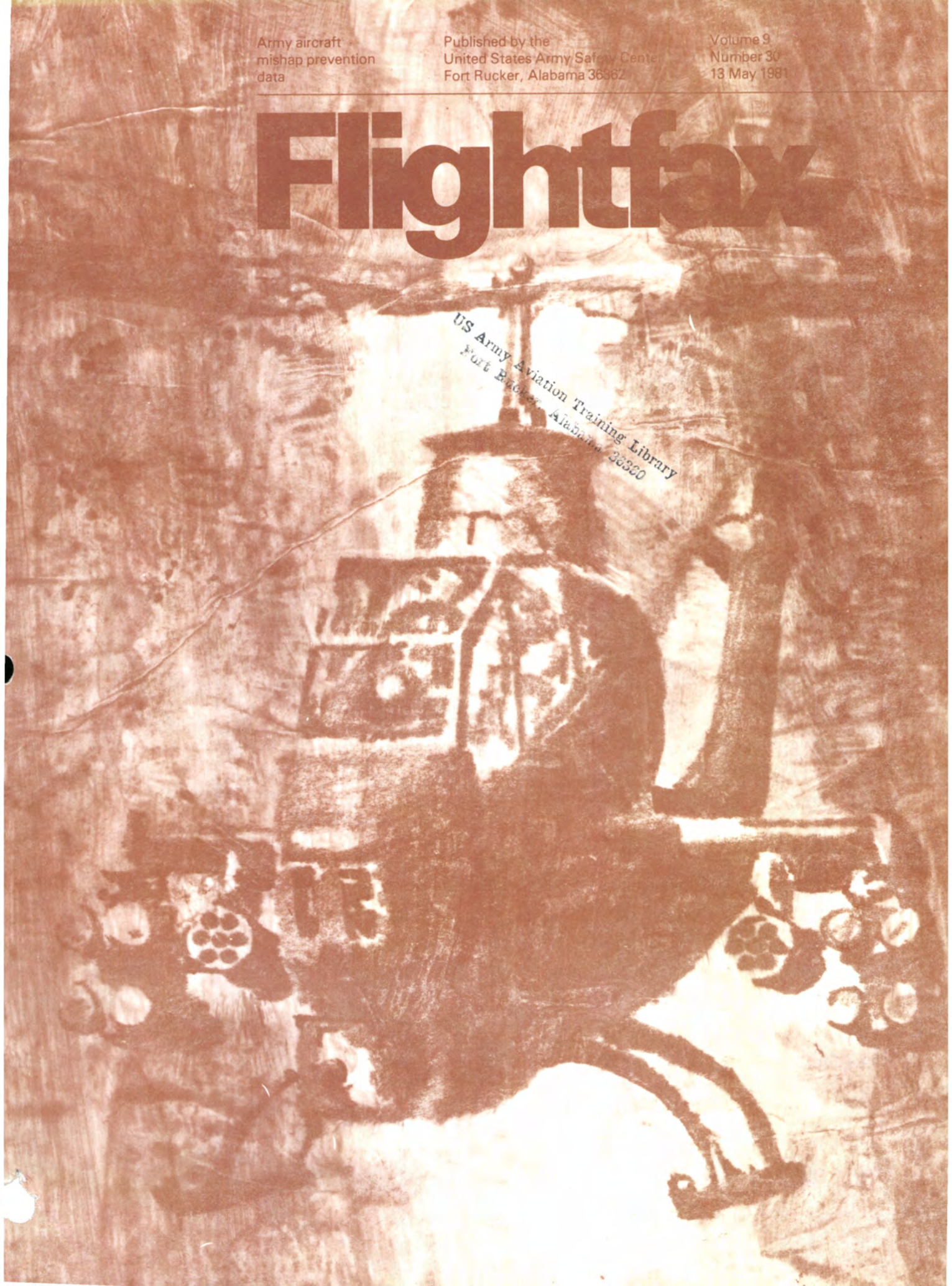
# Flightfax



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Fort Rucker, Alabama 36360

# Mishap review

## Synopsis

A dive was initiated from about 120 feet agl. The copilot was unable to stop the rate of descent before the AH-1G hit the ground and came to rest nearly inverted.

## History of flight

The pilot and copilot flew for about 2½ hours on a tactical screening mission in support of a field training exercise. The mission was completed and the AH-1 was landed. The aircraft was test flown (a routine in-flight fuel control check) for 10 minutes, with no discrepancies being found. A little while later, the pilot and copilot took off on another screening mission.

The mission was conducted along a road running north and south in the vicinity of a mountain. After about an hour and a half, the pilot of the scout aircraft accompanying the AH-1 reported visual contact in an area on the southern slope of the mountain and requested immediate suppression. The AH-1 crew (the copilot was flying from the front seat) made a low-level pass over the vehicles from southeast to northwest and broke right, coming around for a second pass. The second pass was made toward some more vehicles closer to the mountain.

Following this pass, the copilot made a right climbing turn, descended, flew back towards the southeast, and then initiated a climbing left turn, followed by a descent toward the vehicles. This descent was started from an altitude of about 120 feet agl and an airspeed of approximately 40 knots and incorporated a 25-degree angle of dive. As the aircraft neared rolling terrain about halfway down the slope of the mountain, the copilot, assisted by the pilot, was unable to stop the rate of descent.

The AH-1 hit the ground, slid for about 185 feet, and came to rest almost inverted. The pilot could not free himself from the aircraft because of his injuries and was pulled out by ground personnel who had been located near the crash site. The copilot was also injured, but he was able to exit without help.

## Crewmember experience

The 27-year-old pilot had more than 400 rotary wing flight hours, with more than 200 in AH-1Gs. The 22-year-old copilot had almost 400 rotary wing hours, with more than 200 in AH-1Gs.

## Commentary

After placing the aircraft in a descending maneuver from about 120 feet agl, the copilot misjudged the rate of closure and point in the maneuver beyond which he would be unable to fully arrest the rate of descent. The tactical play in progress and screening mission of the aircraft did not authorize or require gunrun-type descending maneuvers toward suspected areas of hostile activity. Regardless, the copilot opted to use this type of maneuver instead of employing the proper tactics for this type of action.

Because of the sharply rising terrain to the right of the aircraft's flight path and the relatively level terrain to the front and left of the flight path, the copilot would have had difficulty perceiving the knoll—the initial impact point on the slope—directly below him. The knoll was 40 to 50 feet higher than the terrain to the front and left of the flight path.

Once the copilot rolled out of the left climbing turn and placed the aircraft in descent, he probably focused his attention on the "enemy" vehicles 1,000 meters to his front instead of staying aware of the flight path in relation to the immediate terrain.

During the left turn and dive, the pilot's attention was diverted to the right, looking for the scout aircraft. When he returned his attention to the diving maneuver, it was too late for recovery.

Discussions with several members of the unit indicated a general feeling of boredom with the training exercise. Although the actual exercise had just begun, the unit had been in the field about 2 weeks. The crew had been flying the same type screening mission in the same area all day and were admittedly bored by the repetitiveness and tediousness of the mission. Also, the mission was coming to an end and the copilot probably became complacent in what was to be the last run and became a little more aggressive in maneuvering the aircraft. ■

# Shortfax

## Nine receive Broken Wing Award

The Broken Wing Award is given to aircraft crewmembers who demonstrate a high degree of professional aviation skill while actually recovering an aircraft from an in-flight failure or malfunction necessitating an emergency landing. Requirements for the award are spelled out in AR 672-74, dated 15 May 1979.

Nine aviators received the Broken Wing Award from January through March 1981.

**Broken Wing Award recipients**

**1LT Floyd E. Baltimore**
168th Engineer Group, Mississippi ARNG, Vicksburg, Mississippi

**CW2 William T. Falin**
Troop E, 1st Cavalry, 172d Infantry Brigade, Fort Wainwright

**CW3 Thomas H. Kennedy**
C Troop, 3d Squadron, 5th Cavalry, Fort Lewis

**CW3 Gary R. Martin**
D Troop, 2d Squadron, 1st Cavalry, 2d Armored Division, Fort Hood

**WO1 Francis I. Martinelli**
B Troop, 7th Squadron, 17th Cavalry, 6th Cavalry Brigade, Fort Hood

**Michael P. O'Connor, DAC**
Night Vision Support Detachment, ERADCOM Flight Test Activity, Electronics Research and Development Command, Fort Belvoir

**1LT Brian L. Savelkoul**
Company C, 3d Aviation Battalion, APO New York 09702

**WO1 William F. Thompson**
Company D, 7th Combat Aviation Battalion, 7th Infantry Division, Fort Ord

**CW3 Timothy C. Tucker**
336th Aviation Company, Armed Forces Reserve Center, Los Alamitos, California

## Choppers—not choppers

Choppers aren't for flying! You're probably thinking that's a dumb statement—I fly them all the time. But there are choppers and then there are choppers. In this case, we're not talking about the choppers which so often chew up tree branches, but rather those for chewing food—specifically removable partial or full dentures.

Those of you who wear dentures realize they contribute much to your health, comfort, and appearance. In contrast, the thought probably never crossed your mind that they could kill you.

Hypothetically speaking, let's say you are involved in an aircraft mishap and are knocked unconscious. Even if you sustain no other injuries, your dentures can become dislodged from the impact forces and lodge in your throat, blocking your breathing. The end result could be death from suffocation.

Although the odds are slim that this might happen, you could be gambling with your life. So what's the alternative? Simple! Just store your dentures in a clean pouch when flying. If you're concerned about your charming smile, forget it. No one will notice it in the cockpit. ■

## Summer fallout

Hot weather is here and helicopters will be flying with doors open or removed so that everyone can enjoy the cooling breezes. Unfortunately, the breezes frequently clean out the cabin of everything that isn't firmly anchored down or removed as required—seat cushions, helmet bags, equipment, etc. Falling objects are bad for public relations and unfortunately they sometimes have close encounters of the worst kind with the tail rotor.

Be kind to yourself and the people you fly over—SECURE THE GEAR! ■

## Check those birds

As evidenced by this photograph, birds are still building their nests in aircraft. These nests can cause FOD. The unit which sent us this photo check their aircraft in the early morning and the nests are sometimes back by 2 p.m.

Keep a close watch on those little critters, particularly during this time of year. They're fast workers. ■

# Selected mishap briefs

**uh1** **Class C mishap** ☐ (V series) As aircraft was flying at 90 knots through light drizzle, bird hit and broke pilot's chin bubble.

**Class E mishaps** ☐ (V series) Loud whine was heard during flight. Caused by failure of inverter bearing. ☐ (H series) Left fuel boost light came on. Caused by failure of boost pump. ☐ (H series) $N_1$ gauge went from 94 percent to 8 percent during climbout. Caused by failure of tachometer generator. ☐ (H series) Cyclic binding during takeoff was caused by failure of cyclic servo. ☐ (H series) Engine fuel pump and master caution lights came on during takeoff. Caused by failure of fuel pressure sensing switch.

**uh60** **Class E mishap** ☐ No. 1 generator light came on during taxi for takeoff. Generator was reset and turned back on. Sparks were seen in main transmission well area. Generator was turned off and aircraft shut down. Caused by electrical short in cannon plug wires leading to No. 1 generator.

**ah1** **Class C mishap** ☐ (G series) During hover, ground guide had pilot turn nose 90 degrees left, then signaled for right sideward hover, forward hover, and for aircraft to land. After pilot landed, ground guide told him tail rotor strike had occurred during sideward movement.

**Class E mishaps** ☐ (G series) Engine stopped during runup. Caused by failure of fuel cutoff valve. ☐ (S series) $N_2$ increased to 102 percent during flight. Caused by failure of overspeed governor. ☐ (S series) Postflight inspection revealed skid shoes were worn through and skid tubes were worn within 1 inch of rear cross tube attaching saddles. Skids had also cracked about 2 inches forward of saddle brackets. Six autorotations and two running landings had been made to runway. Aircraft was not equipped with heavy-duty skid shoes. ☐ (S series) Master caution and transmission oil hot lights came on and transmission oil temperature gauge indicated 114° C. during landing. Caused by failure of engine oil cooler fan. ☐ (TH-1G) Landing was made when SCAS pitch channel caused nose of aircraft to pitch abruptly.

**ch47** **Class E mishaps** ☐ (A series) Master caution and transmission oil pressure lights came on. Caused by failure of transmission oil pressure selector switch. ☐ (B series) Transmission oil pressure light came on. Caused by defective oil pressure transducer. ☐ (C series) No. 2 engine $N_2$ increased to 255 rpm during HIT check. Caused by failure of $N_1$ actuator.

*(continued on next page)*

# Mishap briefs

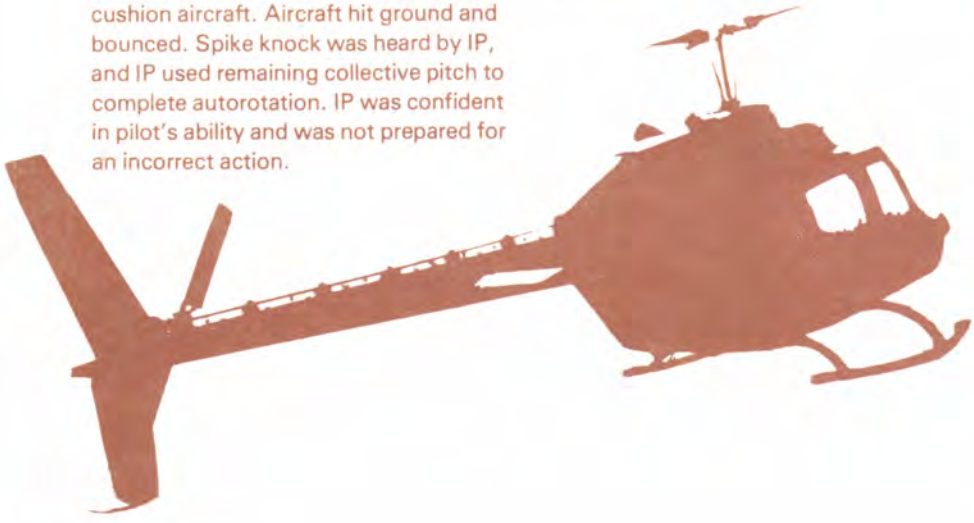
**oh58** **Class C mishap** □ (A series) Pilot noticed F-4 about 3 KM away in right turn. F-4 was about 100 feet below, turning toward OH-58. Pilot started dive, turning aircraft to keep an eye on F-4. During dive, pilot heard overspeed wind, pulled collective, and looked at $N_2$ rpm. $N_2$ was 108 percent and engine tachometer was above that. Postflight inspection revealed main rotor overspeed.

**Class E mishaps** □ (A series) Feedback was felt in controls during hover, and hydraulic light came on. Caused by air lock in hydraulic system. □ (A series) Aircraft was being hovered to rear for takeoff. Dusty conditions caused pilot to lose sight of ground guide, and aircraft drifted to right. Vertical fin hit small cedar tree. □ (A series) During standard autorotation, pilot was late applying remaining collective as necessary to cushion aircraft. Aircraft hit ground and bounced. Spike knock was heard by IP, and IP used remaining collective pitch to complete autorotation. IP was confident in pilot's ability and was not prepared for an incorrect action.

**c12** **Class C mishap** □ (C series) As pilot was taxiing to refueling area, left wing tip of C12 hit right aileron tip of parked King Air 200.

**u21** **Class E mishaps** □ (A series) Left engine would not respond to throttle movement after takeoff. Propeller was feathered and aircraft landed. Throttle rod end bearing was frozen on left engine. □ (RU-21H) Copilot saw oil coming from No. 2 engine cowling, and oil pressure decreased to 60 psi. Engine was secured and single-engine landing made. Oil filler cap was not properly seated.

**t42** **Class E mishaps** □ As throttle was reduced for descent, manifold pressure on No. 2 engine did not reduce and stuck at 25 HG. Single-engine landing was made at airport. Caused by broken throttle cable.



## Maintenance

**uh1** **Class E mishaps** □ (H series) Hydraulics failed during flight. Hydraulic line to right servo ruptured. Stainless steel ID band had not been removed during previous phase inspection. Area where rupture occurred showed evidence of chafing where ID band had been. □ (H series) Engine flamed out when IP placed governor switch in emergency position after reducing throttle to idle. Caused by out-of-rig $N_1$ throttle linkage.

**ah1** **Class E mishaps** □ (G series) Stiff cyclic during flight was caused by binding wiring bundle to cyclic. Clamp was installed incorrectly. □ (S series) When pilot turned master arm switch from off to standby, master caution and No. 2 hydraulic lights came on. Running landing was made. Metal tube from No. 2 pressure filter module to firewall had developed stress crack, and oil from No. 2 reservoir had sprayed over area. Mechanic had overtorqued tube.

**oh58** **Class E mishaps** (A series) $N_2$ dropped to 101 and maximum governor advance was 102 during takeoff. Caused by out-of-adjustment $N_2$ actuator. □ (A series) High frequency vibration during flight was caused by out-of-balance tail rotor. □ (A series) Airspeed indicator did not function during takeoff. Aircraft was on first mission after installation of tail rotor drive shaft cover and missile warning radar MWOs. Postflight inspection revealed disconnected pitot static system hose. □ (C series) When aircraft was landed, pilot saw fluid

*(continued on back page)*

# Stacom

## Prepare for a hot summer

The hot-weather months are with us again. During the months of May through September, we can expect daily temperatures in the 90's and often above 100.

Generally, there is a sizable increase in flying activity throughout the aviation community and, as usual, units of the Reserve components can be expected to be in their summer encampments.

This is the period when the aviator is confronted with the additional problems of thunderstorms, high-density altitudes, high humidity, power limitations, reduced efficiency, and reduced gross weight, to name a few.

During this period a year ago, Army aviation recorded six Class A mishaps where insufficient power or reduced aerodynamic efficiency were cause factors. Now is the proper time to apply that ounce of prevention to the unit aviation safety program. Dust off TC 1-10, Mountain Flying Sense, and TC 1-13, Hot Weather Flying Sense; check out the appropriate operators manual; and review the unit SOP.

Judicious use of the foregoing information and proper performance planning by all supervisors and aviators will produce safe and standardized procedures. ■

## Night hawk/night vision goggle SIP requirements

Guidance in the latest aircrew training manuals (ATMs) indicate that incumbent night hawk/night vision goggle (NH/NVG) standardization instructor pilots (SIPs) must satisfactorily complete an NH/NVG evaluation at night by an NH/NVG SIP from USAAVNC or an NH/NVG SIP designated in writing by USAAVNC, Directorate of Evaluation and Standardization (DES). Once the evaluation is successful, the new SIP must be designated in writing by DES in order to evaluate and designate other NH/NVG IPs as NH/NVG SIPs.

The DA Policy Committee and recent staff actions within USAAVNC determined that these procedures are too restrictive. The above stated requirements will be deleted with the first published changes to the ATMs expected during the second quarter FY 82.

Effective immediately, USAAVNC, DES, will no longer designate NH/NVG SIPs. Expected changes to paragraph 2-13d(3)(c), TC 1-134, "Commander's Guide for Utilization of Aircrew Training Manuals," and paragraph 4-4d(4)(b) in the appropriate aircraft system ATMs will require an incumbent NH/NVG SIP to satisfactorily complete an NH/NVG standardization flight evaluation at night, administered by an NH/NVG SIP. A flight evaluation by an SIP designated by USAAVNC, DES, will no longer be required. The requirement for the incumbent SIP to have graduated from a USAAVNC IP course will no longer be applicable. All NH/NVG IPs/SIPs are reminded that the use of the NH/NVG Exportable Training Package is required when conducting NH/NVG qualification or refresher training. ■

## Effect of wind on the radius of action

1. How far from home base may one fly, remain on station for a predetermined period of time, and return under the following conditions?

   Fuel, 2 hours 30 minutes (plus reserve).
   TAS, 100 knots.
   Time on station, 30 minutes.
   Wind, 270 degrees at 20 knots.
   True course out, 240 degrees.
   True course back, 060 degrees.

**Note:** Assume constant fuel consumption for the duration of the problem.

2. If the wind were reversed (90 degrees at 20 knots) would the radius of action be affected? If so, how?

3. When wind is a factor, is the maximum radius of action with the wind:

   a. Parallel to the route (head/tail winds).

   b. At right angles to the route.

Send your formulas, computations, and answers to:

CDR, USAAVNC
ATTN: ATZQ-ES, STACOM
Fort Rucker, Alabama 36362

The correct answers that most clearly explain the problem will be published in the next STACOM. ■

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Mishap briefs

leaking from aircraft. Investigation revealed main fuel line was leaking on engine deck and fuel was flowing from drain. Caused by insufficient torque to fuel line coupling.

**ov1** **Class C mishap** ☐ (D series) During high speed dive portion of phase test flight, loud bang was heard, followed by vibrations and airframe shudder. Left main gear in-transit indicator flickered, followed by up indicator. Pilot suspected failure of landing gear door and flew back to home base, where tower personnel confirmed that left main landing gear fairing was missing. Lower clamshell door was out of rig, allowing air to get under landing gear fairing. This caused door to separate from aircraft.

## Messages received

- Technical information message concerning return of reparable probe assemblies (GEN-81-05, 291815Z Apr 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Change to TMs

Urgent change 4, dated 17 Apr 81, to TM 55-1520-228-23-2 for OH-58A and C helicopters, and Change 13, dated 7 Jan 81, to TM 55-2840-231-24 for T63A-5A and T63-A-700 engines have been released. ■

# Possible safety hazard

Reference the following 350 gpm pumping assemblies:

NSN 4320-00-060-7853
NSN 4320-00-069-8494
NSN 4320-00-195-4914
NSN 4320-00-407-2583
NSN 4320-00-600-7590
NSN 4320-00-691-1971
NSN 4320-00-916-9172
NSN 4320-00-903-3472

A noninjury-type accident was recently reported relative to the release of the priming cap on the top of the pump casing while the pump was running. The loss of the cap resulted in the operator being sprayed with fuel. To avoid such a recurrence, the following precautionary steps must be taken:

- After removing the cap and priming the pump casing, check the snap-in gasket in the cap to assure it is present and serviceable.
- Place the cap on the male quick disconnect adapter and raise the cam levers to the fully locked (vertical) position.
- Bind the cam levers together in the locked position with soft wire or heavy twine to eliminate any possibility of their release due to vibration.

Applicable operators manuals will be supplemented with these instructions. ■

**—from USATSARCOM Information Bulletin**

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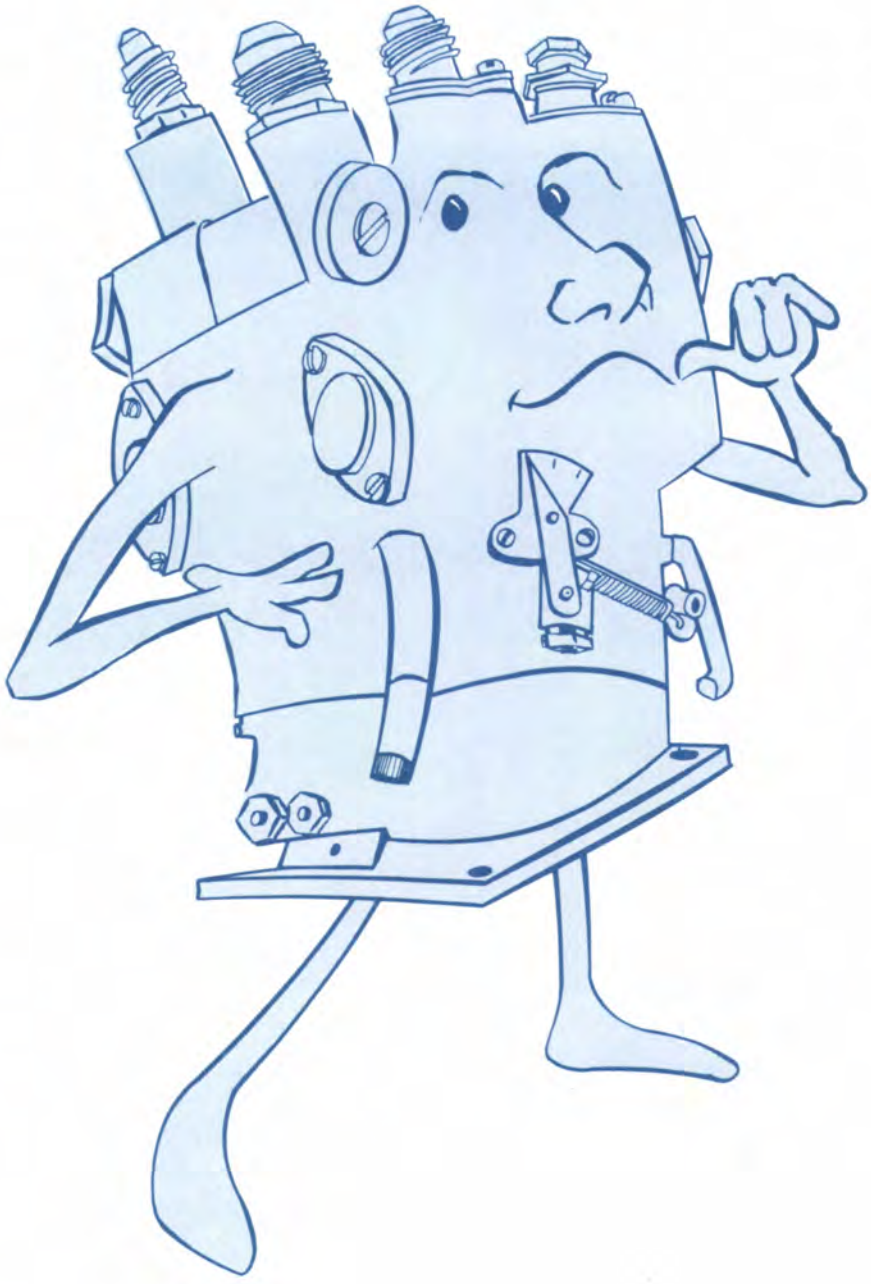
# I am your fuel control

Some people identify me as that unglamorous "black box" affixed to a gas turbine engine. Others more properly refer to me as the fuel control or fuel regulator. But regardless of the nomenclature you may choose to use, one thing is certain: You depend on me to make your engine perform properly—from lightoff to shutdown. And make no mistake about it, this is no mean feat.

I'm not bragging, mind you, but if one person were assigned to perform each of my major tasks, it would require at least eight individuals—and even then, they could not perform these functions as well as I can. For example, consider some of the major parameters I must constantly monitor, sense any changes in, and respond to by reacting correctly at precisely the proper time. These include ambient temperature, barometric pressure, compressor discharge pressure, fuel pressure, throttle position, collective pitch position, compressor rpm, and power turbine rpm. Try that for size.

As you can see, I am a very busy device during my working hours. Yet, there is nothing mysterious about me, and no individual went off his "rocker" to give me birth. As a matter of fact I was never born—at least not in my present configuration. In reality, I came into being through the process of evolution. Over a period of years, I gradually changed from a simple fuel on-off valve to the complex component that I have become.

But I am not overly complicated. Actually, I consist of a number of simple systems "tied" together to function as a unit. You might compare me with a baseball team whose players are on the playing field. Each has a certain position to play. Each must observe any action that takes place, determine the response required, then perform all necessary



functions properly and in a timely manner. Failure on the part of any individual to accomplish his task can cost his team the game. It's somewhat the same with us fuel controls.

While we perform the same functions, my relatives and I may differ as to how we accomplish our jobs. Some of us may rely on airflow and mechanical action to regulate fuel flow. Some of us may use a combination of fuel flow and mechanical action, while others of us may depend on electromechanical action. The most modern of us—the new generation—sense all required parameters and control fuel flow totally by electrical means. But no matter how we do our jobs, the results are the same. We provide the power required when the operator demands it.

Gas turbine engines that power helicopters and turboprop aircraft are somewhat more complicated than pure jet engines. During the operation of a pure jet engine, my prime responsibility is to control compressor speed. I do this by comparing throttle position with actual compressor speed. The throttle position may be presented to me as an electrical impulse, spring force or cam position, but it will be proportional to the desired engine speed. I must then compare this signal with actual compressor speed to determine if I should increase or decrease fuel flow. The actual compressor speed is presented to me by a flyweight type governor driven by the compressor, an electrical generator or a speed sensitive centrifugal fuel valve. Regardless of the means, I am now able to compare actual compressor speed with the desired power setting and adjust fuel flow as required.

If the engine is a turboshaft as found in a helicopter or a turboprop fixed wing aircraft, I must consider yet another system. In these engines, the compressor acts as a gas producer to provide the force needed to drive an additional turbine. This additional turbine is connected to a separate shaft that drives the rotor or propeller and is independent of the compressor and its turbines. It extracts the remaining power from the gas stream that has passed through the compressor drive turbines.

The compressor drive turbines are known as the gas producer turbines and are designated ($N_1$). The remaining turbines are identified as the power turbines and bear the designation ($N_2$). By means of an electrical generator, a flyweight governor or a centrifugal fuel valve (known as the power turbine governor or $N_2$ governor), the power turbine also sends me signals that tell me its speed. During flight in a helicopter, these signals are of prime importance to me.

The gas turbine engine has a very broad speed range and does not produce much power at low speeds. On the other hand, a helicopter requires rapid power changes. To accomplish this job, I must have complete control over the compressor. You see, the only way the gas turbine will react in a timely manner to sudden speed changes is when it is operating at near maximum rpm. That is why I have a built-in capability to prevent overspeeds and overtemps.

The helicopter pilot selects the speed at which he wishes to operate by turning the twist-grip throttle to the full increase rpm (wide open) position. At this time, I shift from compressor governor ($N_1$) to power turbine governor ($N_2$). With the collective pitch full down, the power turbine governor is at its lowest speed setting—if the "beep" or power turbine speed selector is at the full decrease rpm setting. Now, as the pilot adjusts the "beep" to the selected speed range, I will know at what power turbine speed or rotor speed he wishes to operate.

As "beep" is increased, I signal the compressor to speed up to the selected rpm. As I pointed out earlier, the power turbine speed now becomes my primary signal as it rotates the rotor blades, and its only connection to the compressor is the gas stream. So I must be very precise as well as quick in making any power changes so that the compressor will produce the required gas pressure.

To automatically make changes during flight, I have some set procedures I must follow. If, for example, the main rotor should slow down, the power turbine governor will let me know. I will then signal the $N_1$ governor to speed up the compressor. The result will be an increase in fuel flow that will cause the compressor to increase the gas flow enough to return the power turbine to its original speed setting. Just the opposite happens if the rotor overspeeds.

When the pilot increases collective pitch for liftoff or climb, similar events take place. The increase in pitch causes the rotor system and power turbine to slow down. Consequently, I tell the compressor to speed up to keep the power turbine on speed. I operate in much the same fashion on a fixed wing aircraft except that the pilot has more control over the engine and propeller rpm.

So far, my job sounds fairly simple. But it doesn't end here. I have other functions I

(*continued on next page*)

# I am your fuel control

must perform with utmost precision. For example, I must be able to accelerate the compressor at the desired rate without stall, overtemperature, or stagnation. An acceleration is especially critical during an engine start. To begin with, I must provide the exact fuel flow for lightoff. Then, I must increase the rate of flow in proportion to the increase in speed of the compressor. If I increase the rate of flow too fast, it will exceed the rate of increase of airflow. The fuel-air ratio will become unbalanced to the rich side, causing an overtemperature condition. If this condition becomes extreme, the engine will flame out because of an excessively rich fuel-air mixture.

And this brings up a sore point with me—compressor stall or surge. When this condition occurs, I normally get blamed for it. Yet, it is usually not my fault. As a matter of fact, the only time I'm guilty is when I fail internally. To begin with, this condition is called a "surge" because airflow reverses and "surges" in a direction opposite to that of normal flow. It is referred to as a "stall" because the compressor blades which are airfoils enter an aerodynamic stall condition.

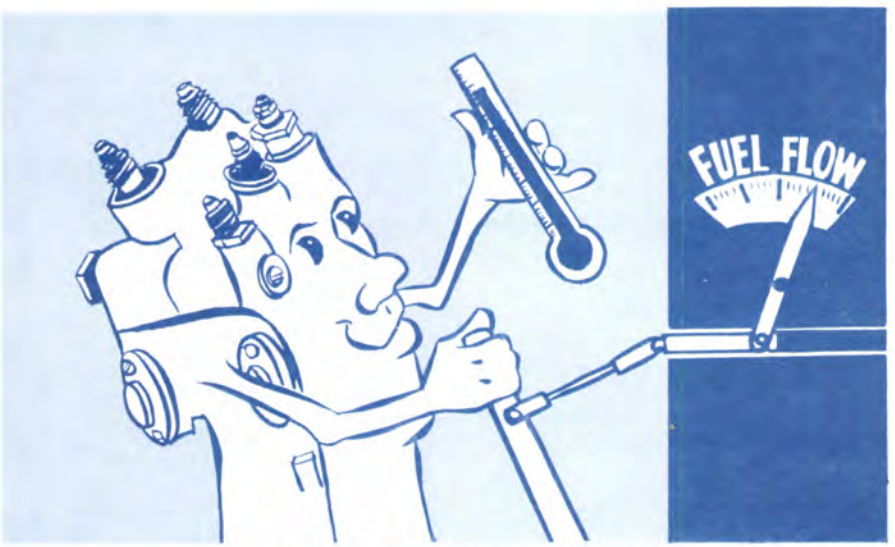
The compressor encounters a stall when the pressure in the combustor exceeds the pressure the compressor is capable of producing. When this occurs, air flows in reverse across the compressor, cooling air

stops flowing around the hot end components, and heat damage begins to occur. If the onset of the stall is sudden, a loud explosion will also occur. This will be accompanied by flame emitted from the tailpipes. This violent action occurs after normal airflow is resumed and takes place as the correct fuel-air mixture comes in contact with the hot end components. The resultant explosion fills the void left by the surge portion of the stall, and the pilot will actually note the overtemp indication **after** the stall has occurred. Erosion, dirty blades, or foreign object damage is usually the culprit when compressor stall occurs.

Since the acceleration compression ratio exceeds the steady state compression ratio by the same amount as the acceleration fuel flow exceeds the steady state fuel flow, compressor stall is most likely to occur while the engine is accelerating. A quick reduction in power demand will relieve the compressor load and stop the stall.

As your fuel control, I am also required to control variable inlet guide vanes (VIGVs) and usually whatever other variable devices the compressor may contain to regulate airflow. I generally control these devices as well as the compressor bleed system by means of some type of linkage and valves. Since these systems regulate airflow into and out of the compressor to prevent stall or surge, particular attention must be devoted toward insuring all linkage is correctly rigged. If these systems get out of sequence with my signal and the compressor's requirements, surge is sure to result. And the sad part is that I will get blamed. The mechanic will replace me and rerig the system, and then everything will check out okay. Actually, rerigging of the system was all that was needed.

Another of my systems that may seem somewhat complicated concerns my temperature sensing devices. Since the gas turbine engine performance is extremely sensitive to temperature variations, I must compensate for both air temperature and fuel temperature




changes. Changes in either of these can cause large changes in engine performance.

I sense air temperature by a bulb or small radiator filled with a sensitive fluid that expands and contracts as the temperature varies. This action is then transferred to a linkage inside of me that resets fuel flow in relation to compressor speed. Also connected to this linkage is another temperature sensing device that senses the temperature of the fuel. In conjunction with the air temperature, it adjusts the fuel flow as required. Needless to say, careless handling of my temperature sensing components can cause complete burnout of the engine.

Another system that must be considered is my P1 or altitude compensation system. In reality, it is an atmospheric pressure compensation system. This system is sensitive to pressure changes in the atmosphere whether I am on the ground or in the air. The heart of this system is a bellows that is calibrated to sea level atmospheric pressure. The free end of the bellows is connected by my internal linkage to a multiplier assembly. As its name implies, this unit multiplies the minute movements of the bellows into a usable mechanical force that adjusts fuel flow when atmospheric pressure changes or when the helicopter climbs or descends during flight.

As atmospheric pressure varies, fuel flow must also be varied to maintain the correct fuel-air ratio. This system is incorporated in my internal throttle linkage in such a way that it will adjust the fuel-air ratio without affecting throttle travel or response.

Now, you have a general overview of what goes on inside me. But I still have one additional major system that all the others depend on to do their respective jobs. It is my engine-driven fuel pump.

This unit always pumps an excessive amount of fuel to keep my internal parts cool and lubricated and to prevent air from reaching the fuel nozzles. Depending on my type, my internal pressures range between 125 and 900 psi. In the hydromechanical units, I use small hydraulic servos controlled by small spool valves to amplify, transmit, and expand the small mechanical forces I receive from my subsystems.

My requirements to accomplish my many tasks are small, and clean fuel is the most important of all. Dirty or contaminated fuel can clog tiny ports, cause binding of delicate parts, or actually damage some intricate assembly. Just a small scratch on some of my internal parts can put me out of action. And this brings up another point.

While my exterior housing looks—and is—tough, please handle me gently when I am not installed on an engine. Just a drop of 6 inches can scramble my insides. Also, be careful when changing my fittings. Don't bang me around. I am more susceptible to contamination and damage when I am empty. Give me a little TLC and check me periodically for external linkage wear, and I will give you many hours of safe, trouble-free operation in the air.

Point of contact at the Safety Center is Jack Carter, AUTOVON 558-3913/3901. ■

# Selected mishap briefs

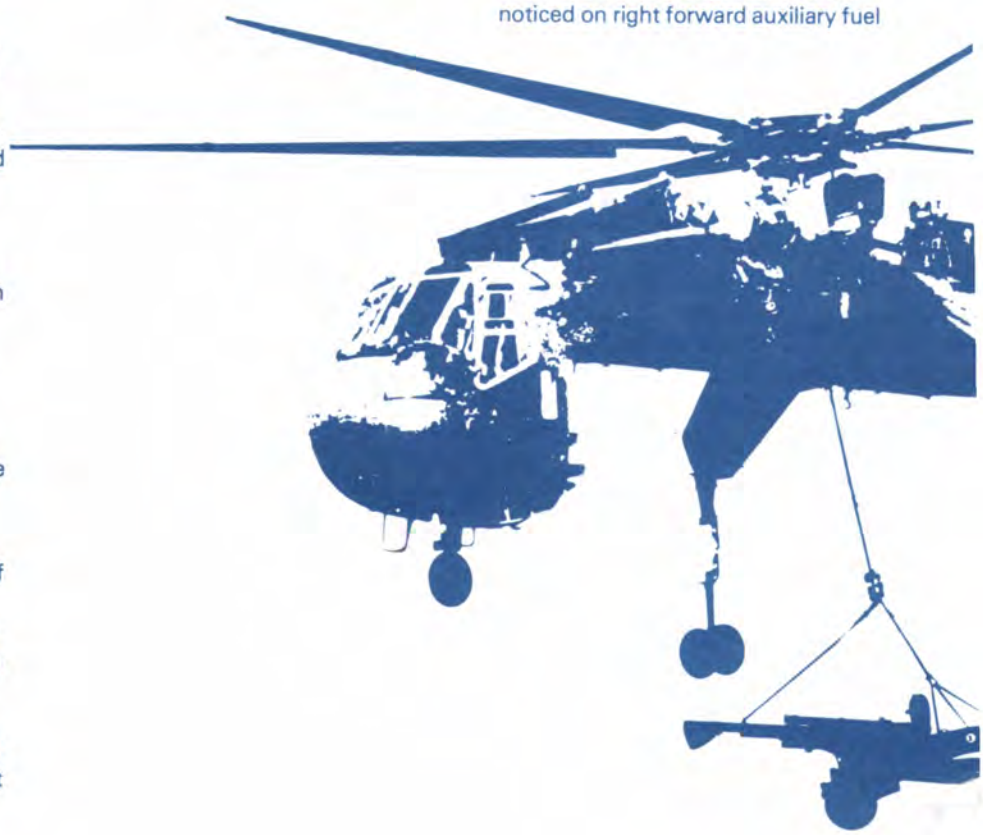
**uh1** **Class E mishaps** ☐ (JUH-1) Aircraft was flown about 20 minutes with vertical fin drive shaft cover open, resulting in sheetmetal damage to stiffeners and hinge. Pilot and crew chief did not do final walk-around inspection after preflight. ☐ (H series) During preflight at night, one crewmember untied main rotor blade and rotated main rotor so other crewmember could check tail rotor blades. Crewmember inspecting tail rotor blade thought there was insufficient clearance between tail rotor blade and vertical fin. Main rotor tiedown was left in main rotor blade. After deciding there was adequate clearance between tail rotor blade and vertical fin, crew continued preflight without removing main rotor tiedown from blade. During start, two thumps were heard and start was aborted. Tiedown strap was severed and one tail rotor blade was dented. ☐ (H series) No. 2 aircraft in formation flight drifted out of position into rotorwash of lead aircraft. Copilot applied power to correct position. Aircraft yawed to left and engine rpm bled to 6300. Pilot saw torque at 55 pounds, and collective was reduced.

**ah1** **Class C mishap** ☐ (S series) During runup with rotor system at low rpm, crew chief signaled for aircraft shutdown. Aircraft shuddered, and copilot said tiedown was still on. Aircraft was shut down, and tail rotor blade hit vertical fin. Pilots did not perform item 7 of the tail section right side preflight checklist.

**Class E mishaps** ☐ (G series) Aircraft pitched forward 45 degrees during takeoff to a hover and rolled left and right 45 degrees. IP in front seat took control and pressed SCAS interrupter button with no results. Pitch and roll was becoming uncontrollable. As IP tried to land, one skid touched the ground. Aircraft pitched forward again, and rotor blades almost hit ground. Pilot also tried to punch off SCAS with rear cyclic, with no success. Because of the number of people on the ramp, IP elected to take off to keep from endangering them. During takeoff, aircraft was still pitching and rolling violently. When airborne, pilot was able to turn SCAS power switch off, stopping the problem. Running landing was made with no further problem. ☐ (S series) Pilot noticed engine oil temperature rising during NOE flight. Caused by failure of bearings in engine oil cooling turbine fan.

**ch47** **Class B mishap** ☐ (B series) As pilot was attempting 180-degree ground turn, aft rotor blades hit telephone pole. One ground guide was at front of aircraft and one was at rear. 8135

**Class E mishaps** ☐ (A series) Crew chief noticed oil running down companionway during flight. Caused by failure of O-ring in No. 2 SAS control filter. ☐ (C series) Crosscheck of instruments during flight revealed No. 2 engine oil pressure at 112 psi. Caused by failure of pressure transmitter. ☐ (C series) No. 1 engine oil low light came on. Landing was made and 5 quarts of oil were needed to bring level to full. Aircraft flew 1.5 hours to refueling stop and added 4 quarts of oil. After 55 minutes of flight, No. 1 engine oil low light came on. Landing was made and 6 quarts of oil were needed to bring level to full. Aircraft flew 45 minutes to destination and oil level was 4 quarts low. Engine used 15 quarts in 3.2 hours of flight.
☐ (YCH-47D) Crew smelled fuel fumes in cockpit. After landing, fuel leak was noticed on right forward auxiliary fuel



tank. Caused by defective fuel manifold and valve assembly.

**ch54** **Class E mishap** □ (B series) Crew was performing sling load training. While at hover with load, flight engineer noticed smoke and spray of fluid coming from No. 2 engine area. Pilot released load and landed. As aircraft was being shut down, crew noticed utility hydraulics pressure falling, and first-stage tail rotor caution light came on. Caused by radial fracture at flare end of tube, causing hydraulic tube to leak.

**oh58** **Class C mishap** □ (C series) During shutdown, main rotor blades flexed down and hit tail boom and tail rotor drive shaft. Postflight inspection revealed pitch change link was broken.

**Class E mishaps** □ (A series) After VHF frequency change, $N_1$ decreased to 100 percent. After changing VHF frequency back to original, $N_2$ dropped below 95 percent. Collective was reduced, and partial power landing was made. Pilot determined that Nomex glove probably snagged on increase/decrease switch. □ (A series) During runup, crew chief notice oil dripping from torquemeter oil pressure line. Caused by hole in line. □ (A series) As pilot was repositioning aircraft in LZ to suitable touchdown area, main rotor blades hit and severed telephone wire. LZ was covered with tall weeds and one end of it sloped 5 to 6 degrees. While pilot was trying to find suitable touchdown spot, he allowed his attention to become fixed on the ground. □ (C series) Both primary directional control lights came on. Landing was made to wet grassy landing strip. Pilot was able to reset primary directional control switch and lights went out. Pilots said they did not touch switch on collective. Thunderstorm had passed over the area a few hours before, and temporary electrical malfunction could have been caused by rain. The front doors of the aircraft were off, and it is possible the wind caused a portion of a seatbelt to hit the control switch, causing the lights to illuminate.

**u8** **Class E mishap** □ (VU-8F) While simulating landing gear malfunction, pilot manually extended gear. When gear was fully down, pilot tried to normally retract gear. Gear would not go up. Caused by failure of circuit breaker.

**u21** **Class E mishaps** □ (A series) When flaps were extended and retracted during runup, noise was heard from floorboard. Flaps were again extended and would not retract. Smoke was seen in cockpit. Aircraft was shut down. Flaps were retracted after flap motor was allowed to cool. Caused by failure of motor. □ (A series) Fuel was seen siphoning from right nacelle fuel cap during flight. Caused by incorrectly secured cap.

# Maintenance

**uh1** **Class E mishaps** □ (H series) Loud bang was heard during hover and loss of hydraulic boost occurred. Inspection revealed locally manufactured hydraulic line had failed, causing loss of hydraulic fluid. □ (H series) Master caution and transmission oil pressure lights came on, transmission oil pressure indicator went to zero, and smoke caused by leaking fuel entered cockpit. Postflight inspection revealed about 5 quarts of transmission fluid had been lost. Caused by overtorqued retaining nuts on internal transmission oil filter.

**ch47** **Class E mishaps** □ (C series) No. 1 engine fire light came on during runup. Fire detector was grounded against engine cowling. □ (C series) Flight engineer saw hydraulic fluid leaking from combining transmission area. Caused by chafed No. 2 flight boost rigid hydraulic line.

**oh58** **Class E mishaps** □ (A series) $N_2$ bled off from 103 percent to 94 percent during hover. Caused by incorrect throttle rigging. □ (A series) $N_1$ tachometer generator failed in flight. Caused by loose cannon plug to generator.

## Messages received

- Technical information message for all AH-1S aircraft having short bolts installed on the T53-L-703 engine which connect the fuel control temperature compensating T1 bellows to the inlet housing (AH-1-81-13, 071345Z May 81).

- Maintenance notice inspection concerning inspection of the installation bolts in the modernized AH-1S (FM-AM) gunner's cyclic stick (AH-1-81-14, 071820Z May 81).

*(continued on back page)*

# Mishap briefs

• Maintenance notice concerning installation of the new AN/PRC-90 radio pocket on the SRU-21/P survival vest used in all Army aircraft except the OV-1 and RV-1 (061616Z May 81).

• Information message on conversion of OV-1/RV-1 propellers and propeller control systems to MIL-H-83282 hydraulic fluid (061630Z May 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Change to TM

Change 6, dated 13 January 1981, to TM 55-1520-228-PM for OH-58A/C Aircraft Phased Maintenance Checklist has been released. ■

# Class C mishap reporting change

Army Safety Center message GEN-81-05, dated 271800Z Apr 81, on aircraft mishap reporting test, is repeated in part in case some of you did not receive it.

To reduce the workload at unit level of reporting Class C aircraft mishaps, Department of Army is instituting a test of a revised criteria for reporting these mishaps. Paragraph 2a of Army Safety Center message 311455Z Oct 80 on clarification of DA Form 2397 series reporting requirements reads: "Clarification instructions for use of current DA Form 2397 series by aircraft mishap investigation boards in consonance with reference a and b follow: For Class A, B, and C mishaps, DA Forms 2397, 2397-1, 2397-2, and 2397-3 should be prepared IAW instruction for completion contained in chapter 14, AR 95-5. Other DA Forms in 2397 series should be prepared whenever they meet criteria set forth in chapter 14, AR 95-5."

For this test, the foregoing paragraph is amended to read: "For all Class A, B, and those mishaps with a total dollar cost above 2,000 dollars, DA Forms 2397, 2397-1, 2397-2, and 2397-3 will be prepared IAW instruction for completion contained in chapter 14, AR 95-5. Other DA Forms in 2397 series must be prepared whenever they meet criteria set forth in chapter 14, AR 95-5. For those aviation mishaps with a total dollar cost of less than 2,000 dollars, the preliminary report of aircraft mishap (PRAM) will suffice."

Commanders may institute this concept immediately to report Class C aviation mishaps with a total dollar cost of $2,000 and below. The test will end on 31 December 1981. A determination on whether or not the concept will become permanent will be made at that time. The concept will be successful only if the information submitted to the Safety Center continues to be of the high quality evidenced by current 2397 reports and is adequate for analysis purposes and input to the Army safety management information system. This can best be accomplished if commanders concerned will adhere strictly to the details specified in appendices C and D of AR 385-40.

The commander of the Safety Center will continue to reserve the right to request additional clarifying information on aviation mishaps as provided for in AR 95-5.

Point of contact at the Safety Center is Mr. Almquist, AUTOVON 558-6385/6510. ■

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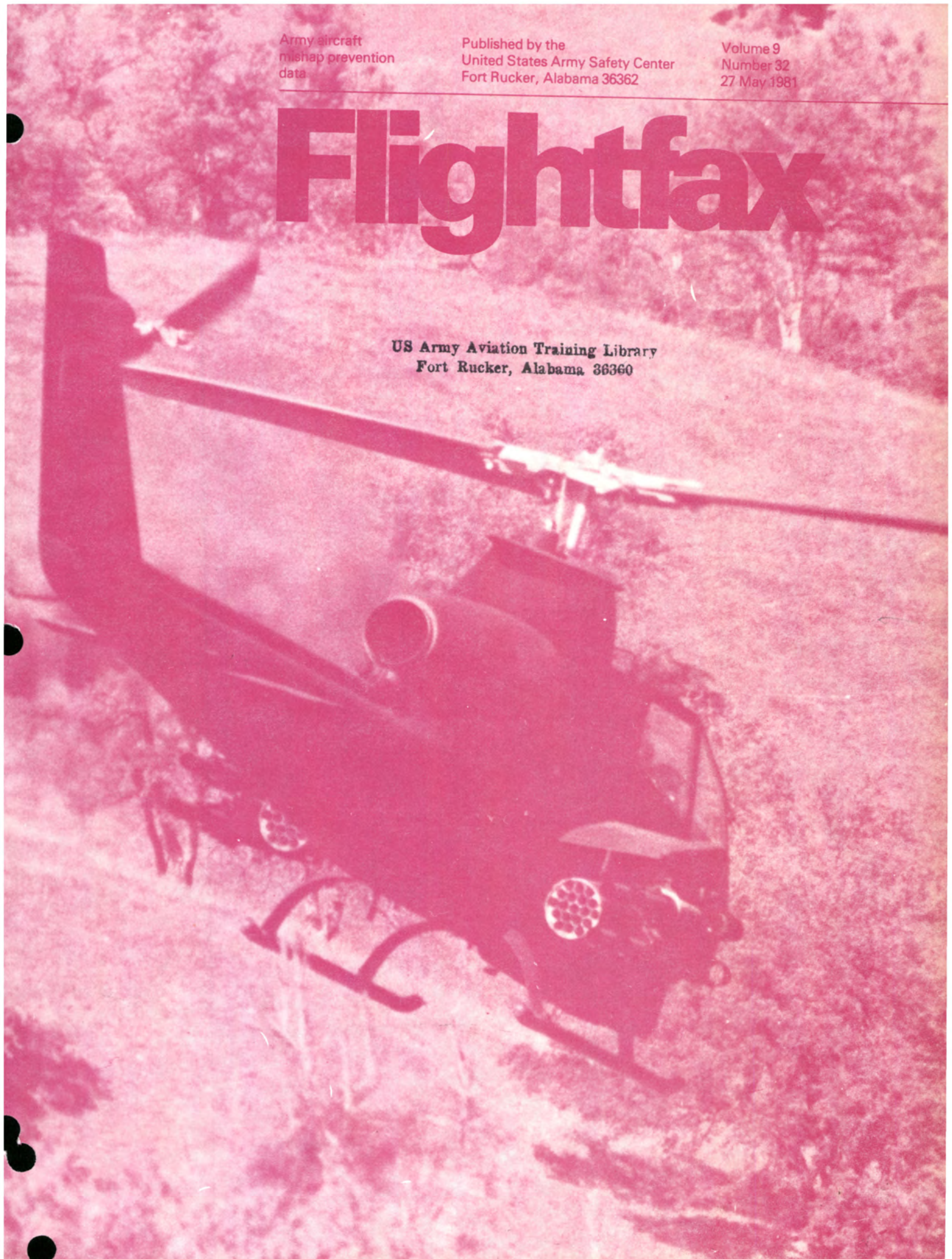

# Improving safety in summer training exercises

Past experience shows that with the peak summer field training exercise period beginning we can expect an increase in mishaps unless all unit personnel, supervisors, and commanders recognize the hazards associated with hot weather operations, particularly in an unfamiliar training environment.

Summer training poses common problems to all aviation units. The key to eliminating or reducing these hazards is total integration of safety during preexercise planning as well as during the actual training. Therefore, emphasis should be placed on the following hazards during summer operations to prevent their occurrence.

• **Terrain flight** proficiency means more than just being able to navigate to various points while avoiding detection. It also means doing those things without sacrificing the mission-ready status of the aircraft through needless mishaps. Successful terrain flight requires the ability to see and avoid obstacles. It follows that proficiency in terrain flying would involve such things as planning flights to minimize the effects of conditions which reduce visibility, i.e., bright sun; flying at an airspeed which will allow sufficient time and distance to see and react to unforeseen obstacles; and planning flights so that locations of actual obstacles or probable obstacles (i.e., roads or buildings usually have wires close by) are known.

Successful terrain flight requires constant alertness. Distraction for even an instant can be disastrous. Terrain flight in itself poses risks you must be willing to accept but which you should not forget. During terrain flight, you are often in the "avoid" zone of the chart in the operators manual entitled "minimum height for safe landing after engine failure." Be aware of this and have a plan for what you will do in the case of engine failure.

• **Tree strikes** continue to affect the operational capabilities of tactical units in all environments. The extent of damage from tree strike mishaps varies from no damage to total loss including loss of life. The difference between the two extremes is often only a matter of feet and/or inches.

The root problem with tree strikes is that they have long been accepted as fair wear and tear in terrain flight operations. There has been little concern about their effect on unit operations. The time a tree-strike-damaged aircraft is down varies depending on maintenance capabilities, recovery problems, parts availability, etc., but regardless, the unit's operational readiness is adversely affected.

In almost every instance tree strikes have been the result of negligence, and they could have been prevented. The flight profile of the AH-1S requires a great deal of NOE flying, particularly in the hovering mode, masked behind trees and terrain. Misjudging clearance, not adequately clearing to either side, or unrecognized drifting will, and often does, result in a

tree strike. These problems are greatly multiplied at night, especially if wearing goggles. While pilots have other tasks to perform in addition to flying, they must not forget that flying the helicopter is the most important job. Improper division of attention or concentrating on something other than flying is a common cause of tree strikes. We have heard most of the excuses for tree strikes and one thing is clear: They are usually a result of pilot negligence and improper flying techniques.

• **Wire strikes,** like tree strikes, range anywhere from little damage to total loss of aircraft and loss of life. And, as in the case of tree strikes, they are almost always the result of pilot negligence. To a greater extent than with tree strikes, however, environmental factors affect the likelihood of wire strikes. There is no disputing the fact that wires are difficult to see, especially when visibility is diminished due to weather, dust or sand, haze, bright sun, dull background, etc. The most effective means of eliminating wire strikes is to slow down in a wire environment. Flying speed must be slow enough to allow adequate time to react to a wire once it is spotted. Of course, extreme vigilance and good crew coordination are important, too. Mishap experience shows that most wire strikes occur during contour flight or during landing, rather than during NOE flight. This is probably because NOE flight involves slower airspeeds and generally greater crew vigilance.

Wire strikes during landings result from negligence, usually inadequate reconnaissance, poor crew coordination, and improper division of attention. Since most wire strikes occur during contour flight, improving safety in this area can provide the greatest payoff in reducing wire strikes. We have already discussed slower speeds that will allow sufficient time to react to a wire and avoid hitting it. You must also plan your flights to determine where the wires are or where to expect them. Wires are usually parallel to roads and in the vicinity of buildings. Wires should be plotted on the operational hazard maps. Whenever possible, all known wires should be marked to make detection easier. A final suggestion is to minimize time in the contour flight mode. Low level and NOE are not as much a problem as contour, which is the killer in wire strikes.

• **Fatigue** is a hazard to both crewmembers and noncrewmembers. Oftentimes, crewmembers exceed their physical capabilities due to the adverse effects of heat, long duty hours, lack of adequate sleeping accommodations, missed meals, and failure to properly rest during their off-duty time. The solution to the fatigue problem is for commanders to establish a realistic crew rest policy that fits their needs and then actively emphasize and enforce it. Furthermore, crewmembers must understand their responsibility to maintain a high level of physical and mental fitness at all times. They have a moral and military responsibility not to engage in off-duty activities which will prevent, restrict, or adversely affect their flying.

Maintenance personnel are just as critical to safe aviation operations and also need proper rest. While specific rest policies for maintenance personnel are difficult to put on paper, the results of fatigue on these people can be just as disastrous as with flight crews. Fatigue contributes to maintenance-related mishaps through negligence, forgetfulness, shortcuts, and failure to follow prescribed procedures. Therefore, supervisors of personnel who work on or around aircraft must be constantly on the alert for symptoms of fatigue and ensure personnel are given adequate rest periods.

• **Density altitude** changes are rapid, frequent, and great during hot weather. The load you take off with may well be beyond your aircraft's capability an hour later. Density altitude must not only be computed for takeoffs, but also for the point of destination. While flying technique is important, the only way aviators can be sure their aircraft is capable of accomplishing a mission safely is to compute aircraft limitations using the performance charts in the operators manual. To be on the safe side, compute density altitude before weight and balance and assume density altitude to be higher than it probably is.

• **Dynamic rollover,** particularly during slope takeoffs and landings, has resulted in numerous mishaps. However, danger of dynamic rollover isn't restricted to slope operations. Several rollover mishaps have occurred on level surfaces.

*(continued on next page)*

# Summer training exercises

The fact that a skid gets caught in soft asphalt or turf doesn't necessarily mean that aircraft rollover is inevitable, but depends on how quickly and accurately aviators analyze the problem and take prompt corrective action. To prevent rollover, aviators should become familiar with the rollover characteristics in the applicable operators manual and with FM 1-51.

• **Rapid refueling** poses several hazards to Army aircraft. Change 2 to FM 10-68 spells out in detail how to correctly set up and run a rapid refueling site. Dangerous deviations from these procedures include improper grounding, deteriorated or leaking hoses, leaking nozzles, improper sampling procedures, improperly storing and/or dumping of waste POL products, lack of personal equipment for refueling personnel, no water on refueling site, uninspected and/or unserviceable fire extinguishers, and no controlled access into and out of the points.

Dust can contaminate fuel if care is not taken to insure nozzles and other equipment are clean. Dust can also be a problem by causing "brownout" of hovering helicopters. Ideally, refueling sites should be located where dust is a minor factor, but this is not always possible. When blowing dust or sand becomes severe, sites should be relocated.

Control of air traffic around a refueling site or lack of it can be hazardous. Usually there is no problem around unit FARE sites. However, large rapid refueling sites used by more than one unit need some type of positive control. Traffic patterns into and out of the sites should be published and familiar to all pilots who will use the sites. Positive control on the ground is also necessary to insure smooth traffic flow, to minimize hovering time, and to reduce confusion. Experience has shown that failure to control traffic greatly increases the chances of a midair collision.

Fires caused by static electricity are another major hazard to flight operations during rapid refueling. It is imperative that all personnel, even remotely connected with the rapid refueling process, be aware of the great potential for explosion and fire during refueling operations. A static electricity arc introduced to fuel vapor will explode. To prevent this, all components of the refueling system must be grounded to help dissipate static electricity from fuel being pumped through the system. The aircraft must be grounded to help dissipate static electricity from its dynamic components. The most important thing, however, is to insure the nozzle is bonded to the aircraft before it is inserted into the fuel receptacle. Failure to do so can result in a static arc between the refueling system nozzle and the aircraft since grounding systems,

however good they are, will seldom dissipate all static electricity. Connecting the nozzle bonding wire before opening the fuel cap will prevent a static arc from occurring in the presence of fuel vapor and significantly reduce the fire hazard.

• **Aircraft maintenance** is another area of critical concern in a field environment. The quality of maintenance performed is directly related to the training and experience level of the mechanics, the effectiveness of the supervisors, and discipline. Discipline in this sense means that people do things right. And that means by-the-book performance. One of the biggest problems with maintenance in the field is a tendency to take shortcuts to compensate for uncomfortable environmental conditions. Failure to perform maintenance by the book, failure

to account for tools, and failure to conduct a thorough inspection of work performed has and will continue to kill crews and damage aircraft.

Another field maintenance problem lies with aircrews. Crews in the field usually are assigned a particular aircraft and fly it day after day. Such a practice has both advantages and disadvantages. One of the major disadvantages from a safety standpoint is that crewmembers become so familiar with the aircraft they think they know all its problems and their severity. So preflight inspections lose their thoroughness, and discrepancies that would normally be of concern are not checked. The lesson learned is not that complacency kills but that preflights must be performed by the checklist before every flight and postflights should be performed whenever the aircraft is shut down. All discrepancies should be written up and checked out, then fixed as soon as possible.

• **Personal protective equipment and clothing** should be worn by everyone who works around operating helicopters. Crewmembers are pretty conscientious about wearing and caring for their protective gear. However, we occasionally see crewmembers with POL-soaked gloves, and it's not uncommon for helmet earpads to have hardened, thus sacrificing a degree of hearing protection. Most of those who don't have, use, or understand the need for personal protective equipment and clothing are noncrewmembers, in particular refueling personnel. However, these people are subjected to numerous hazards which justify protective clothing and equipment. This includes eye protection to keep from being blinded by JP4 and/or objects blown by rotor blades, Nomex or at least fatigues with sleeves rolled down and gloves for protection against burns, and protective headgear. It is very important that all personnel associated with helicopter operations know the hazards involved and the reasons for personal protective clothing. Supervisory responsibility doesn't stop here, however, because knowing about hazards is not the same as being concerned about them. Supervisors must insure that their people are protected to the maximum degree possible.

• **Dust and sand** add to the problems associated with training in the summer heat. Today, a great deal of training is being done in the desert. Units, particularly those going to the desert for the first time, need to know what to expect. And it's important to know that deserts are not the same. For instance, there is a great deal of difference between the Fort Bliss desert and the Fort Irwin desert, both in the terrain relief and the sand itself. The desert at Fort Irwin has large flat areas with basins and mountains. The terrain gently slopes upward toward the mountains, and pilots performing terrain flight toward the mountains must constantly add power to maintain terrain clearance. At night this factor is extremely critical since there are few visual cues.

*(continued on next page)*

# Summer training exercises

The Fort Bliss desert has dunes which vary in height from a few feet to higher than the main rotor of a Huey. From the air it is difficult to determine any relief, but on landing it is not uncommon to set down between dunes and have little or no clearance between the rotor blades and the top of the dunes. Average relief at Fort Bliss also slopes to higher areas and constant power settings cannot be maintained.

The potential for "brownout" in dust and sand is prevalent in both deserts and pilots must know how to cope with this problem. The sand composition at Fort Irwin is more coarse than the very fine sand at Fort Bliss. Both have an adverse effect on aircraft components although the finer sand seems to have a more severe effect on dynamic components such as engines, rotor blades, tail rotor, and hanger bearings. Other factors associated with desert operations which affect helicopter crews are dehydration (the low humidity evaporates perspiration and people need to drink plenty of water to keep from becoming dehydrated without knowing it), fatigue (people get tired faster in the desert), poisonous snakes and insects, and, often, **very high winds.**

Visibility can and often does approach the near-zero point during taxi operations, takeoffs, and landings in any dry environment. Year after year, pilots fly their aircraft into the ground in blowing dust and sand. To prevent this, the following procedures should be followed:

Taxiing. When it is absolutely necessary to taxi in sand and dust, get the helicopter airborne as quickly as possible to minimize the danger of brownout.

Takeoff. A running takeoff is preferred for wheel-type helicopters; otherwise, a maximum performance takeoff is recommended. If rotor blades stir up sand and dust, this maneuver should be executed as rapidly as possible to avoid loss of visual reference.

Landing. The best method to reduce blowing dust or sand is to make a running landing. If the terrain does not permit a running landing, an approach to touchdown should be made, keeping the touchdown roll to a minimum. However, if the terrain is unsuitable for a running landing, a landing should be made using a greater approach angle than that used for normal approaches. To avoid being enveloped in a dust cloud, approaches should never be terminated to a hover and aircraft should never be brought to a hover during takeoff, especially when terrain is known to be dusty.

The problems discussed here are by no means the only ones you can expect during summer field training, but they do occur most often. Give these areas a high priority for safety in planning summer training.

**Safety Center assistance** is available upon request for major joint readiness exercises sponsored by the U.S. Army Readiness Command. Requests for on-site assistance must be routed through MACOMs. Safety Center observers accomplish several functions. They provide briefings to increase safety awareness among exercise participants, identify and help rectify hazardous situations, visit units in the field and discuss mishap prevention matters, and are available to advise and assist in the event of a mishap. Also, one of the most important functions is the identification of risks or safety problem areas for inclusion in future mishap prevention programs at the Safety Center. Observations and recommendations are presented to the commander requesting our assistance and may be written or verbal. Also, telephonic requests by unit safety officers for information, publications, posters, etc., will be honored.

Further information about Safety Center assistance in field training exercises can be obtained by calling Major Kenton, AUTOVON 558-3901/3913, commercial 205-255-3901/3913. ■

# Selected mishap briefs

**uh1** **Class A mishaps** □ (V series) Engine lost power during flight, and aircraft landed in water and sank. 8136 □ (H series) Aircraft yawed left, became uncontrollable, and crashed. 8137

**Class C mishap** □ (H series) During demonstration of emergency governor operations, pilot increased throttle to 7200 rpm while helicopter was on the ground. Throttle was decreased immediately and engine was shut down.

**Class E mishaps** □ (H series) Crew smelled smoke during flight. Caused by failure of attitude indicator. □ (H series) Aircraft was No. 4 in formation of five landing for passenger dropoff. At about 5 feet, while copilot was flying, crew chief, who was monitoring engine instruments and calling torque indications, noted torque had exceeded 61 pounds.

**ah1** **Class C mishaps** □ (S series) During termination of practice low-level autorotation at about 50 feet, pilot applied excessive aft cyclic. IP got on controls to try to level aircraft. High sink rate developed and aircraft touched down hard on aft part of skids. Aircraft bounced, rocked forward, hit runway again, and skidded to a stop. Aft cross tube and sheetmetal around UHF radio antenna were damaged.

**Class E mishaps** □ (TH-1G) Transmission oil bypass light came on during hover/taxi. Caused by failure of pressure relief valve. □ (G series) Transmission hot light came on with temperature at 105° C. Aircraft was kept at flight idle until temperature decreased below 100° C. Oil cooler radiator was clogged with mud.

**ch47** **Class A mishap** □ (C series) As aircraft was on final approach with sling load, what is believed to be high side beep failure on No. 1 engine occurred. Aircraft crashed. One fatality and one major injury. 8138

**Class E mishaps** □ (C series) Utility hydraulic fan failed during flight. Caused by malfunction of thermal switch. □ (B series) High frequency vibrations were felt from No. 2 engine during runup. Caused by failure of transmission drive shaft. □ (B series) Unusual flight control inputs during runup were caused by failure of swivelling actuator.

**oh58** **Class C mishap** □ (A series) As pilot was hovering next to tree line, armament system caution light came loose and fell to floor of aircraft. Pilot turned his head to see what was happening, and aircraft drifted into tree limb, damaging both main rotor blades.

**Class E mishaps** □ (A series) With pilot at the controls, aircraft was in autorotative turn to left. Collective was applied to check rpm buildup. As aircraft was aligned on final, collective pitch was placed in full down position about 75 feet agl. As pilot initiated progressive deceleration, rotor rpm built to 405 for 1 second before IP was able to check rpm buildup. Aircraft had just been refueled, increasing gross weight and tendency to build rpm. □ (A series) Loud screeching noise was heard during start. Caused by failure of engine compressor.

**c12** **Class E mishap** □ (A series) No. 2 engine torquemeter fluctuated rapidly during climb. Engine oil pressure started to decrease and pilot secured engine when pressure dropped below 60 psi. Single-engine landing was made. Pilot had checked oil on preflight and secured cap. Cap was found to be loose after aircraft landed, allowing oil to siphon. Loose tension on oil filler cap allowed cap to jar loose in flight.

**u21** **Class B mishap** □ (RU-21H) As landing gear was retracted during takeoff, crew heard unusual noises, followed by unsafe gear indication. Crew followed emergency procedures but could not get safe gear indication. Right main gear collapsed during landing rollout. 8139

## Maintenance

**uh1** **Class C mishap** □ (H series) IP heard grinding noise during coastdown. Aft section of tail rotor drive shaft cover had sprung to the left, allowing it to rub on tail rotor drive shaft clamps. Cover had arrived at unit badly warped. Maintenance had tried to correct defect at installation.

**Class E mishaps** □ (H series) Aircraft was positioned on ramp for main rotor tracking. Pilot told crew chief to remove main rotor tiedown. Crew chief was busy with fireguard duties and forgot to remove tiedown. Pilot pulled start trigger and noticed tiedown was still attached. Pilot aborted start. Main rotor blade continued around and tiedown hit FM antenna. □ (H series) Master caution and d.c. generator lights came on during flight. Cockpit lights failed, circuit breakers popped, and main generator loadmeter and d.c. voltmeter dropped to zero. Caused by loose wire on terminal at voltage regulator.

*(continued on back page)*

# Mishap briefs

**ah1** **Class C mishap** □ (S series) Pilot in another aircraft told crew vertical fin tail rotor drive shaft cover had come loose in flight. Dzus fastener had pulled out of housing, allowing cover to pull loose and tear. One fastener could not be secured and the four remaining fasteners had worn the housing enough so that it broke under stress.

## Messages received

• Safety-of-flight message on one-time inspection of UH-60 engine output shaft assembly (UH-60A-81-12, 141815Z May 81). Summary: Recently there was a failure of the engine to transmission torque tube on a UH-60A aircraft. A small piece of a flange on the shaft assembly had broken off but was retained under bolts attaching the thomas coupling to the transmission shaft. During shaft rotation, a small metallic piece rotated outward and scratched or cut the torque tube, which subsequently failed. Contractor metallurgical findings indicate that the flange failed due to fatigue fretting caused by loose hi-lock bolts. The bolts had either lost their torque during operation or proper torque had not been applied during installation. The aircraft manufacturer has completed an investigation of the problem, resulting in requirement to inspect and replace assemblies that have accumulated 1,000 hours or more flight time. Contact: Charles Vanartsdalen, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight message concerning one-time inspection of UH-60 axial fan and shaft assembly (UH-60A-81-13, 151945Z May 81). Summary: Failure of the internal splines of the oil cooler fan was discovered on a UH-60. The cause of the failure was attributed to excessive misalignment (run-out) of the shaft assembly. A complete failure of internal splines will result in loss of tail rotor control. This TB provides for inspection of the run-out of the shaft assembly, identified as "on aircraft" inspection, and a procedure for correction of run-out that exceeds .010 inches, identified as "off aircraft" inspection. If the on-aircraft inspection indicates run-out is .010 inches or less, no "off aircraft" inspection is required and components can be reconnected in accordance with instructions provided. Contact: Earl Parsons, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight maintenance notice on trim adjustments for new fuel control for UH-1H/M, EH-1H, AH-1G, and TH-1G aircraft (UH-1-81-06 and AH-1-81-15, 121905Z May 81). Summary: New fuel controls for T53-L-13B engines are trimmed for T53-L-703 engines. Therefore, certain adjustments must be made when controls are installed on T53-L-13B engines. Contact: Robert Lawyer, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# Mishap review

## Synopsis

The OH-58A pilot, while flying toward rising terrain, completed a downwind turn at 30 knots and 100 feet agl while looking out the left side of the aircraft. When he looked forward again, he perceived the aircraft to be descending. After checking airspeed and engine torque (instruments were normal and did not indicate a malfunction), he elected to make a forced landing straight ahead. The helicopter touched down on a snow-covered slope and slid into some trees.

## History of flight

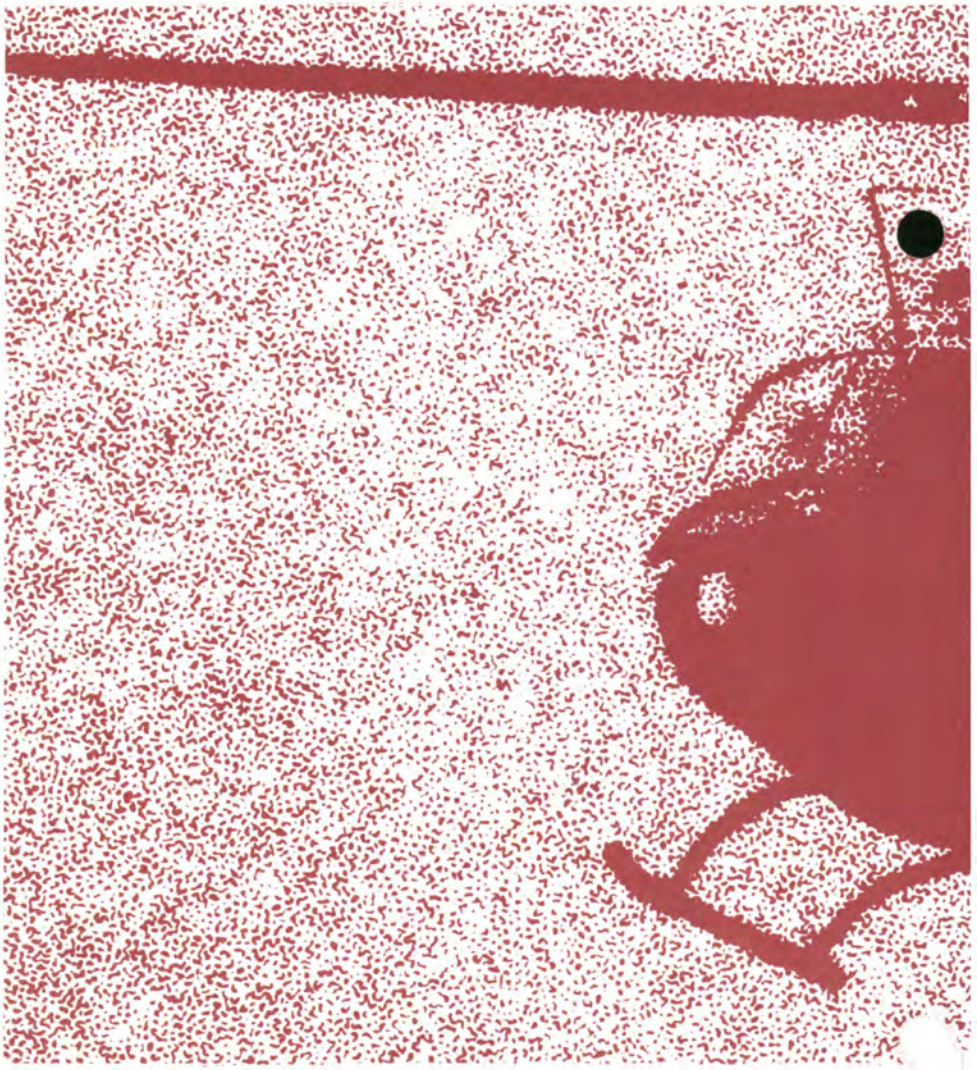
The training mission involved team gunnery tactics, using an OH-58A as the scout aircraft and two UH-1Ms as gunships. A pilot, observer, and passenger, who was in an on-the-job training status as an OH-58 mechanic, were aboard the OH-58.

The flight to the NOE training area took about 30 minutes. Arriving at the initial point for NOE lane No. 1, the flight made the required NOE hover checks. The scout helicopter initially operated with one gunship, and then the second gunship rejoined the flight.

The pilot of the scout aircraft located a target and tried to lead the gunships into firing positions. The OH-58 pilot started a climb out of the draw he had selected as a firing position. He climbed to about 100 feet agl and started a left turn. He intended to maneuver behind the gunships to protect their rear area. During the turn, he looked out the left side of the aircraft to check the position of the second gunship.

When the OH-58 pilot returned his attention to his flight path, he became aware that the rate of closure with the ground had increased, and he perceived his aircraft to be descending. He checked his airspeed and torque, which were 30 knots IAS and 50-52 psi respectively. The aircraft was not descending and was probably climbing at several hundred feet per minute. However, the rate of closure with the ground was a correct observation because of two factors. First, the elevation of the terrain increased about 150 feet in a 200-meter distance along the flight path. Secondly, groundspeed had doubled from 20 knots to 40 knots because of the turn to downwind.

The pilot interpreted the perceived descent as an indication of power loss,



but there was also confusion in his mind about settling with power. As a result, he reduced collective to see if that would improve the situation. This caused the aircraft to descend faster and confirmed the pilot's belief that there was a loss of power.

The pilot selected a forced landing area and continued a power-on approach. He overshot the landing area because of the tailwind and landed just beyond the point he had selected. After the aircraft was on the ground, the collective was lowered to the full down position. The aircraft was on a snow-covered downslope and started to slide forward toward a tree line. Full aft cyclic had no effect (since the collective was full down), and the pilot rolled the throttle to engine idle in an attempt to stop the slide. The rapid change in torque caused the aircraft to turn about 90 degrees to the left and slide down a steeper slope into some trees.

The OH-58 came to rest in a nose-down position. The observer received minor injuries.

## Crewmember experience

The 31-year-old pilot had more than 2,000 rotary wing flight hours, with more than 100 in OH-58As. He had not received adequate individual training in terrain flight missions or terrain flight maneuvers. His last tactical/NOE evaluation was 2 years before this mishap and involved a different aircraft and different mission.

## Commentary

The pilot concentrated his attention on an observation task at the expense of his primary duty, which was flying the aircraft. He then became spatially disoriented and incorrectly determined that an emergency existed. FM 1-51 indicates that terrain flight is a pilot/observer team activity which requires crew coordination. In this case, the pilot was not fully using his observer to accomplish the mission.

The unit SOP did not contain guidance on aircrew duties, procedures, and responsibilities in the terrain flight mode for the unit's attack helicopter mission.

The pilot did not check for the appropriate indications of an engine malfunction because of an inadequate aircraft transition and unit training program. He did not fully understand the relationship between engine torque and power. He was also unfamiliar with the conditions necessary for settling with power and how this differs from a loss of power. ■

# Shortfax

## Inspect, mark, and record

Are you familiar with the requirements found in TB 43-0142? What about those in Title 29 CFR, Part 1910, and in AR 385-10? No, we're not playing any guessing games. We're talking about inspecting and testing all types of lifting devices as well as maintaining proper records that relate to these inspections and tests.

To begin with, the lifting devices we're talking about consist of fixed or mobile cranes, hoists, forklift trucks, jacks, lifts of all types, ground handling wheels, and all maintenance stands, including those used to support engines, transmissions, and main rotor heads.

Supervisors of all activities that use any of these lifting or supporting devices should insure their equipment is properly inspected and marked in accordance with the provisions outlined in the above listed references. A properly marked lifting device will have both its **load rating** and the **date of the next periodic inspection** stenciled on it—on a spot that is clearly visible.

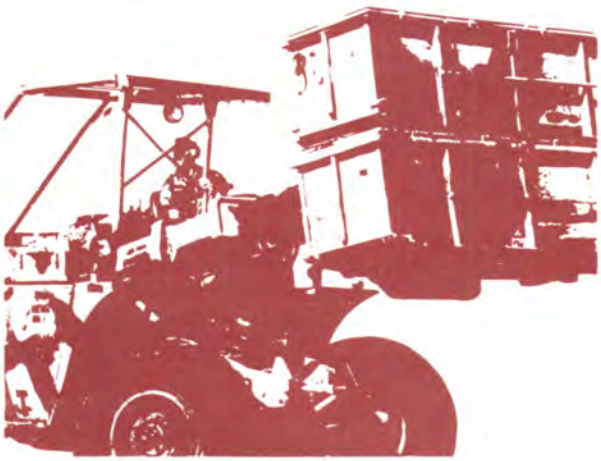
The load rating represents the maximum authorized load that may be lifted or supported by the device in question. This load rating may be less than or equal to the manufacturer's rated load, but must never exceed it.

If your unit does not have the facilities needed to properly inspect and test your lifting devices, then you should submit the necessary work orders to your support maintenance activity who will perform this service for you.

In addition, records are to be maintained on all lifting devices in accordance with the provisions found in TM 38-750 and TB 43-0142. If the required records (DA Form 2409 or DD Form 314) are not currently being maintained, supervisors should initiate them.

Many of the lifting devices presently in use are improperly marked. These show only a load test date and, sometimes, a future load test date—neither of which is required.

If necessary, order and distribute a sufficient quantity of TB 43-0142 to insure all users of lifting devices are familiar with the requirements associated with this equipment. ■



## Old first aid kits issued

A unit in Alaska recently received a shipment of 10-year-old first aid kits (survival kit, individual, tropical tactical aircrew, NSN 6545-00-782-6412) for their survival vests. These kits were manufactured under contract DSA 120-70-C-2296. All of the medical items in the kit had expired or were otherwise unsuitable. Following are examples of out-of-date items:

- Polymixin B eye ointment, expired May 73 (no longer available).
- Antidiarrhea pills (controlled substance), manufactured April 69.
- Primaquine phosphate tablets, manufactured March 69.
- Betadine iodine solution, manufactured Dec 69.

The unit immediately placed notices on their bulletin boards for all aircrewmembers to check their survival vests for this kit and inspect all items that may have expired. The expired items were replaced with fresh stock.

All units should check their survival vests for this kit and inspect new shipments when they arrive to insure first aid kits are usable before they are issued. ■

**Thanks to CW4 Francis Boisseau, ALSE officer, 222nd Aviation Battalion, Fort Wainwright.**

# Guard against fuel contamination

In 1978, the National Transportation Safety Board (NTSB) investigated 17 general aviation accidents involving fuel contamination **exclusive** of water as a cause factor, and 66 general aviation accidents involving water **in** the fuel as a cause factor. Investigation of a recent general aviation fatal mishap revealed that the fuel system showed evidence of extensive water and rust contamination; the underground fuel tank at the airfield where the aircraft was last fueled contained a large quantity of water and rust; the underground fuel tank's filtration system was heavily contaminated; and an incorrect fuel system dispensing filter, intended for use with diesel fuel, had been installed.

Current FAA regulations do not address fuel contamination even for certified airports serving major and regional airlines (air carriers excluding charters and cargo). However, the NTSB's informal communications with the FAA indicated that control of contaminated fuel is considered during airport certification via a rather broad interpretation of Federal regulations. Historically, NTSB's accident statistics do not indicate that fuel contamination has been a problem to air carrier aircraft.

A problem with fuel contamination does exist with airfields serving general aviation aircraft. In March 1980, a field office of the NTSB mailed a questionnaire to all known commercial/air taxi operators in a certain state. Of the operators who replied, 4 percent did not know what type of filtration assemblies and filters they used, 4 percent performed no inspections to determine when the dispensing filters should be changed, 30 percent inspected the dispensing filter daily, and 20 percent inspected the dispensing filter "at least yearly." The remaining operators inspected at intervals ranging from "once every 3 days" to "once every 3 years."

NTSB's recommendations to the Federal Aviation Administration will greatly improve the situation only if the FAA incorporates the recommended controls into Federal regulations. Ultimately, it is the individual aviator/flight crew who is responsible for guarding against taking off with contaminated fuel. A review of paragraphs 2-6 and 2-9, FM 10-68, will refresh your memory on common contamination hazards and their effect on aircraft.

When JP4 contaminated with water is added to a fuel tank, approximately 15 minutes per foot of depth are required for most of the free water to settle to the bottom of the tank (time varies slightly with other fuels). The significance of free water in a fuel sample after this length of time is normally the result of the filtering system on the refueling equipment not being checked or changed and the filter itself being contaminated and no longer effective. Another danger is when an old filter starts to deteriorate internally and particles from the filter are pumped into the aircraft.

Dissolved water contamination can settle out as free water when the fuel is cooled to a temperature lower than that at which the water is dissolved. Such a cooling of fuel is likely at high altitudes, although it is possible that temperature differences can be sufficient for settling of dissolved water during field operations. The differences in temperatures between garrison (asphalt or other surfaces) and the field site may be enough to cause some of the dissolved water to be freed. Warm/hot days with cold/cool nights add to the problems associated with dissolved water in aircraft and fuel trucks. Once the dissolved water is freed, all dangers of "free water" exist.

Contaminated fuel is disastrous. Aircrewmembers and support personnel share a common responsibility for guarding against fuel contamination. It is imperative that all fuel checks be made and samples taken.

Point of contact at the Safety Center is Major Smith, AUTOVON 558-4202/4198. ■

# Selected mishap briefs

**uh1** **Class A mishap** ☐ (H series) Aircraft descended nose low into 50-foot trees and rolled right. Aircraft was destroyed by fire, and all four occupants were killed. 8140

**Class C mishaps** ☐ (H series) Aircraft was No. 2 in flight of three. Flight lead became misoriented and left military reservation at terrain flight altitude. As lead became aware he was off post, he began a climb and, at the same time, saw power poles. He warned the flight about wires, but No. 2 pilot did not see powerlines in time to miss them and tried to go beneath them. Both main rotor blades hit and cut three cables. Wires were not marked but were on hazards map. ☐ (H series) Aircraft was flying about 50 feet agl and 90 knots. Two vultures orbiting in front of aircraft turned and flew past aircraft on right side. One vulture folded his wings and dove straight at aircraft. IP made left turn to try to avoid bird. Aircraft shuddered, and damage to vertical fin cover was found on postflight inspection.

**Class E mishaps** ☐ (H series) When IP reduced throttle to initiate simulated engine failure, rotor and engine would not discharge from each other. Caused by failure of sprag clutch. ☐ (M series) No. 2 hydraulic pressure light came on, and loud grinding noise was heard from hydraulic pump. Caused by loss of hydraulic fluid because of failure of collective servo pressure line. ☐ (H series) Crew smelled fumes and saw vapors coming from battery vent. Voltmeter read 29.5 volts and loadmeter .6. Pilot turned battery off and venting stopped. Voltage regulator adjustment had been made using TS352 multimeter because AN/USM 451 required by TM was not available. This allowed voltage regulator to be set too high, causing thermal runaway. ☐ (V series) Aircraft entered right turn to complete 180-degree autorotation and rotor speed increased to 350 rpm before instructor pilot recovered. Because of an extended period of high stress, IP's overall attention span and level of concentration had deteriorated.

**uh60** **Class C mishap** ☐ During final approach to tactical LZ, one of the occupants being transported pulled cargo window jettison handle instead of cargo door handle. Cargo windows fell out and one window was hit by main rotor blade tip cap. Passengers had been briefed not to open or close doors during flight.

**Class E mishap** ☐ During ground taxi, crew heard high-pitched sound from No. 1 engine. Damage was found to first-stage compressor. Caused by ingestion of foreign object.

**ah1** **Class C mishap** ☐ (S series) After landing, aircraft was being ground guided to a location for a static display. During left pedal turn, tail rotor blades hit overhead electrical wire.

**Class E mishaps** ☐ (S series) Pilot felt severe vertical vibration during flight. Caused by failure of white main rotor grip pitch change bearing. ☐ (S series) Pilot smelled fumes during hover, and alternator and rectifier lights came on. Caused by failure of alternator. ☐ (S series) Copilot was turning left to firing position from contour flight mode. As he neared the ground and realized his rate of descent was too fast, he rapidly increased

**Spirit or intent?**

collective, resulting in overtorque of 58 to 60 pounds. Approach angle combined with tall trees in the background and upsloping terrain may have given misleading visual cues to copilot.

**ch47** **Class C mishap** □ (C series) Pilot noticed split in torque between No. 1 and No. 2 engines during flight. No. 2 engine transmission low oil pressure light came on and smoke was seen coming from engine. Pilot jettisoned external sling load and landed. No. 2 engine and transmission were submitted for teardown analysis.

**Class E mishaps** □ (C series) No. 2 engine transmission oil pressure dropped to zero. Running landing was made. Caused by failure of oil pressure transducer. □ (C series) Flight engineer noticed hydraulic fluid spraying from front of oil cooler fan assembly. Caused by failure of hydraulic oil cooler motor. □ (C series) Transmission chip detector light came on. Caused by internal failure of transmission.

**oh58** **Class A mishap** □ (A series) Aircraft hit powerlines while flying about 100 feet agl. Pilot and passenger sustained major injuries. 8141

**Class E mishaps** □ (A series) During flight at 1,500 feet agl and 80 knots, pilot entered left turn and lowered collective to lose altitude. As pilot tightened turn, rotor rpm increased. Pilot increased collective

to lower rpm but not before it reached 420. □ (A series) During start, main rotor tiedown stayed on main rotor blade for one revolution. Caused by improper preflight procedures. □ (A series) Engine chip detector light came on. Caused by loose wire. □ (A series) Master caution and engine oil bypass light came on during takeoff. Return line to oil engine reservoir had come loose at aft firewall on engine side.

**c12** **Class E mishaps** □ (A series) Smoke and fumes in cockpit were caused by failure of vent blower. □ (A series) Flaps would not retract after takeoff. Caused by faulty flap fuse holder. □ (A series) Loud bang was heard during flight and flames were seen coming from exhaust stacks. Aircraft yawed and tgt peaked at 800° C. Single-engine landing was made. Caused by failure of engine.

**ov1** **Class E mishap** □ (D series) Pilot noticed unsafe gear indication during prelanding check. Gear was recycled without success. Emergency blow-down bottle was used and landing was made. Caused by failure of downlock switch.

*(continued on back page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishaps** ☐ (H series) Crew smelled fuel odor after landing. Fuel was coming from external fuel filter. Caused by incorrectly installed O-ring. ☐ (H series) Pilot saw smoke and fumes coming from battery vent during final approach. Primary loadmeter was indicating maximum load. Unit crew chiefs had been using an incorrect voltage output, which caused battery to overheat.

**uh60** **Class E mishap** ☐ No. 1 engine oil pressure dropped below 25 psi, and oil pressure light came on. Engine oil cap had come loose in flight because of incorrect adjustment of tension spring.

**ah1** **Class E mishaps** ☐ (S series) During climbout, crew heard several loud popping sounds and aircraft yawed 15 degrees left. Inspection revealed engine inlet vortex filter was clogged with dirt and grass. ☐ (S series) Engine oil pressure and master caution lights came on during hover. Gravity feed line was disconnected at quick disconnect by engine oil reservoir. ☐ (S series) Aircraft yawed to left and engine rpm decreased during hover for takeoff. Crew chief had washed aircraft with high pressure hose before flight. Large quantity of water was found in fuel cell. Water probably entered fuel cell through vent as aircraft was being washed. ☐ (S series) One-to-one vibration during flight was caused by excessive play between uniball and swashplate.

**ch47** **Class E mishaps** ☐ (C series) Leaking oil line was found during ramp check. Caused by loose line. ☐ (C series) Crew smelled fuel fumes during flight. Internal fuel tank was leaking at sump drain because of loss of torque on drain line cap nut.

**oh58** **Class E mishaps** ☐ (A series) Smoke was seen coming from battery vents during landing. Caused by battery failure. Voltage regulator was out of adjustment. ☐ (A series) As pilot pressed starter, fuel from loose fitting caused fire in engine compartment. Fire was immediately extinguished. Fitting on fuel line was loose.

**u21** **Class E mishap** ☐ (A series) No. 2 engine was shut down in flight for demonstration of autofeather system. Engine restart was unsuccessful. Single-engine landing was made. Glow plug leads from current regulator cannon plug pulled loose at plug.

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# Followups

## Additional information on mishap briefs previously published

**uh1** **Class A mishap** in 26 Nov 80 issue (8108) ☐ Tail rotor blade of one UH-1 hit main rotor blade of another UH-1 just after takeoff from stagefield. One aircraft crashed into trees and the other landed in field. IPs of both aircraft did not maintain aircraft separation in visual meteorological conditions.

**Class A mishap** in 14 Jan 81 issue (8112) ☐ Pilot used incorrect procedures while attempting deceleration maneuver during left turn. At an airspeed of about 60 knots and 35 to 50 feet above trees, pilot initiated deceleration by rotating aircraft about the center of gravity instead of the tail rotor horizontal plane. This decreased the altitude of the aft tail boom and resulted in tree strike. Aircraft spun twice following loss of tail rotor and was autorotated into trees. Ground impact resulted in destruction of aircraft. The pilot's actions probably resulted from his inaccurate estimate of aircraft clearance or height above the trees. The combined deceleration and left turn maneuver compounded the degree of difficulty in estimating aircraft-to-tree clearance.

**Class A mishap** in 4 Feb 81 issue (8117) ☐ During straight-in autorotation landing to sod touchdown site, aircraft touched down on skid, rolled right, came to rest inverted, and caught fire. IP allowed student to place aircraft in a condition from which IP could not recover. IP was not given adequate orientation or supervision before assuming IP duties.

**Class A mishap** in 4 Feb 81 issue (8118) ☐ During formation landing to snow-covered field, crew of No. 3 aircraft became disoriented in rotor-induced blowing snow. Aircraft crashed inverted. Contrary to instructions in TC 1-12, the flight leader directed a formation landing to a snow-covered field and did not provide adequate time in which to plan the mission. The pilot did not make a go-around when conditions required it. Inadequate unit training in snow flying techniques was also a factor.

**ah1** **Class B mishap** in 18 Feb 81 issue (8121) ☐ While hovering about 45 feet agl during tactical field exercise, aircraft drifted backward into 50-foot tree. Antitorque control was lost. Pilot rolled throttle to flight idle detent position, partially lowered collective, and applied full collective to cushion landing. The pilot's primary attention was directed on tanks to his front, and he used only his peripheral vision to maintain the aircraft's position over the ground. The copilot's attention was diverted to his map. The

8118

8112

pilot's judgment and attention were affected by relaxed adherence to tactical procedures because the exercise was about to end, stress from personal problems, high level of physical and mental stress, and lack of proper nutrition.

**oh58** **Class A mishap** in 28 Jan 81 issue (8113) ☐ While trying to maintain 9-foot hover during precision hover practice, pilot allowed aircraft to assume nose-high attitude and move rearward because of poor coordination between himself and his observer. Each of them thought the other was monitoring aircraft attitude while they looked beneath the aircraft to determine height above the ground. The tail rotor blades hit the ground, antitorque control was lost, and aircraft crashed.

**Class B mishap** in 28 Jan 81 issue (8114) ☐ While hovering over snow-covered field, IP, wearing night vision goggles, momentarily lost visual cues while aircraft was drifting to left. Before he could regain orientation, aircraft assumed unusual attitude and main rotor blades hit ground. IP lost orientation when he selected an area with insufficient visual cues to conduct NVG training because of inadequate written instructions concerning NVG operations over snow-covered terrain and the possibility that NVGs may not be compatible with such operations.

8115

**Class A mishap** in 28 Jan 81 issue (8115) ☐ Pilot was practicing for free-style event of the flyoff for world helicopter competition. He tried to pivot the aircraft to the left while maintaining ground contact with the heel of the right skid. As pilot applied left pedal to initiate pivot, resulting increase in tail rotor thrust caused dynamic rollover limits of the aircraft to be exceeded. Aircraft rolled to right and main rotor blade hit ground. Aircraft came to rest on right side. Pilot used poor judgment in making a spur-of-the-moment decision to attempt the maneuver without considering the factors affecting the aircraft's critical rollover bank angle.

**ov1** **Class A mishap** in 28 Jan 81 issue (8116) ☐ Aircraft was on day VFR maintenance test flight. Witnesses saw aircraft in a near vertical high speed dive at low altitude. Aircraft hit the ground and exploded. Pilot and observer were killed. Pilot may have been distracted by unexpected illumination of an annunciator light, and his performance may have been degraded by hypoglycemia and emotional stress. ■

# T63 air leaks a problem

Leaking air lines continue to cause loss of power and, in some instances, failure of T63 engines. The culprits are the stainless steel lines located between the governor and the fuel control unit along with the tubing that connects the bleed air valve to the scroll.

The two main causes of air leaks are loose lines and defective flares. Loose lines usually occur from incorrect torquing of the B nuts during initial installation or from abnormal engine vibration during flight.

Defective flares, on the other hand, are not necessarily the result of improper manufacturing procedures, although they could be. Usually, the flares are bent or damaged from carelessness or improper handling. Further, they can become worn and unfit for use as a result of improper installation. For example, insufficient torquing of a B nut will allow engine vibration to cause wear to the flared portion of the tubing. This will further loosen the line, and in turn, will allow engine vibration to cause more wear, setting up a vicious cycle capable of producing engine problems in a hurry.

When problems with air lines arise, the common remedy is to torque any loose B nuts and replace any damaged tubing. Often, such corrective measures bring only temporary relief. When vibration is severe enough to cause wear damage to the flared portion of a line, it will also damage the nipple of the flared tubing fitting. Consequently, if you replace such a damaged line without also replacing its fitting, an inadequate seal will result.

When an air leak is noted, a health indicator test (HIT) must be accomplished following corrective maintenance. This action is necessary to insure that the HIT base line was not established during the time the air leak was in progress.

The brunt of the responsibility for insuring the integrity and security of these air lines and fittings rests with maintenance. So it is important for mechanics to check these lines frequently and thoroughly.

When a loose line is discovered, the line should be removed and the flares inspected for feathered edges, wear, dents, bends, and any other type of damage. Similarly, the attaching fittings—especially the nipple portion—should be carefully checked for wear and any other possible damage. The use of a small metal straight-edge is recommended when checking the fitting nipple to detect the possible existence of a groove (see accompanying photo). Usually, if the tubing must be replaced because of a worn or damaged flare, its fitting should also be replaced.

Sometimes it is difficult to visually detect damage to these components, particularly minute damage to the fitting nipple. If in doubt as to the serviceability of either of these items, call on your TI for assistance.

**Groove worn around fitting nipple by vibration of stainless steel line can be readily detected by placing a straight-edge along beveled surface as shown.**

When air lines are removed and are not to be reinstalled immediately, the exposed fittings should be capped and the lines plugged with appropriate threaded plastic plugs to prevent damage.

Since excessive vibration not only can cause lines to loosen but also can damage both flares and fittings, a vibration check should be performed any time severe engine vibration is noted or suspected.

Toward this end, the pilot should perform all cockpit and operational checks as required and remain alert for any excessive vibration that may occur during flight. He should also note and record any instrument readings that might indicate a loss of power.

Unlike aluminum tubing which is soft enough to change its shape somewhat to conform to that of its fitting, stainless steel is hard and tough and must mate almost perfectly with its fitting if air leaks are to be prevented. However, pressure testing a stainless steel line and its fitting for leakage by using a liquid medium such as hydraulic fluid is of little value. While the seal formed by the mated surfaces may be effective enough to prevent the leakage of a liquid, it may not be able to stop a gas from escaping.

If any fuel system control air tubing is removed or disturbed during maintenance, check the control air tubing for leaks in accordance with TM 55-2840-231-24 or TM 55-2840-241-23, paragraph 5-8.

Maintaining these air lines and fittings in good condition and insuring their security is a must for the safety of personnel and equipment. Make sure you give these components the attention they demand. ■

# Shortfax

## Cobra damaged by simulator

During a recent field training exercise, "enemy" soldiers were able to penetrate the unit's security and toss artillery simulators in the area before withdrawing. One simulator landed beneath an AH-1S helicopter, where it exploded, damaging the ADF sensing antenna on the belly of the aircraft. Internal parts of the antenna broke free and further damaged honeycomb structural panels inside the aircraft fuselage.

The simulator exploded only 18 inches aft of the fuel cell and fuel sump. Had it ignited only a few inches further forward, the consequences might have been catastrophic.

Commanders must be aware of the hazards associated with pyrotechnics, particularly in the vicinity of very expensive—and very fragile—aircraft.

**Thanks to CW4 Norman Patterson, ASO, Air Cavalry Troop, 3d ACR, Fort Bliss.** ■

## Disposition of unreliable 3-inch refueling hoses

For the aircraft maintenance and fuels servicing folks who have struggled with the problem for sometime now, the San Antonio ALC item manager for refueling hoses has published disposition instructions for new, in-stock 3-inch refueling hoses, MIL-H-26521E, NSN 4720-00-611-9581, 3Q78 through 3Q80. For those of you who have not seen it, the San Antonio ALC/MMI message 171310Z Feb 81, is quoted in part:

"Subject hoses have recently been determined to be unreliable due to discrepant manufacturing processes used during 3Q78 thru 3Q80. Using activities were advised to place subject hoses manufactured in cited time frame in a hold status pending disposition instructions. To obtain proper turn-in credit for these items, request you advise all activities under your administrative jurisdiction to submit SF 364, 'Report of Item Discrepancy,' to Commander, Defense Construction Supply Center, ATTN: DCSC-SQP, Mr. Dellenbaugh, Columbus, OH 43215. Disposition instructions for failed hoses presently being held as exhibits will be issued on or before 27 Feb 81. . . ."

As these are the hoses most often involved in quick turns, hot refuelings, and the like, we need to get these items out of stock or service and get reliable equipment in use. Fuels servicing and fuels equipment maintenance personnel should coordinate with the base supply folks to see that all such items are disposed of per the instructions. ■

**—from The Air Force Safety Journal**

## How to crack your clevis fitting

When the AH-1 aircraft engine is run while the aircraft is on the ground and the canopy is partially open, vibration causes the clevis to crack. This plastic clevis is in stock and is to be used to fill high priority requisitions. When stock is exhausted, the plastic clevis will be replaced with a metal clevis, NSN 1560-01-092-7085, available May 1981. ■

**—from USATSARCOM Information Bulletin**

## Don't separate fuel controls and governors

If you send a T53 or T55 fuel control to Corpus Christi Army Depot for teardown and analysis because of suspected failure or malfunction, CCAD recommends you also send the governor. Do not separate the two components. ■

## Flares suspended

Lot number 12-F-0569 of MK13-MOD 0 smoke and illuminating flares has been permanently suspended from issue and use according to page 1-R-04, T.O. 11A-1-1, change 9, dated 1 March 1981.

**Thanks to WO1 Don Everhart, 3d ACR, Fort Bliss, for this info.** ■

# Selected mishap briefs

**uh1** **Class C mishap** ☐ (M series) Damage to main rotor blade was discovered during preflight inspection. Damage was caused by tree strike on previous flight.

**Class E mishaps** ☐ (H series) Pilot heard loud swishing noise from main rotor system during flight and aircraft vibrated. Bonding on main rotor blade had separated 4 inches from blade tip. ☐ (H series) Right fuel boost pump and master caution lights came on. Caused by failure of boost pump. ☐ (H series) Loud whirring noise was heard in transmission area, and master caution and hydraulic lights came on. Control feedback was felt. Running landing was made. Caused by failure of O-ring on left cyclic servo irreversible valve. ☐ (H series) Transmission oil temperature reached 110 degrees. Caused by failure of transmission oil cooler thermal valve. ☐ (H series) During shutdown, crew chief noticed engine oil leaking from bottom of aircraft. Caused by failure of hose. ☐ (H series) Engine chip detector light came on during flight. Terminal lug had pulled loose from chip detector wire, and wire touched airframe.

**Aviation-related mishaps** ☐ As helicopter was being towed from hangar, left elevator hit right troop door of another UH-1 parked nearby. Ground guides were used, but driver had windows rolled up and was not watching supervisor. Driver did not hear command to stop. ☐ Mechanic was repositioning workstand. Wheel dropped off parking pad, causing top of workstand to come off and break chin bubble of UH-1.

**uh60** **Class B mishap** ☐ No. 1 hydraulic system failed during hover. Later inspection revealed No. 1 engine Thomas coupling bolts stretched and broken, flex bands twisted and torn, front engine mount severed, and output shaft disconnected. 8142

**Class E mishaps** ☐ Fire warning light came on. Caused by failure of fire sensor. ☐ Backup reservoir low light came on during shutdown. Hydraulic pump bleed valve failed in open position, allowing fluid to be pumped overboard.

**Aviation-related mishap** ☐ Driver was backing truck to offload supplies. Truck hit main rotor blade of UH-60 parked on ramp. Truck driver did not understand signals from ground guide.

**ah1** **Class E mishaps** ☐ (G series) $N_1$ and torque fluctuated during test flight. $N_2$ then fluctuated. Caused by fuel control malfunction. ☐ (S series) Aircraft was flying NOE over trees. Pilot made forward cyclic input and increased power with collective. Engine power decreased, and pilot autorotated to open field. As aircraft landed, engine surged and failed. Caused by failure of fuel control. ☐ (TH-1G) D.c. generator and master caution lights came on during landing. Caused by failure of starter generator.

**Aviation-related mishaps** ☐ As aircraft was being moved into hangar, ground handling wheels hit a bump and came off. Aircraft fell and hit door track in front of hangar, causing dent in left skid tube. Pin on ground handling wheels was too short. ☐ Four people were ground handling aircraft into hangar. Aft part of skids hit hangar door guiding rail protruding from hangar floor, causing rear of aircraft to hit hangar floor. Main rotor blade then flexed down and hit No. 4 tail rotor drive shaft.

**ch47** **Class E mishaps** ☐ (B series) No. 1 engine would not respond to power changes during flight. Caused by failure of $N_2$ actuator. ☐ (C series) No. 2 engine would not accelerate to flight from ground idle. Caused by failure of fuel control. ☐ (C series) No. 2 engine transmission oil pressure dropped to zero and caution light came on. Caused by failure of transducer. ☐ (C series) During ramp check, with ramp cargo door retracted, flight engineer noticed hydraulic spray blowing into ramp area. Caused by broken O-ring on aft right gear. ☐ (C series) Rotor tachometer indicator went to zero. Caused by failure of tachometer generator.

**oh58** **Class C mishap** ☐ (C series) Main rotor blades hit top of tree during NOE flight. Copilot was at the controls and pilot was reading the map.

**Class E mishaps** ☐ (A series) Engine-out light came on, audio activated, and $N_1$ dropped to zero during climbout. Autorotation was made. Caused by failure of $N_1$ tachometer generator. ☐ (C series) $N_2$ dropped and low rpm audio activated during OGE hover. Pilot initiated forced landing procedure and then realized engine was still developing power. Power-on landing was made. Problem could not be duplicated. ☐ (A series) Master caution and hydraulic lights came on during hover. Caused by failure of hydraulic pressure switch. ☐ (A series) When engine was retarded to flight idle after landing, transmission oil pressure light came on. Caused by failure of transmission pressure switch. ☐ (A series) Master caution and engine chip detector lights came on during flight. Caused by internal failure of engine.

**Aviation-related mishaps** ☐ Operator backed tractor into aircraft. Untrained and unlicensed operator was applying pressure to brake pedal and gas pedal at the same time. ☐ Tiedown came loose as aircraft was being pushed out of hangar. Main rotor blade hit bottom edge of hangar door.

**u21** **Class E mishaps** ☐ (RU-21H) Flap switch was placed in up position after aircraft was landed. Crew smelled burning electrical odor and saw that flaps were still down. Caused by overheated flap motor and possible malfunction of down limit switch. ☐ (RU-21H) During climb to altitude, fuel consumption appeared to be abnormally high on right side. Caused by faulty fuel quantity indicating system.

**ov1** **Class E mishap** ☐ (D series) Hydraulic indicator showed zero during flight. Check of windshield wipers confirmed loss of hydraulic pressure. Postlanding inspection revealed failure of O-ring on piston assembly on right main brake.

**c12** **Class E mishap** ☐ (C series) No. 2 oil pressure gauge fluctuated during climbout. Engine was secured and aircraft was landed. Caused by malfunction of oil pressure transmitter.

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishap** ☐ (M series) High squealing sound was heard, and master caution and No. 2 hydraulic lights came on. Caused by chafed hydraulic pressure line to No. 2 hydraulic system.

**ch47** **Class E mishap** ☐ (C series) During ramp check, flight engineer saw hydraulic fluid leaking from valve. Caused by incorrectly installed O-ring.

**ov1** **Class E mishap** ☐ (C series) Newly installed cockpit hatch separated from aircraft during takeoff. Clevis rod end connected to escape activating mechanism was not locked into lever activating mechanism.

## Messages received

- Safety-of-flight message on inspection of all OH-6 aircraft controls support bracket assembly (OH-6-81-01, 282230Z May 81). Summary: A failure of the controls support bracket assembly has been recently reported by Category I EIR. Cracks in two other bracket assemblies were informally reported. The cracks/failures were found during maintenance for collective and power control problems. Failure of the bracket assembly can cause severe binding of the collective control. This message provides instructions for a one-time and recurring inspection of the controls support bracket assembly for cracks. Contact: Richard Smith, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

- Maintenance notice on OH-58C T63-A-720 engine (OH-58-81-04, 281540Z May 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## MEK still authorized

There seems to be a misconception concerning the use of 2-Butanone (Methyl-Ethyl-Ketone or MEK) as a cleaning agent. MEK is still authorized for use, providing the following safety precautions are taken:

- Eye goggles or face shield.
- Protective aprons.
- Gloves.
- Respirators.
- Well ventilated work area.

Proper protective garments are listed in DA Pam 385-3. ■

—**Thanks to SSG Gaspelich, 56th Aviation Company.**

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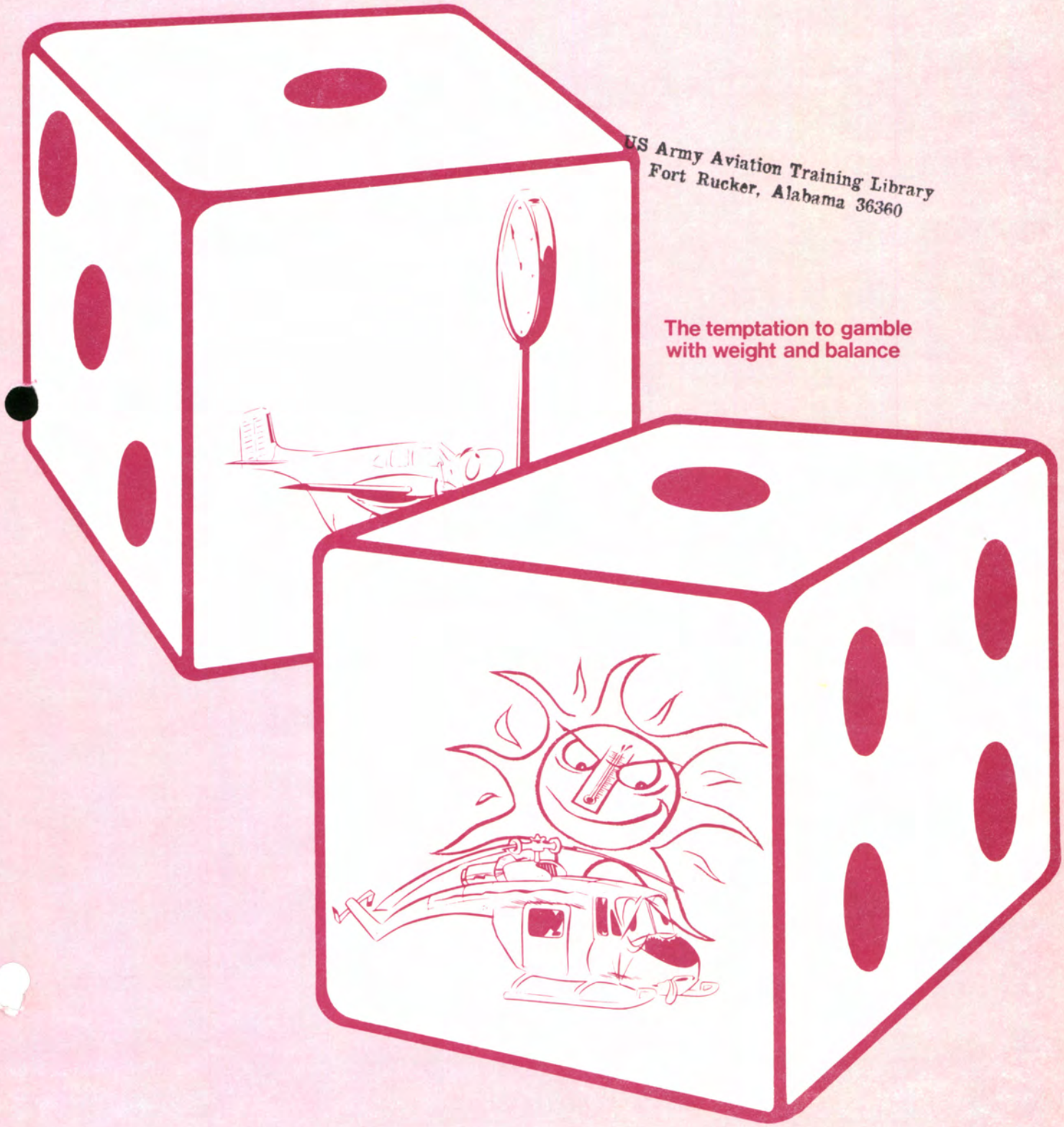
## The temptation to gamble with weight and balance



# Fixed facts of life

It is common knowledge that most any aircraft can usually take more punishment than the handbook recommends if the occasion seems to demand it. That doesn't mean that an aircraft, fixed or rotary wing, should be pushed past the red line. Sometimes, when the density altitude (DA) has soared out of sight, an aircraft can be pushed too far. It will cling to the ground with a grip of steel. You just might be able to coax it into the air by using spurs and horsewhips. You are not going to coax it very high or very far.

Just the same, the temptation is there for a pilot who doesn't know or fully respect his operators manual. The temptation to forget the limitations. To overlook them. Or, what is probably the case 99 times out of a hundred, to gamble. Gambling can be great sport, if you can afford to lose.

There are several interesting ways pilots gamble with weight and balance with Army aircraft, particularly helicopters. You may well win for a while, too, but don't worry. The odds will surely catch up with you in the end.

• You can grossly overload an aircraft under the simple theory that it will obligingly haul upstairs anything you can cram into it. This is known in gambling circles as the Beginner's Approach and is not recommended by old hands.

• You can make a hasty estimate of the weight and balance situation rather than arrive at an exact figure. This is the mark of the born gambler. All **born** gamblers are due to **die** broke.

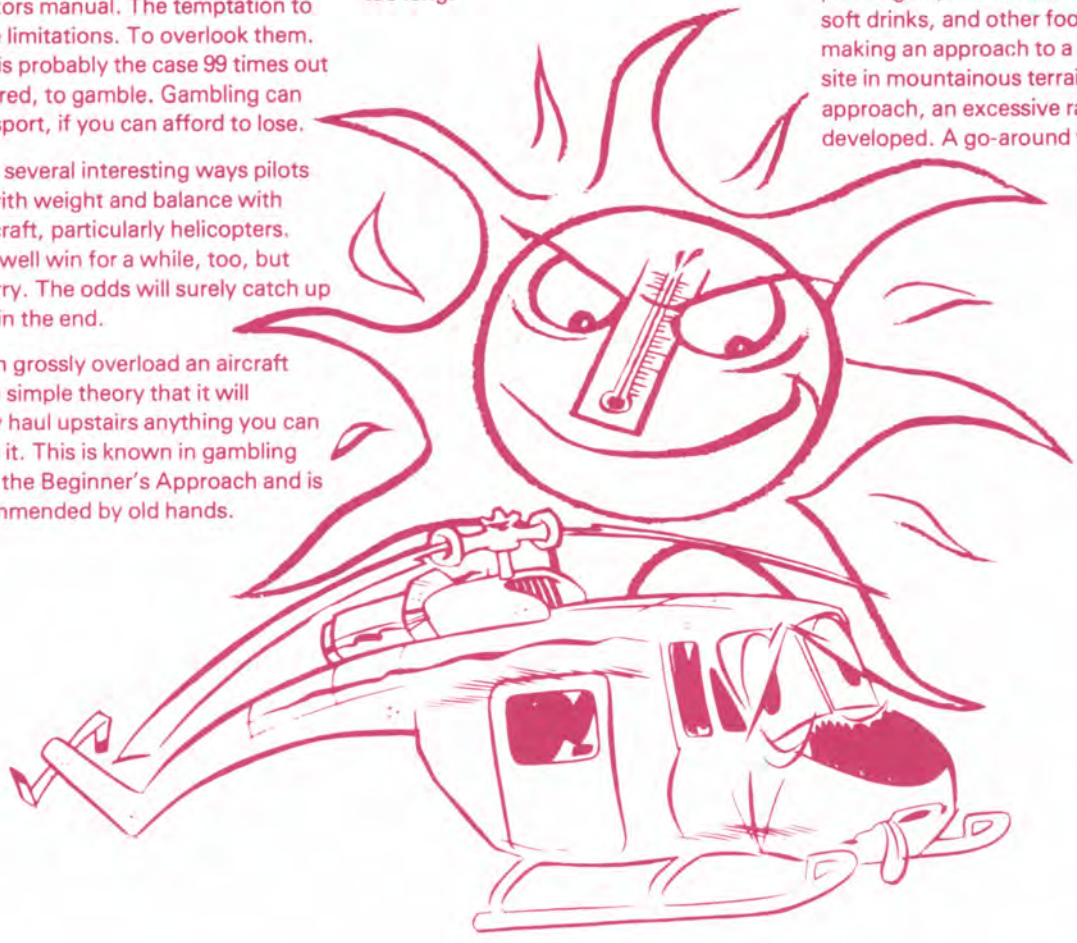
• You can forget about the whole thing, ignore the odds. People like this aren't even allowed at the tables at Vegas. They make the other players nervous.

• You can look at one aspect of the situation and forget the other. In gambling circles this is referred to as Blind Man's Bluff and nobody will argue that it isn't as exciting as all get-out—as long as it lasts, which probably won't be too long.

One long-shot way of gambling is to tinker with density altitude.

Most aviators associate high DA with summertime flying and have an almost intuitive feeling that it reduces aircraft performance. What is not fully understood are the factors that make up density altitude and their direct application to mission planning and execution. Mishap files are full of cases in which the aviator did not fully understand the concepts involved or attempted to substitute "technique" for sound planning.

A UH-1H, loaded with crew, three passengers, 21 mermite cans, 18 cases of soft drinks, and other food items was making an approach to a tactical landing site in mountainous terrain. On final approach, an excessive rate of descent developed. A go-around was initiated



with a right turn. During the turn, the aircraft struck trees, the main rotor hit the ground and separated, and the aircraft came to rest in an inverted position and was destroyed by fire. The aircraft was overgross and out of c.g.

A UH-1H with crew of three and nine combat-equipped troops took off across a shallow gully. Just after takeoff, cyclic feedback occurred, the low rpm audio came on, and rpm dropped to 6200. The pilot lowered collective slightly and rpm returned to 6600. A right turn was made toward a landing area. Rpm again dropped to about 5800 and the aircraft touched down hard, yawing to the right. Substantial damage resulted from an attempt to take off with the aircraft over gross weight limitations.

The big trouble with density altitude is that you can't see it. When a pilot about to take off is confronted with a thunderhead which looks like the after-effects of a 20-megaton nuclear blast, he prudently stays on the ground. The same aviator, no matter how experienced, can be capable of sailing blithely off into the wild blue yonder on a sunny day which is every bit as lethal for an aircraft which has been loaded with no thought to DA.

It's no great secret that hidden dangers are the ones most likely to trip you. DA may be hidden from you. It isn't hidden from Army rotary wing aircraft, which are as sensitive to sudden changes as a skittish colt. On a sunny summer day, Fort Rucker **looks** the same at noon as it did at breakfast. No new mountains, or anything. Just the same old flat Alabama landscape we all know.

But no Huey in its right mind is fooled. It knows that while Rucker's actual altitude is under 400 feet, its density altitude varies between minus 1,000 and plus 4,000, depending on the time of day and the mood the sun is in. To a hard-working Huey, that makes the difference extra pounds do to a horse in a handicap race. It will tell you so, too, and in no uncertain fashion, if you load it with no thought to density altitude.

Rucker is not an exception. There is hardly any place where Army aircraft are operating that DA ranges can't vary widely on a day-to-day basis. A jungle which can be comparatively cool at night can be steamier than a Chinese laundry by midmorning.

## What really is this thing called density altitude?

It obviously has something to do with air density or mass per unit volume. To be specific, density altitude is altitude corrected for changes in temperature, pressure, and, oftentimes, humidity. Air density will be decreased by a rise in temperature, a drop in pressure, or an increase in humidity. This last effect is due to the fact that while water is obviously more dense than air, water vapor is a gas which is less dense than air. A mixture of dry air and water vapor is therefore less dense than an equal amount of dry air.

As the temperature of air increases, so does its ability to hold moisture, and thus it becomes less dense. Density altitudes obtained from sources such as Air Force weather stations include the effects of humidity. The standard density altitude formula, the dead reckoning computer and most density altitude charts are based on dry air; humidity is not considered. If the air is hot and the relative humidity is high, the error can approach 500 feet. Mission planning that does not consider the effects of humidity can thus result in a decision to carry an extra passenger or extra cargo with potentially dangerous results.

The steps to take then are:

- Check weight and balance.
- Make an approximate correction for humidity. If the air is cold and dry, the correction is negligible. If it is hot and humid, add 400 feet to the pressure altitude to correct for humidity. This will effectively increase the density altitude by about 500 feet.
- Use performance charts to determine mission allowable gross weight.
- Repeat above steps for each point of intended landing (or hovering).
- If the result is marginal, reduce the load or fuel still further since the charts are not exact, and other parameters have not been considered, such as load factor due to angle of bank or deceleration, engine condition, winds, and nonstandard lapse rate.

*(continued on next page)*

# Facts of life

## Everybody's problem

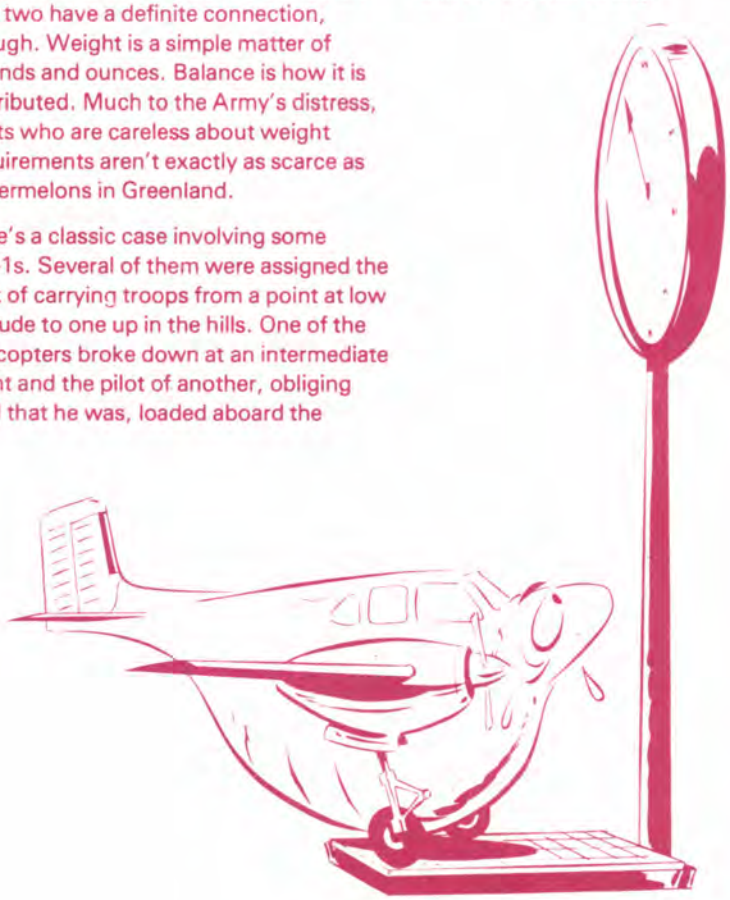
In Army aviation, weight is everybody's problem. It is true the helicopter is about as sensitive to density altitude changes and weight loads as a hay fever sufferer is to milkweed and goldenrod, but even workaday fixed wings can become balky if you put too much of a burden on them.

It's a fact that **any time** you improperly load an aircraft you are imposing additional stresses which are not going to improve its flying performance or lengthen the time before it will have to be retired to pasture.

Weight is one thing. Balance is another. The two have a definite connection, though. Weight is a simple matter of pounds and ounces. Balance is how it is distributed. Much to the Army's distress, pilots who are careless about weight requirements aren't exactly as scarce as watermelons in Greenland.

Here's a classic case involving some UH-1s. Several of them were assigned the task of carrying troops from a point at low altitude to one up in the hills. One of the helicopters broke down at an intermediate point and the pilot of another, obliging soul that he was, loaded aboard the stranded troops. Not that they ever got there. Long short of the destination, rising actual and density altitudes forced the laboring Huey to a messy landing in a patch of woods.

Here was a pilot who had given no thought to the mission as a whole from takeoff to touchdown, not in the way the pro would handle it. Instead, using his own crystal ball, he managed to arrive at the conclusion that he could pack aboard more passengers than they do on subways at the rush hour and still land them safely at a place where even Alpine climbers would have trouble handling the thin air. He was wrong.



## Expecting miracles

Every aircraft has definite limitations. You might get a near-miracle in performance from your helicopter for a while, but only as long as it can deliver maximum performance under optimum conditions. For instance, everybody knows that it is not unusual for a helicopter to lose rpm on takeoff. You won't get the miracle you are asking for when that happens to you in an overloaded helicopter when the DA is high.

About the only miracles being passed these days are the result of solid hard work and unremitting attention to detail. As a matter of fact, once you have that lesson under your belt you don't need any miracles.

Where you **will** find density altitude and weight and balance given its proper share of respect is in units which have sound training and supervisory programs aimed at impressing younger pilots with the importance of weight and balance and keeping old hands from forgetting about it.

Training and supervision can go only so far. After that it is a matter of mature responsibility.

Weight and balance and density altitude, like calories, are fixed facts of life. Pretending they aren't there, or can be tinkered with, isn't going to make them go away.

It is just going to weigh on you that much heavier. That's all. ■

# Shortfax

## Clarification

FLIGHTFAX, Vol. 9, No. 32, contained an article entitled "Improving Safety in Summer Training Exercises." The final section should have stated that the Army Safety Center now provides support to units participating in major joint readiness exercises sponsored by U.S. Readiness Command. We are also available to provide safety assistance for major Army field training exercises and Reserve component annual training. Such support may consist of providing copies of lessons learned from previous exercises, mishap data which may be useful in determining hazards that may be peculiar to a particular training area, or relevant safety-related publications. On-site assistance can also be provided; however, requests for such assistance must be routed through MACOMs. We believe this on-site assistance is mutually beneficial. Not only can our observers provide an impartial source of experience and safety expertise, but they are also exposed to the most current tactical training and gain an awareness of problem areas which future Safety Center mishap prevention efforts should address.

Point of contact at the Safety Center on matters pertaining to training exercises is Major Kenton, AUTOVON 558-3901/3913. ■

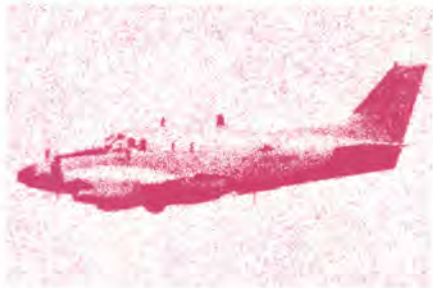
## Warning decals for the U-21

Recommend the placing of a locally manufactured decal on the U-21 panel to reduce the failure rate of the weather radar and its components. The decal should read as follows:

"Caution: Do not change inverters with the weather radar on."

If the weather radar is off line during the change of inverters, the power interruption and surges will be isolated from the weather radar and its components, thereby reducing the failure rate. ■

**—from USATSARCOM Information Bulletin**



## UH-1 ground handling wheel assembly

Problems have surfaced again with ground handling wheels coming off when transporting aircraft. Measurement of ground handling wheel pins and skid tube eyebolt span should be taken to insure these parts meet standards.

Measurement of the skid tube eyebolt from centerline to centerline of eyebolt span should be 18.756 inches. Ground handling wheel assembly tip of pin (P/N 204-050-164-1) to tip of pin (P/N 204-050-134-3) span should be 18.756 inches. Currently, there are several repairs available:

- Reference TM 55-1520-210-23P, fig. 103, item 36. It has been noted in the field that burrs might be present on the walls of the inside diameter of hold of eyebolts. This would stop the pins on the ground handling wheel assembly from traveling full distance through the eyebolts on the skid tubes, resulting in wheels coming off while transporting aircraft. Use a rat-tail file to smooth any burrs on the inside diameter walls of the eyebolt hole.

- Reference PS Magazine, Issue 310, September 1978, page 8-9. Article "Keep 'Em Rolling," approved by TSARCOM Engineering, has several checks and a fix. This fix recommends adding a lock pin to the ground handling wheel assembly release pin to assure full travel of the release pin through the skid tube eyebolt. ■

**—from USATSARCOM Information Bulletin**

# Selected mishap briefs

**uh1** **Class C mishap** ☐ (V series) As aircraft was passing over parking lot during approach to hospital helipad, rotorwash caused camper shell to be blown off parked truck. Camper shell landed on car. Shell was attached to truck with one-half-inch bolts without washers.

**Class E mishaps** ☐ (H series) As aircraft was flying in traffic pattern, main rotor blade hit large seagull. There is a large population of birds in the area. ☐ (H series) Crew heard loud whistling noise during flight. Skin had separated from blade. Bonding failure allowed moisture to accumulate under skin. ☐ (H series) Loud popping noise was heard from engine area. Caused by failure of bleed band. ☐ (H series) Engine rpm bled off to 6400 during approach. Caused by failure of governor. ☐ (H series) $N_1$ needle went to zero during hover. Caused by failure of $N_1$ tachometer generator. ☐ (H series) Pedals became stiff during flight. Failure of tail rotor servo caused binding of tail rotor system.

**uh60** **Class E mishap** ☐ Transmission oil pressure decreased from 47 psi to 25 psi. Transmission oil filters had collected debris, causing pressure to drop.

**ah1** **Class C mishaps** ☐ (G series) Postflight inspection revealed vertical fin drive shaft had come open in flight, causing damage to drive shaft cover and vertical fin. Three stud assembly locks had failed. ☐ (S series) During low-level autorotation, pilot pulled excessive collective on initial pitch pull. Aircraft ballooned to about 30 feet. IP took control, leveled aircraft, and cushioned at 3 to 5 feet. After touchdown, blades flexed, causing excessive pylon rock.

**Class E mishaps** ☐ (S series) Main and standby inverters failed during flight, and fumes entered cockpit. Battery relay wire had shorted to airframe. ☐ (S series) Master caution light came on during flight. Caused by malfunction of annunciator. ☐ (S series) Engine oil pressure fluctuated during hover. Caused by failure of oil pressure transducer. ☐ (S series) Master caution and aft fuel boost lights came on. Caused by failure of aft boost pump pressure switch.

**ch47** **Class C mishaps** ☐ (C series) Postflight inspection revealed dent in edge of forward rotor blade. Caused by bird strike. ☐ (B series) Aircraft lifted sling load, and strain was applied to sling straps. Crew chief was looking at load through cargo hook hole. One of the nylon straps broke and snapped up through cargo hole, hitting and severely bruising crew chief's eye. Crew chief was not wearing helmet visor down, and load may have been incorrectly rigged.

**Class E mishaps** ☐ (B series) No. 1 engine torquemeter failed during runup. ☐ (C series) No. 1 engine would not start after aircraft had been on the ground for a while. Caused by failure of engine start valve.

**oh58** **Class E mishaps** ☐ (A series) Aircraft vibrated severely when collective pitch was applied during takeoff. Caused by failure of bleed valve assembly. ☐ (A series) Fuel gauge started fluctuating during hover, and pilot received static in his earphones. Caused by electrical short in attitude indicator. ☐ (A series) Pilot felt abrupt upward movement in collective

control. Collective became very stiff and required more than normal force to operate. Running landing was made. Caused by binding servo actuator. ☐ (C series) Low rpm audio would not illuminate during flight control check at engine idle. Caused by failure of rpm audio sensor.

**th55** **Class E mishaps** ☐ Excessive vibrations in clutch upper pulley unit during flight were caused by worn bearing. ☐ Clutch would not disengage during shutdown. Caused by defective clutch actuator.

**c12** **Class E mishaps** ☐ (A series) Inboard inspection cowling on left engine flew open during takeoff. Cowling remained attached to engine. Cowling was apparently not fastened correctly after preflight inspection. ☐ (A series) Strong smell of fuel was noticed during landing. Following shutdown, fuel was seen leaking from No. 1 engine-driven fuel pump. Caused by failure of O-ring.

**u8** **Class E mishap** ☐ (F series) Battery charge light came on during flight. Caused by thermal runaway of battery.

**u21** **Class E mishap** ☐ (A series) Circuit breaker for left fuel boost pump popped and boost pump light came on. Caused by failure of fuel boost pump.

# Maintenance

**uh1** **Class E mishaps** ☐ (H series) Egt fluctuated about 300 degrees during runup. Insulation on wire was chafed and exposed wire grounded against aircraft. ☐ (H series) Master caution and hydraulic lights came on during start, followed by whining sound from hydraulic pump. Chafing caused failure of hydraulic pressure line to lateral cyclic servo. ☐ (H series) Hydraulics failed in flight. Hydraulic line was too tight, causing fitting to crack.

**ch47** **Class E mishap** ☐ (C series) High frequency vibration was felt during runup. Caused by lack of grease in drive shaft bearings.

**c12** **Class E mishap** ☐ (A series) Fuel was seen streaming from No. 1 engine nacelle and trailing edge of wing during takeoff. Maintenance personnel had allowed spilled fuel to become trapped in wing structure. As vent valve was being repaired, vent line was disconnected at valve, allowing fuel to drain into wing structure.

## Messages received

• Safety-of-flight message concerning one-time inspection of CH-47A/B/C forward transmission lubrication hose assemblies (CH-47-81-12, 031630Z Jun 81). Summary: Incorrect installation of the forward transmission lubrication hose was discovered on two aircraft at manufacturer's facility. Incorrect installation can cause a deterioration of lube filtration efficiency with possible contamination of internal transmission lube jets. This could result in insufficient lubrication of internal transmission components and subsequent failure. The purpose of this inspection is to insure that forward transmission lubrication hose assemblies are correctly installed. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

• Safety-of-flight message concerning one-time inspection of UH-60A main rotor head swashplate assembly (UH-60A-81-14, 051730Z Jun 81). Summary: Inspection for severe vibration

*(continued on next page)*

# Mishap briefs

of a UH-60A revealed that main rotor head swashplate assembly had one-half inch to three-fourths inch lost motion between the rotating and stationary swashplates. The swashplate assembly was replaced and forwarded to the depot for repair. Teardown of the defective swashplate assembly indicated that the outboard bearing spacer was missing. Two serialized matched spacers (inner and outer) should be installed on each swashplate assembly. Lack of an outer spacer results in excess axial play after a relatively low number of flight hours. This technical bulletin provides for inspection and removal from service those swashplate assemblies that may not have an outer spacer installed. A No. 30 drill bit is used as a probe to determine if the inner spacer is installed. Contact: Charles Vanartsdalen, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

- Safety-of-flight maintenance notice on OH-6A controls support bracket assembly (OH-6-81-02, 041550Z Jun 81).
- Safety-of-flight maintenance notice concerning torque on AH-1S tail rotor gearbox retaining nuts (AH-1-81-16, 041810Z Jun 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Changes to TMs

The following changes to TMs have been published:

- Change 13, 5 May 81, to TM 55-1520-214-23.
- Change 10, 21 Jan 81, to TM 55-1520-228-10.
- Change 5, 22 May 81, to TM 55-1520-228-23.
- Change 6, 9 Feb 81, to TM 55-1520-235-CL.
- Change 7, 1 May 81, to TM 55-1520-235-CL.
- Change 17, 15 May 81, to TM 55-1520-235-10. ■

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Fort Rucker, Alabama 36360

# Runway just ahead

An old story that still crops up from time to time tells about a sergeant in the "brown shoe" Army who was leading a basic training group in calisthenics. Standing on a tall wooden platform, he proceeded to bark instructions to the raw recruits assembled before him: "Left foot up; left foot down; right foot up; right foot down." Suddenly, his words came out differently: "Left foot up; right foot up . . ." And with that, he stared in amazement as the entire complement of soldiers went sprawling to the ground. Somewhat embarrassed he scratched his head in disbelief, then made a rather classic statement: "If I wasn't a sergeant, I'd swear I made a mistake!"

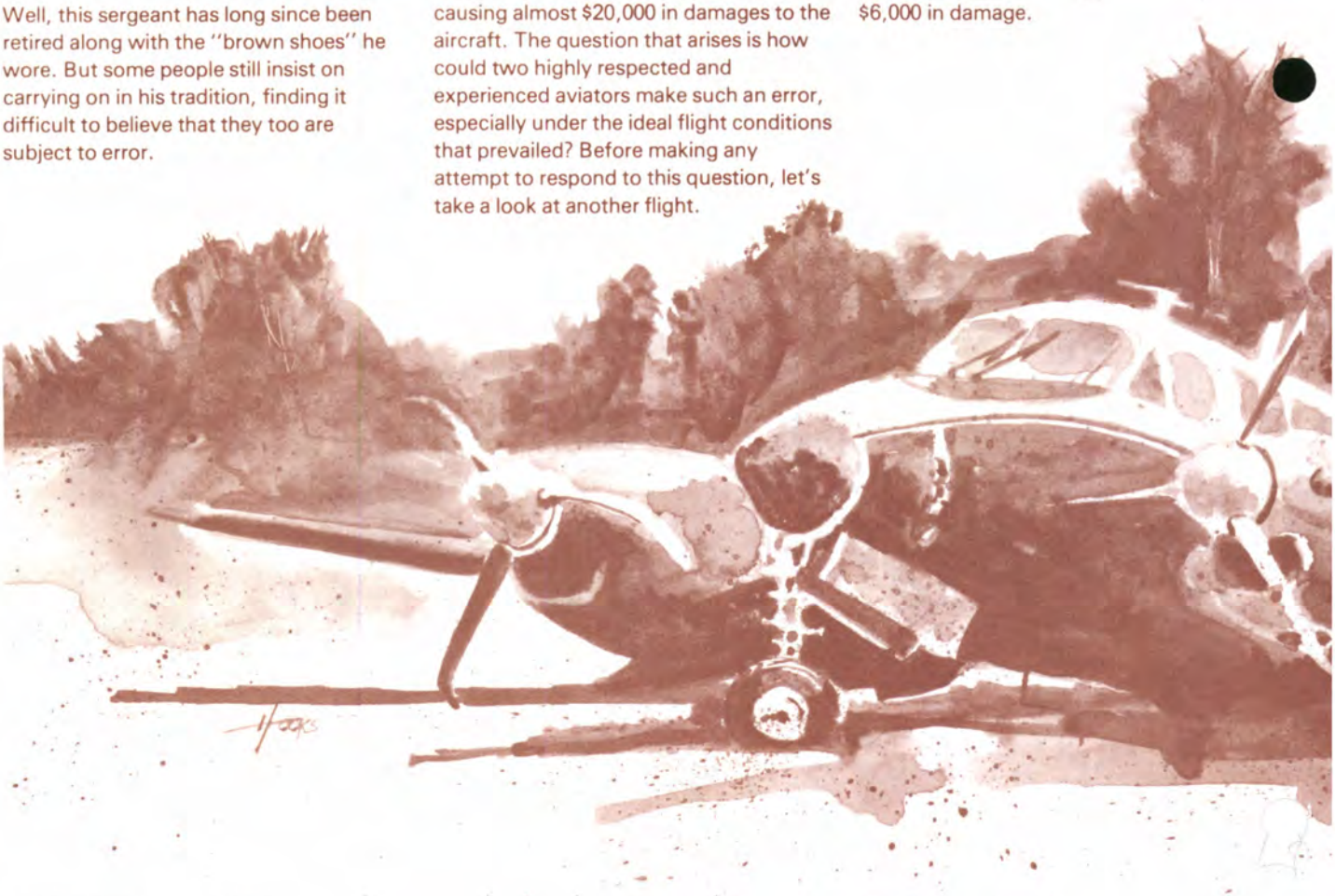
Well, this sergeant has long since been retired along with the "brown shoes" he wore. But some people still insist on carrying on in his tradition, finding it difficult to believe that they too are subject to error.

Take, for example, the twin-engine Army fixed wing aircraft that was on a routine administrative flight. Not only was the pilot a capable and experienced aviator but seated next to him was an SIP with more than 4,000 hours of flight experience, 1,100 of which were logged as an SIP.

The sky was clear, all instruments were in the green, and the engines were purring away like two contented kittens as the aircraft turned on final to a modern runway—one that was long enough to permit a couple, or more, landings to a full stop if the crew so desired. Yet, despite their experience, both pilots suffered embarrassment as the wheels touched down short of the runway, causing almost $20,000 in damages to the aircraft. The question that arises is how could two highly respected and experienced aviators make such an error, especially under the ideal flight conditions that prevailed? Before making any attempt to respond to this question, let's take a look at another flight.

This one also involved a twin-engine Army fixed wing aircraft. The PIC had accumulated more than 8,000 hours of flight experience—3,000 of them as an IP. Further, he had logged 1,300 hours in the same type aircraft he was now piloting, and he was an SIP in the aircraft.

Weather conditions were good and all aircraft systems were properly functioning as the aircraft neared the runway for a landing—a runway that was four to five times longer than that needed for a successful normal landing. Undoubtedly you've guessed the results. It was like watching instant replay on TV. The aircraft touched down short of the runway and sustained approximately $6,000 in damage.



What caused these mishaps? Technically, we could say pilot error. Factually, both of these crews wanted to make an early turn-off and save a little time in taxiing. Yet no urgency existed to induce them to make such a decision. It was merely a matter of personal desire. Unfortunately, their efforts proved unsuccessful.

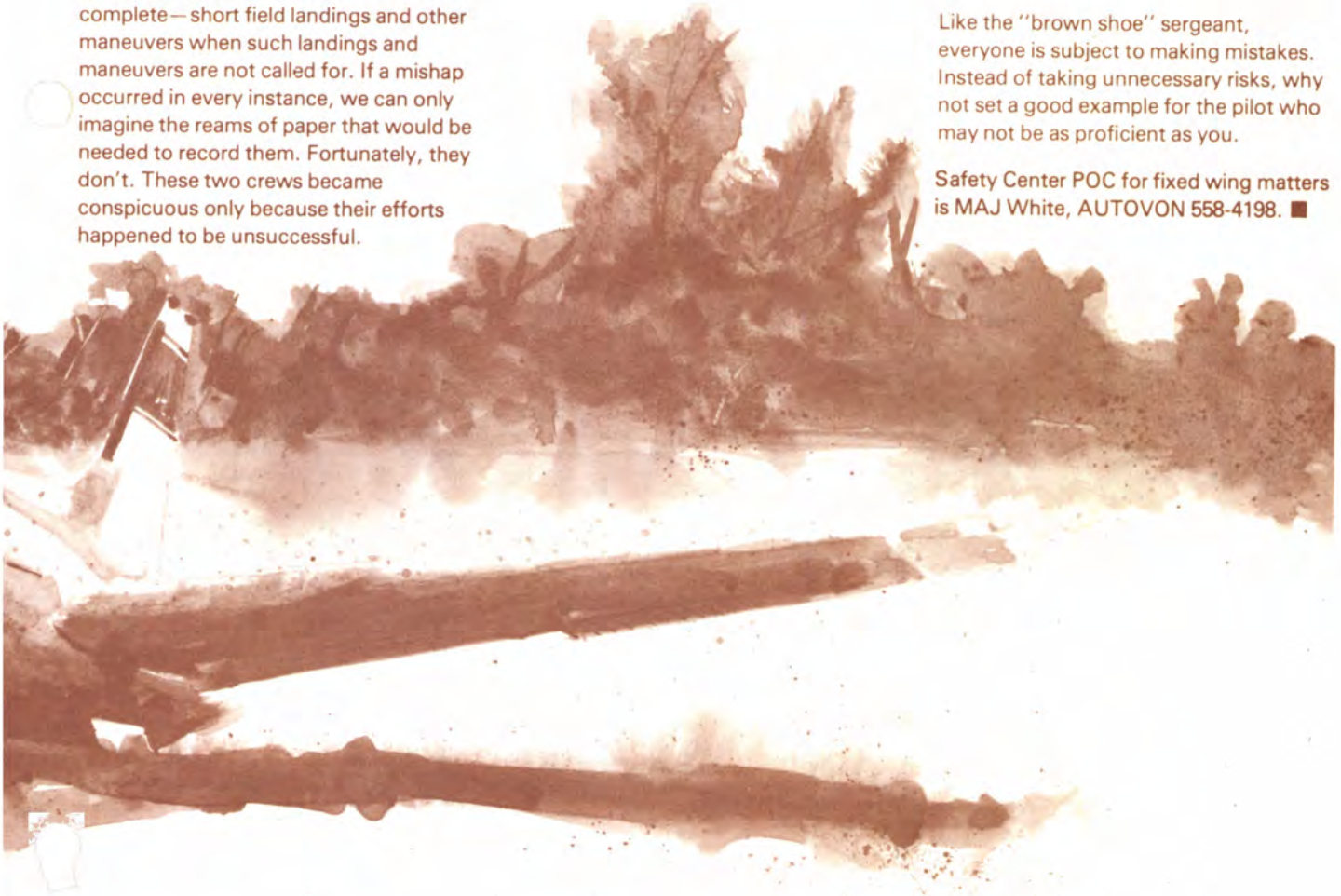
With their flight experience, the odds were definitely in their favor, and this is precisely why their actions are important. It is not so much that they failed to make successful short field landings but rather that they, in reality, are representative of an unknown number of pilots who attempt—and successfully complete—short field landings and other maneuvers when such landings and maneuvers are not called for. If a mishap occurred in every instance, we can only imagine the reams of paper that would be needed to record them. Fortunately, they don't. These two crews became conspicuous only because their efforts happened to be unsuccessful.

The lesson gained from these mishaps concerns risk. A certain element of risk is necessarily associated with every flight. The point is for crews not to add to this risk and thereby increase the potential for a mishap. In Army aviation it is essential that we do everything we can to reduce risk. This means much more than simply following techniques described in the ATM when landing an aircraft. It means sticking to approved procedures and obeying ARs and SOPs in every area associated with flight. (See STACOM column in this issue.)

One of our safety problems in recent years concerns the abnormally high fixed wing mishap rate as compared with that for rotary wing aircraft (see "A Time for Action," FLIGHTFAX, 15 November 1978). Obviously, the pilot is the one individual who can do more to effect a reduction in these types of fixed wing mishaps than anyone else. So, regardless of your experience, avoid taking unnecessary chances—even when the odds are vastly in your favor. Not only will this result in reducing the number of mishaps and their associated damage costs but also will prevent any bruised egos and embarrassment.

Like the "brown shoe" sergeant, everyone is subject to making mistakes. Instead of taking unnecessary risks, why not set a good example for the pilot who may not be as proficient as you.

Safety Center POC for fixed wing matters is MAJ White, AUTOVON 558-4198. ■



# Water purification tablets

The following water purification tablets (NSN 6850-00-985-7166) are unsuitable for issue and use. These tablets should be destroyed.

| Lot number | | | | | | |
|---|---|---|---|---|---|---|
| 0416-601 | 120-4320-163 | 120-4723-236 | 2007-627 | 277 | 4641-402 | 4641-494 |
| 0416-614 | 120-4320-165 | 120-4723-243 | 2007-634 | 2849-564 | 4641-403 | 4641-495 |
| 0618-517 | 120-4320-166 | 120-4723-245 | 2007-637 | 2849-565 | 4641-404 | 4641-496 |
| 0618-533 | 120-4320-167 | 120-4723-246 | 2007-638 | 2849-592 | 4641-442 | 4641-497 |
| 0618-534 | 120-4320-168 | 120-4723-283 | 2007-639 | 2849-595 | 4641-444 | 4641-498 |
| 0618-535 | 120-4320-187 | 120-4723-287 | 2007-641 | 2849-599 | 4641-447 | 4641-499 |
| 0618-539 | 120-4320-188 | 120-4723-288 | 2007-651 | 4 | 4641-448 | 4641-500 |
| 1 | 120-4320-192 | 120-4723-289 | 2007-658 | 416-602 | 4641-449 | 4723-213 |
| 11069-14 | 120-4320-205 | 120-4723-290 | 2007-661 | 420-2737-363 | 4641-450 | 4723-230 |
| 11069-16 | 120-4641-457 | 120-4723-291 | 2295-557 | 4320-153 | 4641-451 | 4723-231 |
| 120-1608-6681 | 120-4641-458 | 120-4723-295 | 2295-562 | 4320-195 | 4641-452 | 4723-232 |
| 120-1608-6682 | 120-4723-212 | 120-4723-301 | 23 | 4320-196 | 4641-453 | 4723-244 |
| 120-1608-6689 | 120-4723-213 | 120-4723-321 | 2548-105 | 4320-197 | 4641-454 | 4723-279 |
| 120-1608-6690 | 120-4723-214 | 1311-702 | 2548-106 | 4320-198 | 4641-455 | 4723-295 |
| 120-2548-119 | 120-4723-216 | 1311-705 | 2548-121 | 4641-377 | 4641-456 | 4723-302 |
| 120-2548-123 | 120-4723-219 | 1311-735 | 26 | 4641-379 | 4641-458 | 6 |
| 120-2548-106 | 120-4723-221 | 151 | 263 | 4641-386 | 4641-483 | 7 |
| 120-2737-320 | 120-4723-223 | 156 | 264 | 4641-387 | 4641-484 | 7423-286 |
| 120-2737-328 | 120-4723-224 | 157 | 271 | 4641-389 | 4641-488 | |
| 120-3073-139 | 120-4723-225 | 159 | 273 | 4641-390 | 4641-489 | |
| 120-3073-142 | 120-4723-226 | 161 | 2737-315 | 4641-400 | 4641-491 | |
| | 120-4723-228 | 2007-623 | 2737-362 | 4641-401 | 4641-493 | |

The following lots of water purification tablets have been extended.

| Lot number | Retest date | Lot number | Retest date | Lot number | Retest date |
|---|---|---|---|---|---|
| 0416-600 | 81212 | 1311-706 | 82151 | 2007-654 | 80273 |
| 0416-602 | 82151 | 1311-707 | 81151 | 2007-660 | 80243 |
| 0416-604 | 80181 | 1311-710 | 80304 | 2007-662 | 80334 |
| 0416-605 | 80181 | 1311-711 | 82304 | 2007-664 | 81212 |
| 0416-608 | 80181 | 1311-712 | 82304 | 2007-665 | 81365 |
| 0416-609 | 80181 | 1311-713 | 81151 | 2007-668 | 81365 |
| 0416-610 | 80181 | 1311-714 | 82304 | 2007-672 | 81151 |
| 0416-611 | 80181 | 1311-715 | 82304 | 2737-317 | 80243 |
| 0416-612 | 80181 | 1311-716 | 82304 | 2737-348 | 82120 |
| 0416-613 | 80243 | 1311-717 | 81273 | 2737-349 | 82120 |
| 1106-920 | 81365 | 1311-718 | 82304 | 2737-353 | 82120 |
| 120-1608-66-79 | 81151 | 1311-720 | 82304 | 2737-366 | 80243 |
| 120-1608-66-80 | 81151 | 1311-722 | 80304 | 2849-568 | 81304 |
| 120-2737-349 | 80243 | 1311-724 | 81151 | 2849-569 | 80304 |
| 120-2737-353 | 80243 | 1311-727 | 80304 | 2849-570 | 81304 |
| 120-2737-354 | 80243 | 1311-728 | 82304 | 2849-581 | 82273 |
| 1204-723 | 80304 | 1311-730 | 80304 | 4641-378 | 80304 |
| 1311-694 | 81365 | 1311-731 | 80304 | 4641-391 | 80365 |
| 1311-695 | 80304 | 1311-733 | 80304 | 4641-392 | 80365 |
| 1311-697 | 82151 | 2007-620 | 80243 | 4641-399 | 81273 |
| 1311-698 | 81031 | 2007-624 | 82273 | 4641-425 | 80243 |
| 1311-700 | 80304 | 2007-642 | 81059 | 4641-441 | 80181 |
| 1311-701 | 82304 | 2007-643 | 80181 | 4641-485 | 82031 |
| 1311-703 | 80243 | 2007-648 | 81243 | 600 | 80304 |
| 1311-704 | 81212 | 2007-652 | 80365 | 618-536 | 80243 |

If you find you have some lot numbers which are not on either list, check the retest date on them. If the retest date has expired or will expire within 6 months, report lot numbers, quantity, and manufacturer to appropriate medical supply personnel.

ALSE personnel should contact their installation medical logistics chief or medical quality control personnel and request notification of messages pertaining to ALSE items.

**Thanks to CW3 Hintze, 3d ACR, Fort Bliss.** ■

# Selected mishap briefs

**uh1** **Class A mishap** ☐ (H series) Aircraft rolled on right side during ground runup checks. Investigation is underway. 8143

**Class E mishaps** ☐ (H series) During maintenance test pilot training flight, with pilot on the controls, IP told pilot to land and then perform "hover in emergency governor checks." While IP was clearing aircraft on left side as it descended, pilot placed governor in emergency position without reducing throttle to idle. Engine rpm increased to 7200. Hot end inspection is being made. Caused by failure to follow appropriate procedures. ☐ (H series) Excessive vertical vibration was felt at 90 knots. Vibration decreased slightly at lower airspeed. Postflight inspection revealed main rotor blade was separating at tip. ☐ (H series) During shutdown, pilot smelled burning odor and saw white fumes coming from battery vent. Caused by thermal runaway of battery. ☐ (V series) Engine inlet air filter caution panel light and master caution light came on during runup at night. Pilot discovered air filter covers still in place over engine inlet air filters. Copilot had arrived at aircraft first and started to remove covers. Crew chief then arrived and continued to remove covers. Crew chief did not remove engine inlet air filter cover before clearing aircraft for start.

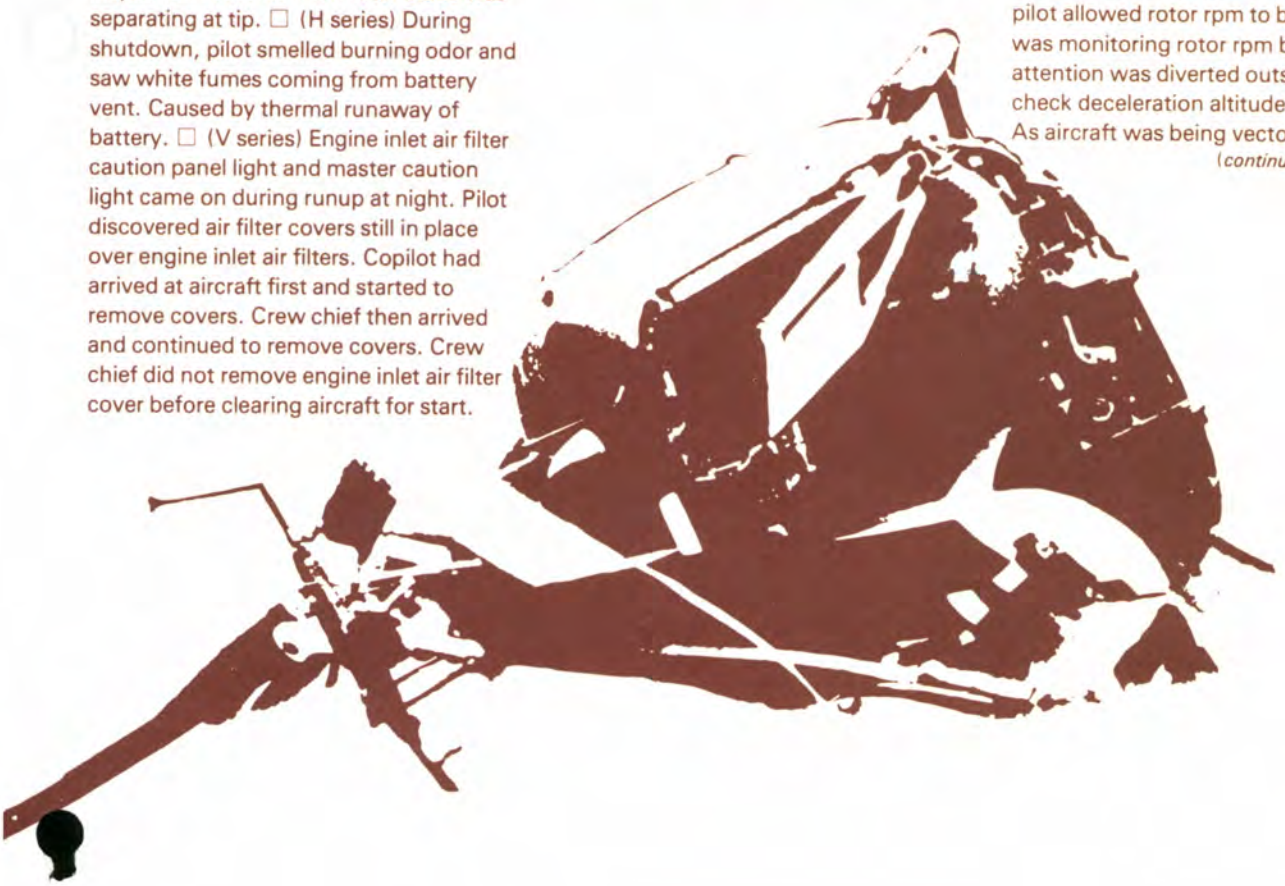
**ah1** **Class E mishaps** ☐ (S series) Pilot noticed engine oil temperature at 100° C. Before aircraft could be landed, temperature rose to 145° C. Caused by failure of engine oil cooler fan bearing. ☐ (S series) Engine oil pressure fluctuated from 90 psi to 140 psi after takeoff. Caused by failure of pin in cannon plug for engine oil pressure transducer. ☐ (S series) Pilot noticed increased noise level coming from rotor blades during flight. Portion of leading edge erosion guard on end of rotor blade had separated. ☐ (TH-1G) Transmission oil bypass light and hot light came on during approach. Transmission oil temperature increased from 70° to 90°. Caused by failure of oil bypass valve.

**ch47** **Class E mishaps** ☐ (B series) No. 2 engine continuously dripped oil during runup. Caused by failure of drive seal. ☐ (C series) High frequency vibrations were felt on right side of aircraft. No. 2 engine drive shaft was out of balance. ☐ (B series) Speed trim extended without warning during hover/taxi. Caused by failure of actuator.

**ch54** **Class E mishap** ☐ (B series) When copilot retarded No. 2 $N_1$ lever to ground idle to conserve fuel, oil pressure dropped 6 to 8 psi and T5 rose to 850° C. Caused by malfunction of fuel control linkage.

**oh58** **Class E mishaps** ☐ (A series) At deceleration phase of autorotation with turn, IP and pilot allowed rotor rpm to build to 395. IP was monitoring rotor rpm but his attention was diverted outside aircraft to check deceleration altitude. ☐ (A series) As aircraft was being vectored around

*(continued on next page)*



# Mishap briefs

thunderstorms, lightning began striking in all directions around aircraft. Pilot landed and remained on ground for 40 minutes. ☐ (A series) Loud bang was heard, aircraft yawed, and low rpm audio, engine-out light, and master caution light activated. Caused by failure of engine-driven fuel pump. ☐ (A series) During simulated antitorque malfunction, stuck left pedal, with aircraft about 1 foot off the ground and 10 degrees left of runway heading, pilot pitched aircraft nose up, causing left rear skid to hit runway. Aircraft landed hard. Pilot was undergoing transition training. IP had demonstrated two simulated antitorque maneuvers. This was pilot's first hands-on attempt at this maneuver, and he used a UH-1 technique.

**th55** **Class C mishap** ☐ During standard autorotation, IP allowed student to let airspeed decrease to 40 knots. At 40 to 50 feet, student began deceleration phase of autorotation. He realized he had started deceleration too soon and tried to regain airspeed. He could only gain about 30 to 40 knots. He decelerated again at 20 to 25 feet and began to apply collective pitch. IP tried to take controls, but student would not let go. IP was able to take some control of aircraft and lower collective pitch and apply forward cyclic control. Aircraft hit runway in nose-low attitude, slid 71 feet, and came to rest upright, with damage to landing gear and engine frame.

**ov1** **Class E mishap** ☐ (D series) No. 2 hydraulic pressure was lost during flight. Caused by failure of hydraulic pump assembly.

**u3** **Class C mishap** ☐ (A series) On right downwind for landing, IP gave pilot a simulated single engine. On base leg, IP told pilot that aircraft altitude was too low to complete maneuver in accordance with ATM requirements. IP told pilot that procedures for restoring inoperative engine had been accomplished and to make a normal landing. After propeller lever was placed in full increase position, throttle was advanced to takeoff power. Engine rpm did not increase above 1500. Aircraft landed on left main gear in wet sod about 10 feet short of runway. Left main gear hit edge of runway and main strut was driven up, puncturing skin on top of left nacelle.

**u8** **Class E mishap** ☐ (F series) As aircraft passed through rotation speed, left engine inboard cowl door opened and separated from aircraft. When pilot was preflighting aircraft, crew chief was washing windshield. Crew chief lowered left engine cowl door to place ladder next to fuselage to wash left windshield. Pilot noticed cowl was not latched, but he was unable to secure cowl because of ladder placement. Pilot was then called away. When pilot returned, he failed to lock cowling.

**u21** **Class E mishap** ☐ (RU-21H) On climbout, pilot noticed that avionics access door was open. Pilot had not secured avionics door during preflight.

## Maintenance

**uh1** **Class D mishap** ☐ (H series) Pilot, flying 10 feet above trees, was dispensing talcum powder from M5 disperser. Outlet end of hose was blown into cabin area and cabin filled with talc. Pilot and copilot were immediately blinded. Pilot held aircraft in what he believed to be a level attitude for about 15 seconds and then was able to regain visual reference out side window. Aircraft was held in out-of-trim condition so visual reference could be maintained until landing. Dispensing hose clamp had come loose, allowing hose to enter cockpit.

**Class E mishap** ☐ (H series) Crew heard loud bang, aircraft yawed and shuddered, and tail rotor pedals vibrated. Caused by failure of self-locking nut on No. 1 drive shaft hanger bearing. Installation/torque on nut was probably incorrect.

*(continued on back page)*

# Stacom

## Landing short of long runways

STACOM #59, 20 August 1980, addressed the problem of fixed wing landing mishaps due to landing short of the runway. The article took note of the fact that the runways being used were many times longer than the computed landing distances for the aircraft involved. This author concluded that the mishaps were the result of aviators attempting to "make the first turnoff" after landing. A recent fixed wing landing mishap was a classic repeat of the above conditions.

A review of the normal landing procedure contained in the Fixed Wing Aircrew Training Manual reveals that the aircraft should arrive at Vref (1.3 times the stall speed) plus one-half the wind gust speed at approximately 50 feet above the landing area. "Above the landing area" means over the threshold marker on instrumented runways and over the numbers on VFR noninstrumented runways. On runways with no markings, over the landing area means over the first usable prepared landing surface.

Deviations from the methods outlined in the ATM and/or the operators manual for the purpose of landing on the very first part of the runway are in contravention to the intent of these publications. Such deviations have too often been the cause of aircraft mishaps resulting in extensive damage to equipment and injury to personnel.

Deviations of this nature do not save time, which is generally the intent of the aviator involved, and in a worst case analysis, such actions could be construed as manifestations of an irresponsible attitude toward safe operations. ■

## Radius of action

The response to the radius of action (RA) problem presented in STACOM #68 was quite gratifying, and indicated that our operational aviators have considerable background and experience with the subject.

This problem is important to the military aviator in determining how far he may fly in a particular direction and return to his starting point, or how long he may remain on station and be certain that he can make the return trip with the fuel he has on board.

The most comprehensive and detailed (10 pages) correct answer was presented by CW2 Richard K. Buergel, Aeroscout Branch, Fort Rucker, AL. Major Ed Pouncey, HQ TRADOC, gets an "atta boy" for not wasting words. He answered all questions correctly using the equivalent of 24 words! The correct answer chosen for publication was submitted by CW4 Rollin A. Hatfield, ID-ARNG:

GIVEN: Usable fuel, 2 hours.
TAS : 100 knots.
WIND : 270 degrees at 20 knots.
TC out: 240 degrees; TC back, 060 degrees.

The ground speed out is computed to be 82 knots and the ground speed back, 117 knots.

The RA **for each hour of flying time** is determined by the formula:

$$\frac{\text{GS out} \times \text{GS back}}{\text{GS out} + \text{GS back}} = \text{RA per hour.}$$

**Answer to Problems:**

1. $\frac{82 \times 117}{82 + 117} = 48.2 \times 2 = 96.4$ RA

2. The RA would **not** be affected if the wind were reversed because the ground speeds remain the same.

3. Applying the RA formula:
   a. Head/tail wind 40K, TAS 100K
   $\frac{60 \times 140}{200} = 42$ RA
   b. Cross wind 40K, TAS 100K
   $\frac{90 \times 90}{180} = 45$ RA

It is obvious that when wind is a factor, the minimum RA exists with wind parallel to the route and maximum RA occurs with the wind at right angles to the route. ■

## UH-1C/M dash 10 correction

The title of figure 7-13, page 7-61, TM 55-1520-220-10, is erroneously labeled as Torque Available (Continuous Operation). The title should be Torque Available (30-Minute Operation).

Paragraph 7-42 indicates that 30 minutes' operation applies to the power ratings indicated in figure 7-13. A corrected title for figure 7-13 can be expected in a future change to the manual. ■

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Mishap briefs

**ah1** **Class E mishaps** □ (S series) Hydraulic pump cavitated, master caution and No. 1 segment lights came on, and pedals became stiff. Running landing was made at airfield. Caused by chafed hydraulic line. □ (S series) Transmission oil temperature rose to 110° C. during NOE flight. Transmission oil cooler was stopped up with dirt and mud, causing oil to overheat.

**oh58** **Class E mishap** □ (A series) Rpm decreased from 103 percent to 96 percent, warning light came on, and audio sounded. Caused by loose B nut on governor.

**u8** **Class E mishap** □ (F series) Right engine was started normally. When left engine start position was selected and starter button depressed, all battery power was lost. When starter on No. 1 engine was removed and reinstalled to replace seeping garlock seal, starter leads were reversed. Leads were not marked when removed from starter nor was starter marked as to which was ground terminal.

## Messages received

• Message on vibrex balancing kit repair (032100Z Jun 81). Reference TSARCOM message, DRSTS-STSM, 271615Z Feb 81, subject: Vibrex Repair Program, NSN 4920-01-040-7816. Many vibrex balancing kits have been returned to the repair contractor with no defects noted. Before requesting shipping instructions from TSARCOM, insure that the vibrex balancing kit has been tested in accordance with the Operators Aviation Unit and Intermediate Maintenance Manual, TM 55-4920-402-13&P, 14 Aug 80, with Change 1, dated 10 Feb 81. Once the defect is isolated, and it is determined that it is beyond the AVIM level of repair, contact Mr. Newstrom or CPT Krueger, DRSTS-STSM, AUTOVON 693-3312, for shipping instructions. **See FLIGHTFAX article, "Blade Tracking, the Vibrex, and You," 15 April 1981.**

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Urgent change

• Urgent change 15, dated 19 May 81, to TM 55-1520-228-23-1 for OH-58A and C helicopters, has been released. ■

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# Desert training tips

Today, a great deal of aviation training is done in the desert. The desert environment puts added stress on flight personnel and aircraft, reduces overall capability of aircraft and aircrews, and increases the elements of danger.

## Effects on operations

"Brownout" during takeoffs and landings is the greatest hazard to flight safety during desert operations and requires special techniques. First, all approaches should be made directly to the ground without terminating at a hover. This reduces the time during which sand or dust clouds can be generated by rotorwash. Similarly, takeoffs should be made from the ground without coming to a hover to reduce sand and dust disturbance. Second, ground operations should be limited to normal runup and shutdown procedures. This aids in preventing ingestion of sand, dust, or debris into engines and other moving components.

All deserts have persistent, shifting, and often violent winds. Wind velocities of 50 to 60 miles an hour are not uncommon in many deserts. Pilots must realize that winds change in velocity and direction over each ridgeline and up- and downdrafts can cause problems. Winds and dust can make formation flying extremely dangerous, especially during takeoffs and landings.

In desert country, changes in density altitude are frequent, rapid, and often great, calling for very careful flight planning. Temperature, wind, elevation, and density must be considered before loading, takeoff, and landing. The high temperatures and variation in altitudes limit aircraft loads. These limits are more extreme when temperature is very high and altitude ranges from a couple of hundred feet below sea level to thousands of feet above sea level. In fact, the normal loading table will not apply for planning in this environment; therefore, loads must be adjusted accordingly.

Lack of terrain features and poor reference points make navigation very difficult. Usually aviators must rely on dead-reckoning if radio navigational aids are not available. However, much help can be provided by sketches and notes by flight personnel who have flown over the area. Sketches should show varying shades of sand, the pattern of sand dunes and drifts, salt around flats, craters, wreckage, or any other features identifiable from the air.

Night flying is extremely hazardous during desert operations. On a moonless night, the horizon is almost impossible to see. Distance estimation and depth perception are difficult because of the lack of visual cues. Spatial disorientation can result if a pilot relies only on his senses to fly the aircraft. During the day, wires, poles, and other hazards are difficult to see because of the desert coloring and background. Because of the open expanse of the desert, pilots often are tempted to fly low and fast, compounding the danger of these hazards.

## Effects on the aircraft

Most maintenance problems are caused by blowing sand and dust. The most damaging aspect of sand is the unfavorable effect on airframes and moving parts. All exposed surfaces are continuously sand blasted and eroded; bearings can be destroyed; plexiglass becomes crazed; instruments can become unreliable; and even radio operation can be impaired.

Although turbine engines are designed for satisfactory engine operation in sandy areas, sand erodes compressor blades and inlet guide vanes and reduces engine life. Maintenance personnel can do little to reduce these undesirable effects. Similarly, crew chiefs and maintenance personnel find it difficult to prevent erosion of main and tail rotor blades. In the desert, maintenance personnel must be extremely vigilant in detecting all types of blade deterioration. Deterioration occurs at a rapid rate and few blades will last until time between overhaul.

With respect to bearing surfaces, maintenance personnel can play a vital role in protecting parts and increasing operating life. All bearing and pitch change links should be inspected at least daily. Lubricated bearings should be purged daily to remove sand and other abrasives. In general, the most satisfactory way to reduce maintenance problems is by repetitive inspections, detection, and cleaning. Extensive efforts should be made to insure that areas where sand can collect are kept free of dust and dirt. Engine decks, cowling-covered components, and places where oil and grease can be expected should be cleaned frequently. All filters should be inspected and cleaned often. Air intake, fuel and oil, and instrument filters collect dust and dirt rapidly. Constant cleaning can help insure trouble-free operations and extend the operating life of all components.

To prevent entry of sand and dust when aircraft are parked, protective covers and dust excluder plugs should be used. Similarly, making all possible ground checks before starting engines and performing runups on hard surfaces, when possible, will lessen the chances of damage to engines as well as to canopies and surface skin. Care must also be exercised when performing all servicing operations to prevent entrance of sand into the aircraft and engine systems. When possible, delivery of oil and hydraulic fluid should be directly from can to tank without an intermediate container.

## Effects on personnel

In the desert, outside air temperature may rise to 110 degrees F. or higher. However, cockpit temperature has been known to reach 150 degrees F. Under these conditions, a person loses a lot of water and salt. In fact, a person sweats off about a quart of water an hour, and this continues whether or not water is consumed. When water is not replaced, dehydration occurs. Since thirst is not a dependable factor, water should be consumed frequently. While the amount of salt in food may be adequate under normal hot weather conditions, additional salt may be required during desert operations. If so, one-fourth teaspoon of table salt added to a canteen (one quart) of water makes a satisfactory solution. Supervisors should insist that all personnel carry two canteens of water when possible and that a 5-gallon can of water be placed aboard each aircraft, weight permitting, along with the necessary survival gear.

Sunburn adds to the dehydration problem. Protective creams, oils, and lotions should be issued to each person, and strict discipline on sun exposure to include the wearing of proper clothing should be enforced. Work areas should be covered if possible and, if not, work hours should be arranged to allow the majority of outside tasks to be completed during the cooler morning and evening hours of the day.

The desert is extremely fatiguing for all personnel. Fatigue occurs early if individuals aren't given about 2 days to become acclimated to the heat. While this does not allow for full acclimatization, it does allow for some body adjustment to the temperature and fluid loss. Everyone should understand the mechanisms of body heat regulation and the symptoms and signs of heat illness. Furthermore, commanders and supervisors must be constantly alert for symptoms of fatigue, which lead to reduced efficiency, and insure personnel are given adequate rest periods.

Eye protection from sun and dust is necessary for all personnel. Sunglasses must be worn because of the glare of the desert surface. Goggles should be worn by POL handlers, ground guides, and other personnel who work in dusty and sandy areas.

These are just a few of the problems units can expect during desert operations. More indepth information is contained in TC 1-13, "Hot Weather Flying Sense," and TC 1-10, "Mountain Flying Sense."

Desert operations teach personnel how to better handle themselves should the real thing come along and test each person's ability to perform tasks with proficiency. But the key to reducing aviation hazards in the desert is full consideration for safety during the planning stage as well as during actual operations. ■

# Mishap review

## Synopsis

The RU-8D lost power during flight at 10,500 feet msl. When the engines could not be restarted, a wheels-up landing was made at a road construction site.

## History of flight

The mission was a ferry flight. The first leg of the flight was uneventful except for siphoning of fuel from the right auxiliary fuel cell at the filler cap. Landing to spend the night, the pilot did preventive maintenance on the fuel cell cap.

The next morning, the pilot was joined at the airport by two other RU-8D crews from his home station, and they decided to fly the remainder of the route in loose formation. During the next leg of the flight, fuel siphoning occurred again. Landing to refuel, the pilot, trying to stop the fuel siphoning, rotated the O-ring so the cracks would be against the cap.

Because of local traffic, all three aircraft could not take off at the same time. The flight joined up about 30 miles from the airport and proceeded on course. During the climb to cruise altitude, the pilot checked the right wing auxiliary fuel cap to determine if the siphoning problem had returned. No fuel was being siphoned.

Climbing to 6,500 feet msl, the pilot noticed a fluctuation of $\pm$ 40 rpm in the No. 2 engine. Some time later, the aircraft climbed to and remained at 10,500 feet msl because it was cooler. During the climb, the pilot noticed that the No. 2 engine coughed. A short while later, the No. 2 engine propeller surged to 3250 rpm and then decayed to 2200 rpm. The pilot reduced his prop lever to detent, but this did not correct the problem.

The pilot then decided to increase power to the No. 2 engine. After power was applied to the engine, manifold pressure decreased and the engine stopped. The pilot secured the engine and told the flight leader about his problem. As the pilot was securing the engine, the No. 1 engine coughed and died. The engines could not be restarted. The pilot selected a landing site, a hard-packed, smooth roadbed of an uncompleted section of an interstate highway, and made a power-off approach with a zero flap setting and with the landing gear retracted. The U-8 hit a parked car during the landing and slid about 1,200 feet after touchdown. The pilot exited uninjured, but the airplane was damaged substantially.

## Crewmember experience

The 34-year-old pilot had more than 700 fixed wing hours, with more than 400 in RU-8Ds. However, less than 600 of his fixed wing hours were logged as pilot and IP time, and he had not flown the RU-8D for almost 3 months before this mission. According to AR 95-1, he should have been required to demonstrate his proficiency to an IP before participating in a U-8 flight. He had not done this. Therefore, he was not current in the aircraft.

## Commentary

The pilot did not switch fuel selectors from main tanks to auxiliary tanks after 1 hour of flight, contrary to TM 55-1510-201-10/4 and the fuel management instructions contained on the aircraft's fuel system control panel. As a result, both main fuel tanks ran dry, causing both engines to stop because of fuel starvation.

Flight lead left the airport 5 minutes ahead of the other aircraft because of traffic congestion. Although the pilot of the aircraft involved in the mishap found it necessary to use higher than normal power and rpm settings to catch up and keep up with the other two aircraft after takeoff, he used poor judgment in not monitoring his fuel consumption more closely. He compounded this error by not using the fuel gauges as a normal part of this process. He admittedly did not have confidence in the reliability of RU-8D fuel gauges.

The pilot had flown the same mission on three previous occasions. This time, flight lead was navigating and making position reports. Lack of the need to navigate, familiarity with the mission, the sparsely inhabited terrain over which they were flying, and the hot, dry, clear weather probably led to the pilot becoming bored, complacent, and inattentive.

When No. 2 engine rpm fluctuated because the main tank supplying its fuel ran dry, the pilot misinterpreted this symptom as a runaway prop and shut down the engine. This resulted in a full feathered, nonaccumulator-equipped, rapidly cooling engine situation that diminished the pilot's chances of achieving an air start. The pilot may have misinterpreted the emergency because of inadequate current experience in the RU-8D and mild hypoxia. The aircraft was flown at 10,500 feet msl for 15 to 20 minutes without supplemental oxygen on board. This may have been enough time for the pilot's judgment and mental alertness to become impaired. During the climb before the No. 2 engine stopped, the pilot had noticed a slight fluctuation in rpm. He interpreted this as an indication of a pending prop malfunction and probably became mentally preset.

After both engines stopped because of fuel starvation, the pilot did not prime either engine during several air start attempts. His account of the mishap implies that he may have switched fuel selectors and pumps back and forth to positions at cross purpose with each other, e.g., fuel selectors on main tanks, pumps on auxiliary tanks, or vice versa. ■

# Selected mishap briefs

**uh1** **Class A mishap** ☐ (H series) IP had demonstrated two NOE decelerations. Pilot had completed two slow NOE decelerations and was doing a third from 20 knots. Pilot flared abruptly without applying sufficient power and pivoting on tail rotor axis. IP tried to add power and push cyclic forward as tail rotor struck ground. Aircraft rolled on side. 8144

**Class E mishaps** ☐ (H series) Crew heard unusual noise in flight. Skin on main rotor blade had separated at tip. ☐ (H series) Hydraulic pressure light and master caution light came on. Caused by failure of hydraulic pressure switch. ☐ (H series) Airspeed indicators would not operate during takeoff. Wasp nest was found in pitot static line. ☐ (H series) Transmission oil pressure fluctuated on short final. Passenger said fluid from transmission area was seeping into rear of passenger/cargo compartment. Caused by failure of seal on input quill.

**uh60** **Class E mishap** ☐ During final approach to LZ, passenger jettisoned left cargo door window. Passenger mistook jettison handle for door release.

**ah1** **Class E mishaps** ☐ (G series) Transmission oil pressure and bypass lights came on. Caused by fatigue failure of transmission oil line elbow fitting. ☐ (S series) Ninety-degree gearbox chip detector light came on during runup. Caused by excessive internal wear of 90-degree gearbox. ☐ (S series) During NOE flight, pilot increased airspeed to close distance on lead OH-58. Pilot suddenly realized he was closing too fast and applied aft cyclic. Overtorque light came on and pilot noticed torque going down through 100 percent. ☐ (S series) Severe vertical vibration developed during flight. Caused by failure of main rotor blade feather bearing. ☐ (TH-1G) Transmission oil bypass light came on during runup. Caused by failure of bypass valve.

**ch47** **Class C mishap** ☐ (C series) Aircraft was climbing through 1,000 feet. When crew chief closed upper section of main cabin door, jettisonable panel popped out and fell to the ground. Inside air pressure from climb combined with shock when upper door closed probably caused jettisonable panel to pop out.

**Class E mishaps** ☐ (B series) Flight engineer smelled smoke and noticed hydraulic fluid dripping from aft transmission area. Caused by failure of hydraulic cooler fan thermal switch. ☐ (B series) Inoperative engine beep during hover/taxi was caused by failure of $N_2$ actuator. ☐ (B series) No. 1 engine tachometer dropped to zero during flight. Caused by failure of tachometer generator.

**oh6** **Class A mishap** ☐ During night tactical mission, pilot brought aircraft to a hover. Rotor-induced blowing sand and dirt restricted visibility so pilot switched on landing light, which further limited his visibility. Pilot became spatially disoriented, and aircraft drifted into nearby tree. 8145

**oh58** **Class A mishap** ☐ (A series) Aircraft was on recon mission. During OGE hover, aircraft spun to right and crashed nose down through trees. Power required for maneuver may have been very close to maximum power available. Three fatalities and one major injury. 8146

**Class E mishaps** ☐ (A series) Transmission oil hot light came on. Caused by broken wire to sensor probe. ☐ (A series) Turbine oil temperature rose abruptly during flight. T fitting located on centrifugal diffuser housing that connects deice valve came out. Line was fatigued at fitting and threads inside diffuser housing had stripped. ☐ (A series) Pilot heard loud high-pitched whine during engine start. Caused by sheared starter shaft.

**th55** **Class C mishap** ☐ Student pilot began left hovering turn. After about 45 degrees of turn, rate of turn increased and aircraft turned about 360 degrees. SP applied full right pedal, which stopped the turn, but at the same time nose of aircraft pitched up. Student applied forward cyclic and simultaneously abruptly lowered collective pitch. Aircraft hit the ground left skid low and moved backward, coming to rest right side up.

**c12** **Class E mishaps** ☐ (A series) Left wing tip hit parked truck as aircraft was being ground guided to parking spot. Ground guide misjudged distance between wing tip and parked truck. ☐ (A series) No. 2 engine tgt fluctuated and went to zero. Caused by broken wire on temperature probe harness. ☐ (A series) Aircraft was on IFR clearance at 12,000 feet approaching line of thunderstorms. Because of inoperative transponder, aircraft could not climb over or be vectored around thunderstorms. Crew cancelled IFR and descended in attempt to circumnavigate individual cells. This was impossible because of density of thunderstorm activity.

**ov1** **Class E mishaps** ☐ (D series) Right entrance hatch came open on takeoff. Crew did not insure hatch was properly secured. ☐ (D series) Pilot saw flash and then sparks coming from right side of engine and from around exhaust pipe. Caused by failure of generator.

**u21** **Class E mishaps** ☐ (A series) Left boost pump and crossfeed caution lights came on. Caused by failure of boost pump. ☐ (A series) Left main landing gear did not indicate down during approach. Gear was manually extended and still did not indicate down. Caused by defective down-lock switch.

# Maintenance

**uh1** **Class E mishaps** ☐ (H series) Hydraulic pressure light came on, loud noise was heard from transmission area, and controls became stiff. Line to left lateral servo was chafed through. ☐ (H series) Master caution and transmission oil pressure lights came on. Transmission oil pressure gauge indicated 28 psi. Oil line from transmission external oil filter to thermal bypass was chafed through. Oil line was installed too close to drain line. ☐ (H series) Crew chief saw fluid coming from bottom of aircraft during shutdown. Caused by overtorqued hydraulic line. ☐ (H series) Completing autorotation with turn, IP saw avionics compartment door on ground next to aircraft. Mechanic had adjusted voltage regulator just before flight and did not properly secure access door. Door blew off sometime during autorotation.

*(continued on back page)*

# Mishap briefs

**ah1** **Class E mishaps** ☐ (S series) During engine shutdown, pilot inadvertently moved wing stores jettison select switch to "outboard," resulting in immediate jettison of outboard tow launchers. Incorrect relay switch was installed in jettison select circuit. Aircraft was issued to unit with wrong relay installed. ☐ (G series) Aircraft was on first flight after extensive rewiring of armament control system. When landing light was turned on, severe vertical vibration was felt in airframe. Pilot turned landing light off, and aircraft vibrated two more times. Landing was made to open field. Maintenance test flight revealed momentary SCAS hardover occurred each time landing light was turned on or off. Short circuit to landing light switch probably occurred during armament rewiring.

**ch47** **Class E mishaps** ☐ (C series) During takeoff, crew chief told pilot hydraulic leak had developed on engine start manifold return line. Bonding cable had chafed tube assembly because line had not been correctly placed. ☐ (C series) Engine beep trim No. 1 switch operated both No. 1 and No. 2 beep. Caused by incorrectly wired beep trim switch.

**u21** **Class E mishap** ☐ (RU-21H) When gear was extended on approach, left main gear did not indicate down. Normal landing was made. Left main down-lock switch was not safetied to jam nut, allowing switch to back off and give unsafe indication when gear was lowered.

## Messages received

- Safety-of-flight maintenance notice on installation and inspection of UH-1 stabilizer bar tube (UH-1-81-07, 171850Z Jun 81).
- OV-1/RV-1 information message concerning urgent change 5 to operators manual (151430Z Jun 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# Safety on the ground

After completing a somewhat turbulent flight in moderately severe weather, an airliner was unloading its passengers. As they disembarked, most appeared calm although a bit shaken. For one passenger, however, this had been a harrowing experience. It was his first flight and he was elated at being safely on the ground again. So much so that as he stepped off the aircraft, he breathed a sigh of relief and loudly exclaimed: "Good old terra firma!" Then, without pausing, he added: "And the more the 'firma' the less the 'terra'!"

Without a doubt, solid ground does give us a feeling of security; but sometimes the security we feel is false. For example, when we think of aviation mishaps, we usually picture some dramatic in-flight occurrence such as a wire strike, a midair collision, an engine failure during low-level flight over trees, or perhaps inadvertent flight into severe weather conditions. But all accidents that involve Army aircraft are not necessarily spectacular ones. Nor do they always occur during flight. Damage to equipment and injuries to personnel can, and often do, happen while aircraft are supposedly resting safely on the ground. Furthermore, in most instances the aircraft are not being operated when these accidents occur. Usually, they are in a static state, securely parked on the flight line or inside a hangar. These accidents have one thing in common: They are all related to maintenance.

Although they may receive little publicity, such accidents make a substantial impact on our resources and adversely affect our operations. During CY 1980, damage costs alone totaled more than one-half million dollars. To this must be added medical costs as well as those costs related to lost work days. Finally, we must consider the various types of injuries and their effects on the lives of the personnel who sustained them.

In CY 1980, the amount of money spent for the repair of equipment damaged in maintenance-related accidents was nearly twice that spent in CY 1979. And the amount spent in CY 1979 was more than double that spent in CY 1978. Yet in CY 1979, the total number of accidents increased by only three over those of the preceding year, and in CY 1980 their number was only three more than the CY 1979 total. Consequently, while the

number of aviation maintenance-related accidents is remaining nearly constant from one year to the next, their cost is doubling. If this rate should continue, the annual cost for these accidents will rise to approximately $512 million by 1990. The solution lies in the area of prevention, and just about all these types of accidents are preventable.

A statistical analysis of all aviation maintenance-related accidents that occurred in CY 1980 shows that 94 percent of them stemmed, singly or in combination, from failure to follow proper procedures and from inattention or carelessness while performing maintenance. In some instances, external factors such as those related to weather played a predominant role. In others, a moment of thoughtlessness was all that was necessary to produce both accidents and injuries. Following are a few examples:

## Improper procedures and/or carelessness

While replacing a map light in the pilot's compartment of an AH-1, a mechanic noticed that the safety wire on the jettison switch cover was broken, and he flipped the cover up. Then, after completing work on the map light, he started to exit the aircraft to get some safety wire to resafety the jettison switch cover. In the process, his knee hit the uncovered switch, triggering the firing mechanism and jettisoning the rocket pods and two missile launchers. No ground safety pins were installed.

When a work order request for CH-47 rotor head maintenance could not be immediately honored by a support activity, the flight engineer and a coworker decided they would perform the necessary maintenance. To save time, they resorted to shortcuts and did not install locking pins or tie the blades down as the TM specifies. During maintenance, the aft rotor head shifted, damaging the rotor head, three pitch change links, the swashplate and one rotor blade. Total cost for repairs: approximately $89,000.

In contrast, a relatively simple accident occurred when two maintenance personnel attempted to push an OH-58 out of a hangar. In this instance, safety procedures for ground movement of aircraft were not being followed, and the aircraft struck a 50-pound fire extinguisher, breaking the left chin bubble.

In another accident, weather played a predominant role as an injury cause factor. The mechanic was working on the engine of an AH-1 when high, gusty winds blew the engine compartment door closed, slamming him hard against the fuselage. The impact of his body against the aircraft was of sufficient force to jar the canopy, causing it to fall and strike him on the head.

Other accidents resulted from the use of makeshift support stands for rotors, transmissions, and engines. In numerous instances equipment tilted and toppled off these unauthorized stands, sustaining damage.

Many accidents occurred because personnel failed to consider existing hazards. As a result, they took no suitable precautionary measures. For example, in several instances, mechanics slipped on wet or icy aircraft surfaces and fell, injuring themselves. Others slipped on oil that had been spilled and left on hangar floors.

Puncture wounds presented another safety problem. Most resulted from safety wire piercing the hands of mechanics while they were performing maintenance work. Often these injuries resulted in infection and lost days from work—even when normal first aid measures were taken at the time the injuries occurred.

Some personnel sustained injuries to eyes, ribs, necks, and backs from carelessness while attempting to loosen hardware or remove heavy components while their bodies were in a variety of awkward positions.

All in all, 53 maintenance personnel suffered injuries of one type or another during CY 1980 while performing their duties. Although most of these injuries were not of a critical nature, many were sufficiently serious to require major surgery.

*(continued on next page)*

# Safety on the ground

## Areas for concern

Even a brief look at these ground accidents readily reveals the types that occurred, the cause factors directly associated with them, and the results, including injuries and damage costs. But to prevent additional mishaps from similar causes we need to know more. Why, for example, were only two individuals being used to move an aircraft out of a hangar when the aircraft sustained damage? Why did mechanics take shortcuts and omit some of the procedures stipulated in the TM for the aircraft they were maintaining? These omissions resulted in costly damages. Why were unauthorized, makeshift support stands being used to cradle expensive aircraft components when equipment toppled over and was damaged?

An in-depth examination of the facts relative to the accidents that occurred during CY 1980 points out a number of areas for concern. For simplicity, they can be summarized as follows:

- Often, an insufficient number of personnel were available to perform the work required.
- The experience level of maintenance personnel was not always adequate for the tasks they performed. In numerous instances mechanics had received insufficient training for the specific jobs they were assigned.
- Supervision was often inadequate to insure personnel were performing maintenance work properly and that tools and equipment were suitable and appropriate for use.

Other discrepancies noted concerned mechanics feeling a false sense of urgency to complete the required work; and failure of personnel to be safety oriented, often displaying an attitude of unconcern relative to ground safety.

## The cure

Unlike the problems encountered when trying to deal with flight safety, the solution to maintenance-related ground accidents is relatively simple. It is a matter of management—insuring the availability of an adequate number of experienced personnel and providing additional training, as necessary, to make certain they are not only knowledgeable concerning maintenance matters but also are safety conscious; and furnishing adequate supervision to insure maintenance work is properly performed and equipment being used is safe and suitable.

Nevertheless, placing the brunt of responsibility for safety on management does not relieve the individual of his responsibility to follow approved maintenance procedures as well as those that relate to personal safety.

One mechanic, for example, was killed when he inadvertently stepped into the path of a rotating tail rotor. Investigation revealed the individual was taking a commercially procured reducing drug without having consulted a doctor. This drug caused severe drowsiness. Consequently, he was also taking an over-the-counter drug intended to keep him alert during duty hours. Unfortunately, it didn't do the job.

When all is said and done, ground safety is not only essential for the well being of maintenance personnel but also for flight safety. Without the first, the second cannot be guaranteed. After all, if a person is negligent with his own safety, how much concern will he have for the safety of others? ■

# Mishap review

## Synopsis

The OH-58A was at a 9-foot hover on a precision hover training flight. While the pilot and observer were looking underneath the aircraft to determine height above the ground, aft cyclic was inadvertently applied. The helicopter moved rearward as the nose pitched up. The tail rotor blades hit the ground and the aircraft crashed.

## History of flight

The mission was a training flight to prepare for the flyoff competition for the World Helicopter Championship. When the aircraft arrived at the training site, the copilot was on the flight controls. The aircraft was landed, and the pilot exited to secure some ropes to the right front and aft jacking points. The ropes were used to indicate hover height in the precision hover event.

After attaching the ropes, the pilot got back in the aircraft on the right side and took the controls. The copilot got out and removed and stowed the left-side collective pitch lever. At this time, the copilot's role was changed to that of an observer because he could not perform flight duties without a full set of controls. The observer got back in the aircraft and loosened his seatbelt/shoulder harness so he could lean out of the aircraft to look at the ropes. The pilot's and observer's doors had been removed before flight.

The pilot took off to a hover and climbed to an altitude of about 6 feet. He then climbed to about 9 feet. The observer, who was looking at the aft rope, asked the pilot if he was sure the aft rope was 3 meters long and recommended that he look at it while the observer monitored the flight controls. The pilot leaned out and looked down at the ropes. The observer saw the pilot move and thought he had returned his attention to the cockpit, so the observer again leaned left to check the aft rope. The pilot, however, was also leaning out, trying to check the ropes.

While both crewmembers were looking out, the aircraft drifted aft and the nose pitched up. The tail skid dug into the ground, followed by the tail rotor blades hitting the ground. Antitorque control was lost, and the aircraft pitched forward and began to spin nose right. The aircraft continued to spin right until it crashed. The crew exited without difficulty.

## Crewmember experience

The 29-year-old pilot had more than 700 rotary wing flight hours, with almost 600 in OH-58As. The 29-year-old observer had almost 1,000 rotary wing flight hours, with almost 600 in OH-58As.

## Commentary

After the aircraft was stabilized at a 9-foot hover, the observer questioned the pilot as to the length of the aft rope. The observer then sat back up in his seat and told the pilot to check the rope lengths and indicated that he would watch the cyclic. The pilot, who knew that the observer did not have a full set of controls, did not relinquish control of the aircraft but did attempt to observe the ropes. The observer insured that the aircraft did not assume any unusual attitude while the pilot's attention was outside.

The pilot then made a movement, which was interpreted by the observer as the pilot returning his attention to the cockpit. The pilot and observer did not communicate during this sequence. The observer, thinking the pilot was looking into the cockpit, leaned left to observe the aft rope. Because the pilot could not see the aft rope, his attention remained outside to insure that the front rope was off the ground the appropriate distance. The pilot was leaning right and looking below the aircraft at the front rope, believing that the observer was still monitoring aircraft attitude. The pilot believed he would be alerted by the observer in the event of an inadvertent control input or aircraft movement. While the attention of both crewmembers was directed beneath the aircraft, the pilot inadvertently applied aft cyclic and the aircraft began to drift aft and pitch nose up. Because each crewmember assumed the other was monitoring the flight controls, the resulting unusual attitude was not detected until the tail rotor blades hit the ground. ■

# Selected mishap briefs

**uh1** **Class A mishap** □ (H series) Aircraft slid off end of lane during low-level autorotation and rolled over. 8147

**Class E mishaps** □ (V series) Lid from ice cooler blew out right cargo door and hit synchronized elevator. □ (H series) High frequency vibration began during termination of approach. Caused by failure of oil cooler fan. □ (H series) Binding throttle was felt during runup. Caused by frozen fuel control shaft at power lever. □ (H series) High-pitched squeal was heard during flight. Flight controls began to stiffen, followed by total hydraulics failure. Running landing was made. Hydraulic line broke at fitting. □ (H series) Sling load was seen to be oscillating during flight. Load was incorrectly rigged.

**ah1** **Class C mishap** □ (S series) Rotor rpm increased to 110 percent during simulated high speed engine failure with 180-degree turn. IP increased collective pitch to reduce rotor rpm and landed. Main rotor hub was changed.

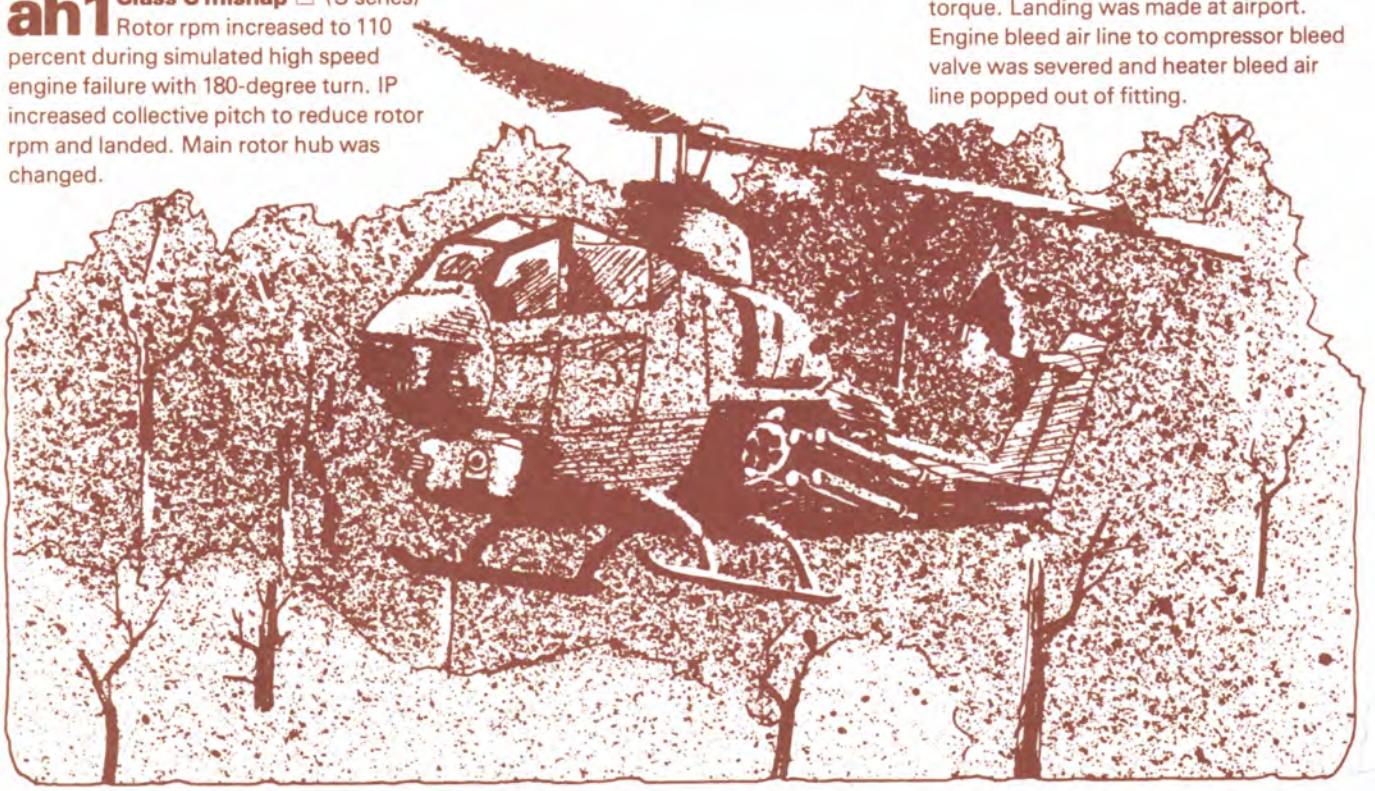
**Class E mishaps** □ (G series) Transmission oil pressure light came on and pressure dropped to 10 psi, followed by illumination of transmission oil bypass light. Caused by failure of transmission oil line elbow fitting. □ (S series) During runup with SCAS engagement, rotor tip path plane moved 1 to 2 feet. As pilot got aircraft light on skids, aircraft yawed 10 to 20 degrees left and right. Caused by malfunction of SCAS system.

**ch47** **Class E mishap** □ (C series) Transmission chip detector light came on during hover. Caused by failure of aft transmission.

**ch54** **Class E mishap** □ (A series) ADF antenna severed at attaching point on left main gear during takeoff, allowing antenna to trail behind aircraft.

**oh6** **Class C mishap** □ Contractor pilot decided to practice several high altitude solo autorotations to an abandoned airstrip although he knew they were unauthorized. He started with a series of power recovery termination autorotations and then decided to do an autorotation to a full touchdown. After flare and pitch pull, aircraft pitched forward, rolled right, and touched down on forward one-third of right skid because of wind gusts and crosswinds. Aircraft yawed right and slid off runway. Right skid hit rock, and aircraft came to a stop about 20 yards off runway.

**Class E mishap** □ Pilot heard popping sound, followed by thump. Engine torque dropped from 60 psi to 40 psi and TOT rose from 600° C. to 850° C. Engine-out light and audio warning system activated. Maximum power available was 46 psi torque. Landing was made at airport. Engine bleed air line to compressor bleed valve was severed and heater bleed air line popped out of fitting.



**oh58** **Class E mishaps** □ (A series) Through-flight inspection revealed right exhaust stack clamp was fractured at rivet line, allowing stack to separate from exhaust diffuser. □ (A series) Master caution and fuel boost lights came on. Caused by failure of fuel boost pump. □ (C series) Transmission oil pressure gauge indicated 72 psi during OGE hover check. Caused by malfunction of transducer.

**c12** **Class E mishaps** □ (A series) As aircraft was on short final for landing, flock of pigeons turned into flight path. One bird hit and broke left landing light. □ (A series) No. 2 engine oil temperature rose to 130° C. during climbout, and right torque fluctuated 10 to 15 percent. Engine was shut down and aircraft landed. Engine oil temperature remained above red line for 10 minutes after engine was shut down. Caused by failure of No. 2 propeller gearbox and subsequent failure of engine.

**t42** **Class E mishaps** □ Landing gear did not retract on missed approach. Caused by failure of landing gear motor. □ Both alternators failed and battery became very weak. Gear was manually extended and aircraft landed.

**u21** **Class E mishap** □ (A series) Crew noticed fuel siphoning from right main fuel cap during climbout. Fuel cap was not seated correctly.

# Maintenance

**uh1** **Class E mishaps** □ (H series) Left fuel boost pump light came on during runup. Circuit breaker was pulled and fuel pressure dropped to zero. Main blade air line was disconnected. Crew chief had apparently not reconnected lines correctly after engine flush. □ (H series) Noise was heard from rotor system during landing. Incorrectly torqued drag brace nut backed off. □ (H series) Egt gauge indicated slow decrease in temperature to 350 degrees. Electrical connector adapter which caused failure appears to have been damaged by lateral pressure on electrical line attached to it. □ (H series) Crew smelled fuel during landing. Crew chief saw fuel spraying from bottom of fuel control servo filter. O-ring was pinched and stretched.

**ah1** **Class E mishaps** □ (S series) Pilot felt binding in right forward quadrant of cyclic. Caused by incorrect positioning of armament system. □ (S series) Master caution and transmission oil hot lights came on during hover. Incorrect bleed air reducer fitting was installed. This caused turbine fan to overspeed and resulted in bearing failure.

**ch47** **Class E mishaps** □ (C series) No. 2 engine failed during landing. Hole was chafed in fuel line. □ (C series) Crew chief noticed fluid leaking in aft pylon area during flight. Rigid line had chafed against another line, causing pinhole leak.

## Messages received

- Safety-of-flight maintenance notice on temporary waiver of OH-58C turbine outlet temperature system checks (OH-58-81-05, 181430Z Jun 81).
- Safety-of-flight maintenance notice concerning procedures for use of battery on AH-1 during use of external power for testing (AH-1-81-17, 191830Z Jun 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# ALSE bits and pieces

• The Aviation Life Support Equipment School, Fort Eustis, will begin training ALSE personnel on 5 January 1982. Specific instructions on how to apply for the course, class quotas, etc., will be stated in a TRADOC message within the next two weeks. The course will award an additional skill identifier (ASI) of "Q2."

• When you're flying the AH-1 with NBC gear and using the helmet-mounted sight, wear the NBC hood under the SPH-4 helmet. When flying in other conditions, wear the hood over the helmet and make necessary adjustments of the suspension system to avoid hot spots.

• During a recent aircraft mishap—a ditching—the crewmembers' LPU-2/P life preservers would not inflate, even after repeated attempts. There could be at least two possibilities for this problem—a misdirected lanyard pull or the $CO_2$ cartridge was not seated properly because the set screw was not loosened to allow the cartridge to be activated. During this same mishap, the pilot unbuckled his lapbelt while still airborne. Had the impact been more severe, the pilot could have been thrown against the instrument panel or other aircraft structures, rendered unconscious, and drowned. When a mishap is inevitable and time permits, manually lock your shoulder harness so you will stay secured in your seat. As soon as the aircraft comes to a stop and the rotors stop turning, release the restraint system and egress.

• In another mishap, the pilot removed his helmet before leaving the aircraft. He received a laceration on his head while hastily getting out of the aircraft. Had he left his helmet on, he would not have received the injury.

• If you are having problems getting the screw and post assembly for your SPH-4 helmet, you may obtain them through local purchase as follows (per Army Support Activity Supply Information Letter No. 3-80, June 1980):

Nomenclature: Post and screw assembly
Screw: P/N D366 x 1/4 inch
Post: P/N D4023 x 3/8 inch
NSN 8415-01-092-5290
Source: Acme Rivet & Machine Co.
1116 Edgewater Avenue
Ridgefield, NJ 07657
Unit of issue: each
Unit price: $1.00 ■

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Army aircraft mishap prevention data

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## The three-quarter mark and the months ahead

At the three-quarter point of this fiscal year, the number of Class A mishaps far exceeded that of the same period a year ago.

With about 75 percent of this year's programmed flying hours flown during the first 9 months, 37 Class A mishaps and 22 fatalities have been recorded. Thirty-one of the 37 Class A mishaps involved total losses. At the three-quarter mark, we have already had as many Class A mishaps as we had for all of FY 80.

If this upward trend is permitted to continue, it is projected that another 7 aircrewmembers will die in 12 more Class A mishaps by the end of September, and the FY 81 Army Class A aircraft mishap rate per 100,000 flying hours will be higher than any year since fiscal 76.

With over 2 months of peak summer flying still ahead, this increase in mishaps is cause for great concern.

**Class A Aircraft Mishaps**

| | Month | FY 80 | FY 81 |
|---|---|---|---|
| 1st Qtr | October | 4 | 2 |
| | November | 5 | 5 |
| | December | 0 | 1 |
| 2nd Qtr | January | 3 | 8 |
| | February | 3 | 4 |
| | March | 3 | 4 |
| 3rd Qtr | April | 2 | 1 |
| | May | 4 | 5 |
| | June | 2 | 7 |
| Total | | 26 | 37 |

A large part of the problem continues to be crew error. Although some of these mishaps are still under investigation, we know that crew error was involved in at least 27 of the 37 mishaps. Flight experience ranged from the student pilot to the IP with over 3000 hours.

The cure for crew-error mishaps is straightforward. It is a matter of command and supervision. As long as pilots are assigned missions for which they are neither qualified nor trained, we can expect mishaps . . . As long as pilots are allowed to operate their aircraft without regard to established procedures, we can expect mishaps.

### Unit commanders

Commanders must be directly involved in day-to-day unit operations. If our aircrews are not qualified, we must qualify them. Unit training programs must fully qualify every pilot in the type mission he will fly and the environment in which he will operate. Commanders at all levels must know the limitations of our aviators and careful attention to crew selection is essential.

Pilots inclined to be careless or complacent must be made to change or be replaced and given some other duty. Incidents of reckless or careless flying must be dealt with directly and recurrences prevented.

Unit SOPs must be strictly enforced and aircraft must be operated in accordance with established procedures.

Any success in reducing mishaps in the months ahead will be directly related to the amount of effort we all put forth and how well we apply the lessons learned from past mishap experience.

We can ill afford to continue this upward trend in mishaps. ■

# No one outgrows the need

A new pilot fresh out of flight school has acquired the necessary knowledge and skills he needs to become a proficient aviator, but he lacks experience. It is one thing for him to fly under the hood in calm weather with an IP beside him, and quite another to inadvertently encounter weather conditions that suddenly put him on instruments when no IP is on board. Inadvertent IMC is often all that is needed for an inexperienced pilot to become involved in a mishap. It has happened more than once.

A mishap not too long ago involved an OH-58 pilot who became disoriented while hovering in snow. One main rotor blade struck the ground, causing the mast to separate and severing the tail boom aft of the horizontal stabilizer. The aircraft then ended up on its left side. This pilot was fortunate. A bit shaken up, he managed to exit the aircraft through the right cockpit door uninjured.

To begin with, this pilot was flying in weather conditions beyond his capabilities. Further, he persisted in his attempt to continue flight even though he had previously experienced spatial disorientation in a whiteout. He was not adequately trained nor did he have knowledge of the techniques for hovering in falling and blowing snow. An effective unit training program would have lessened the possibility of this inexperienced aviator being placed in such a situation.

## On his own

It must be remembered that the new pilot has become accustomed to having assistance—someone to rely on. Namely, the IP. When he embarks on his own, no one is available to make his decisions for him.

In gaining experience, the new pilot must not only develop proficiency in handling his aircraft but also, and what may be even more important, in handling situations—making right decisions and coping with any problems that may arise. Without benefit of unit training, he must acquire this experience on his own. Consequently, he may pick up wrong habits and develop self-taught practices or procedures not found in the operators manual or contrary to those published. Sooner or later, this means trouble.

## Helping hand

In a sense, then, unit training takes the place of the instructor, or "helping hand," after a pilot leaves flight school. And this kind of helping hand is necessary not only for the new aviator but for the seasoned one as well. Neither outgrows the need for it. The veteran aviator left to his own designs can develop a case of severe overconfidence to the point that his technique becomes sloppy. Further, he may become so familiar with routine missions that he may disregard established procedures.

Another important purpose of an effective unit training program is that it surfaces an individual's strong points as well as his weak ones and points them out not only to the pilot involved but also to his commander. Armed with this information, the commander can intelligently assign missions within the capabilities of his pilots and provide any necessary training. His failure to know the limitations of his pilots can result in mishaps.

During field exercises a couple of years ago, the crew of an OH-58 was detained after completing a mission to a field location because it was thought the aircraft might be needed for another mission. The crew made several requests to be released from further duty because of approaching darkness and the need for crew rest. These requests, however, were denied. Finally, around 2100 hours, the aircraft was released for flight back to the training area which was located on flat terrain devoid of trees or other vegetation. While on final approach to an unlighted landing pad, the aircraft crashed, causing one minor injury and damages estimated at $250,000. The crew was fatigued and both pilots had limited experience in executing night approaches to minimum or nonlighted areas. In addition, no night training program had been established. Couple these facts with the extremely low ambient light conditions that existed, the absence of vegetation or other land features to aid in depth perception, and the dust present in the area to further restrict visibility, and it can readily be seen that the demands placed on these pilots far exceeded their capabilities.

## Tailored program

To be effective, a training program must be tailored to a unit's needs. So, no two programs will necessarily be exactly alike—even if the units involved are operating in the same geographic area and using the same type of aircraft.

Specific mission requirements of each unit are the prime considerations along with the equipment being used and the environment in which the unit must operate. This includes climate and topography.

## Special problems

Although many training tasks can be readily worked into the unit's normal operations, some cannot, and these pose special problems. For example, functions such as inserting and extracting troops in confined areas or tactical missions that require night formation flying fall into this category. Special training is necessary in areas such as these, and often the training hours available to conduct it are insufficient. This is where a good record system can be invaluable. While it won't magically produce extra hours for training, it will show the number of pilots qualified to perform a particular type of mission. If this number is insufficient and the supported unit must have that type of support, then some kind of arrangements will have to be worked out to give the pilots the necessary training and experience.

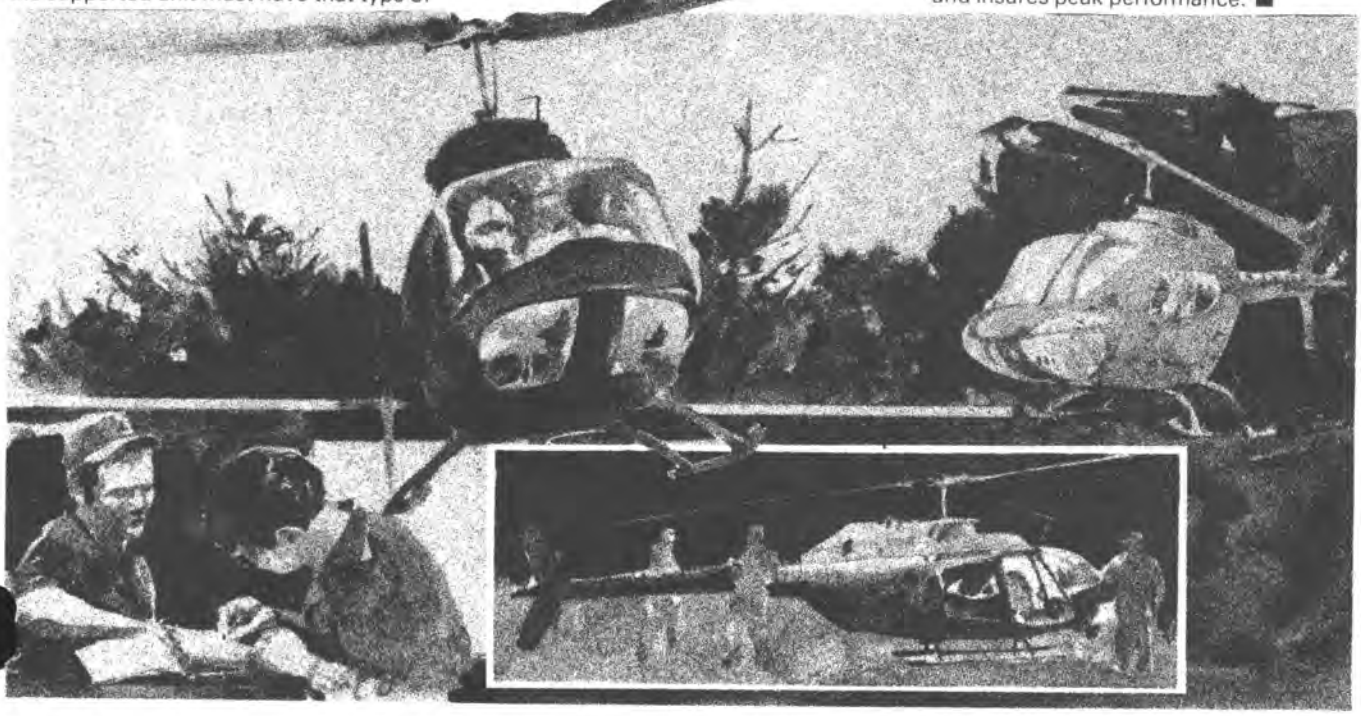
This may mean an increase in flying hours to be allocated for the following year; or it may mean fewer hours to be applied to support missions, with more to training. In any case, the commander will not be guessing when he assigns his pilots to specific missions. He will be aware of their capabilities and be able to provide documentation as to what they can and cannot do. When he makes an assignment, he will know the personnel selected are knowledgeable, experienced, and able to accomplish the mission, and do so with maximum safety.

A good unit program does more than point out strengths and prepare and maintain unit personnel in full readiness. It also surfaces any weaknesses associated with the unit's operations for corrective or preventive acton.

## For everyone

Although the emphasis for unit training is placed on pilots, the supporting elements must not be forgotten. Training is equally important for maintenance and other personnel, including TIs. Sooner or later, experienced mechanics are reassigned. Their replacements may be seasoned or green. In addition, equipment changes and so do maintenance procedures. Even TIs can become lax, especially when they know they are working with mechanics who are thorough and conscientious.

All in all, effective unit training sharpens the skills of all personnel and maintains the entire unit in a state of readiness to accomplish its mission. It enhances safety, produces pride in the individual, increases his self-confidence and morale, and insures peak performance. ■



# Mishap review

## Synopsis

On short final for landing, as the UH-1H passed over trees bordering the south side of the landing site, the main rotor blades hit two trees located along the left side of the flight path. Sections of the trees were thrown into the tail rotor blades, causing separation of the blades and 90-degree gearbox. The Huey then landed hard.

## History of flight

During takeoff from a field site, with 10 people aboard the aircraft, the copilot used about 43 pounds of torque to clear bordering trees. The pilot noticed that engine rpm dropped from 6600 to about 6400 and, without telling the copilot, he beeped the linear actuator to maximum, which did not have any effect on the lost rpm. After the aircraft cleared the trees, rpm returned to normal.

Upon arrival at another site to pick up an additional passenger, the copilot entered a modified left downwind turn to make an approach into the site. The pilot took the controls at this point and continued the approach. On short final, as the aircraft passed over trees bordering the south side of the site, the main rotor blades hit two trees located along the left side of the flight path. Sections of the trees were thrown into the tail rotor blades, causing separation of the blades and 90-degree gearbox. The Huey tucked nose low and began to spin to the right. The pilot was able to level the aircraft, but it continued to turn to the right, landing hard on the aft part of the left skid and coming to rest upright. All passengers and crewmembers exited without assistance. The crew chief sustained a strained back, and one passenger sustained a cut knee.

## Crewmember experience

The pilot had more than 500 rotary wing flight hours, with most of these in the UH-1H. The copilot had more than 200 rotary wing hours, with more than 170 in the UH-1H.

## Commentary

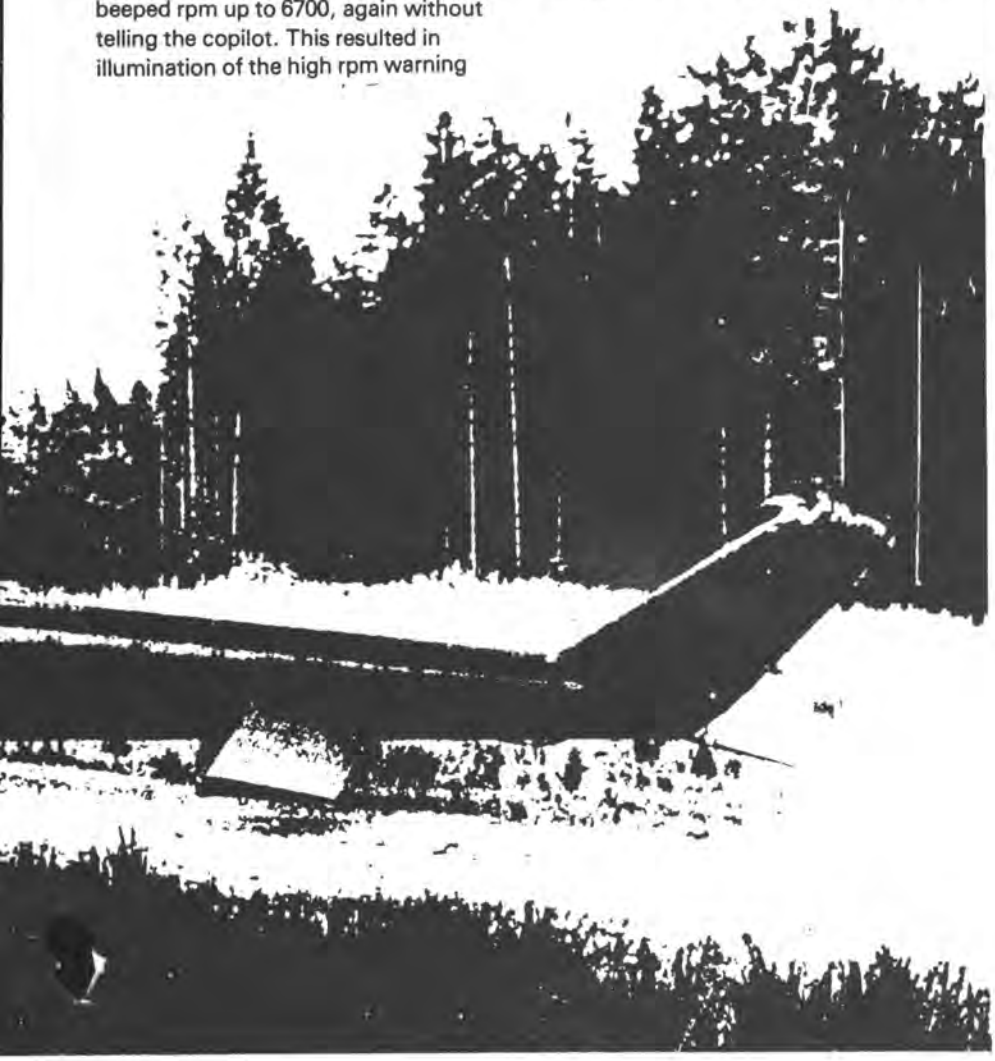
The pilot apparently did not maintain an approach angle that would allow for obstacle clearance. Because he was concerned that he might experience an engine bleedoff similar to the one that occurred on the previous takeoff, his attention was focused alternately outside and inside the aircraft during the approach. Since the aircraft hit the trees just as it was coming out of effective translational lift, the pilot would have been adding power at that point. Therefore, his attention was probably focused on the engine tachometer and he would not have noticed the aircraft settling into the trees.

The pilot may have been distracted during the early part of the approach since he was using an incorrect procedure (shooting the approach at 6700 rpm) and the rpm limit warning light came on at

least twice during the approach. These distractions occurred at a point where the pilot should have been concentrating on establishing a suitable approach angle.

The pilot refrained from commenting on the loss of rpm during the previous takeoff because he did not want to unduly alarm the passengers who were wearing headsets connected to the intercom system. Later, when the pilot took the controls to make the approach into the area where the mishap occurred, he beeped rpm up to 6700, again without telling the copilot. This resulted in illumination of the high rpm warning light, and the copilot reacted by beeping rpm down, causing the pilot to again beep up rpm.

The fact that the pilot did not roll the throttle off following loss of antitorque control when the aircraft hit the trees—and probably instinctively lowered collective instead of cushioning the landing—is not considered unusual in view of the circumstances involved. Although Army aviators are trained in antitorque and hovering autorotation maneuvers, they are not trained to handle simultaneous multiple emergencies, as faced by this pilot (tree strike, loss of tail rotor control, and a rapid c.g. shift close to the ground). Although the pilot's actions following the emergencies added to the extent of damage to the helicopter, there was not enough time available to analyze and correctly react to the multiple emergencies.



The cause of the engine rpm loss on takeoff could not be determined. Based on the way the problem began and was corrected, the most probable explanation would be that the engine was topped (power required exceeded power available) during takeoff. This is somewhat supported by the fact that the turbine engine analysis check had not been performed following a fuel control replacement a year before and, therefore, maximum power available was not known. The pilot should have made an immediate precautionary landing when he perceived the rpm loss. He may have been influenced by a desire to complete the mission since it had been coordinated directly by his commander. ■

# Selected mishap briefs

**uh1** **Class A mishaps** □ (H series) Rpm decreased as aircraft was crossing ridgeline. Tail rotor authority was lost and aircraft spun. Control was lost, and aircraft crashed on steep slope and rolled down a hill. 8148 □ (H series) Aircraft crashed and burned during approach to heliport. Aircraft may have hit chain link fence. 8149

**Class C mishaps** □ (H series) Lead aircraft in flight of five hovered close to tree line in LZ. Main rotor blade hit tree. □ (H series) During departure from LZ at dusk, aircraft hit tree, damaging main rotor blade. Mission was supposed to be completed before dark, but because of delays, flight leader had requested mission be extended. To complete mission before dark, platoon leader authorized increased passenger load, in violation of unit SOP. Increased load, darkness, and position of aircraft close to tree line affected pilot's ability to avoid tree.

**Class E mishaps** □ (H series) Compressor stall occurred during hover. Caused by failure of fuel control. □ (H series) Engine oil temperature was noted at 125° C. and rising. Caused by failure of thermal relief valve. □ (H series) Aircraft was started at night with engine inlet cover in place. Crew chiefs in the unit routinely tucked the "remove before flight" ribbons inside the cowlings to prevent the ribbons from banging against the sides of the aircraft and to aid in securing the inlet cover. Had the ribbons been free, it is possible the pilots might have noticed them. Had a proper preflight been made, the mishap would not have occurred. □ (H series) Postflight inspection after second flight revealed small hole in tail rotor drive shaft cover. Destroyed pocket knife was found in tunnel. Knife was left in tunnel during previous inspection. Damage was not discovered during preflight because tunnel cover was not opened. □ (H series) Loud whining noise was heard and fuel pressure fluctuated. Caused by internal failure of engine. □ (M series) Aircraft developed severe vibration during flight. Main rotor blade was cracked.

**uh60** **Class E mishap** □ Slight vibration occurred during 15-foot hover. Thirty seconds later, main transmission failed, causing aircraft to drop 15 feet. Engines were secured and rotor blades stopped within 15 seconds. Caused by failure of main module transmission.

**ah1** **Class B mishap** □ (S series) During standard autorotation, 20mm cannon hit runway and dug in asphalt. Aircraft bounced and crashed upright, damaging cannon, turret, aft cross tube, and skids. 8150

**Class E mishaps** □ (S series) Transmission oil pressure indicated less than 30 psi during runup. Caused by failure of transmitter. □ (S series) Pilot felt unusual vibration during flight. Caused by failure of alternator. □ (S series) As aircraft was in left bank during NOE flight, pilot let go of the controls, thinking copilot had them. Aircraft continued banking until an estimated 60- to 80-degree bank, when both pilots reacted to excessive bank angle. Pilot called for control of the aircraft and pulled power and aft cyclic, trying to avoid tree strike. Main rotor blades hit tree, and

aircraft was landed. ☐ (TH-1G) SCAS light would not go out during runup. Caused by failure of channel assembly and transducer.

**ch47** **Class A mishap** ☐ (A series) As aircraft was taxiing from refueling area, aft rotor system hit light pole. Rotor system dephased, destroying aircraft. 8151

**Class E mishaps** ☐ (C series) Crew chief noticed hydraulic fluid leaking from flight boost accumulator. Caused by failure of O-ring between hydraulic line and flight boost accumulator. ☐ (C series) Stick positioner indicated 2½ inches forward cyclic at 70 knots. Caused by failure of electrical/mechanical actuator. ☐ (B series) Rotor tachometer dropped to zero during runup. Caused by failure of generator. ☐ (B series) Pilot noticed zero pressure on utility hydraulic pressure gauge during runup. Caused by sheared drive shaft. ☐ (C series) During runup and HIT check, No. 1 engine stabilized at 93 percent $N_1$ and rpm bled off to 230. Caused by failure of fuel control.

**oh58** **Class C mishap** ☐ (A series) Engine chip detector light came on during night flight. Main rotor blade hit wires during termination of power-on approach. Darkness, ground fog, and haze reduced visibility.

**Class E mishaps** ☐ (A series) Engine oil pressure indicated 100 psi during flight. Caused by clogged oil pump filter. ☐ (C series) Engine oil pressure gauge dropped to 100 psi during hover/taxi. Caused by failure of oil pressure regulator and housing. ☐ (C series) Engine-out light came on and $N_1$ dropped to zero. Caused by failure of $N_1$ tachometer generator.

**c12** **Class E mishap** ☐ (A series) After landing, aircraft was taxied onto taxiway. When pilot tried to stop aircraft with brakes, left brake pedal went through full travel, with no braking effect. Caused by failure of packing between manifold and piston housing on left landing gear assembly.

**u21** **Class E mishap** ☐ (A series) During simulated engine failure, pilot initiated correct emergency procedure and began to move condition lever to off position. IP blocked lever with hand and condition lever moved less than one-fourth inch. Air restart was unsuccessful. After single-engine landing, crew discovered overboard combustor drain fitting was leaking fuel. Packing had crystalized and blown out. Entire fitting was loose.

**u8** **Class E mishap** ☐ (F series) No. 1 engine rpm fluctuated and engine ran rough. Engine oil temperature exceeded red line, and oil was seen coming from front and rear of engine. Chip detector light came on and prop was feathered. Caused by internal engine failure.

# Maintenance

**uh1** **Class E mishaps** ☐ (H series) Master caution and hydraulic pressure lights came on. Locally manufactured line chafed through on hydraulic irreversible valve. ☐ (H series) Crew chief noticed oil on tail boom during runup. Filler cap had been left off 42-degree gearbox after oil sample was pulled the night before. ☐ (H series) Forced trim circuit breaker popped out during runup. When it was pushed back in, smoke was seen coming from lower console pedestal area. Electrician had incorrectly wired cannon plug while installing new cyclic control. ☐ (H series) AH-1G tail rotor PC link was installed on UH-1H. Larger diameter bolt hole in AH-1 link allowed excessive play. During initial installation, torque was adequate to hold rod end bearing snug, making installation appear correct. Aircraft was operated 13 hours with incorrect link installed. As torque backed off during operation, play

(continued on back)

# Mishap briefs

developed. AH-1G and UH-1 PC links are identical except for diameters of bolt holes.

**oh58** **Class C mishap** □ (A series) After test flight, maintenance test pilot determined tail rotor pedals were creeping and required rigging adjustment. Crew chief and test pilot removed tail cone to make adjustments. Adjustments were made and tail cone was left hanging by tail light wires. Test pilot inspected the work and went to pilot's station. Crew chief thought test pilot was running the pedals through. When test pilot called "clear," crew chief believed pilot was aware of loose tail cone but did not check to see if he was aware of it. Pilot started engine and brought it to operation rpm. Tail rotor blades hit tail cone. Light crosswind may have blown tail cone into tail rotor blades. Maintenance NCO standing nearby heard tail rotor strike tail cone, ran to aircraft, and pulled tail cone from tail rotor plane.

**c12** **Class E mishap** □ (C series) Directional control was inadequate during power application for takeoff. Nose gear strut housing did not have enough grease.

## Messages received

- Safety-of-flight maintenance notice concerning change in overhaul and retirement schedule for UH-1 and AH-1G main transmission, UH-1 tail rotor gearbox, and UH-1/AH-1 intermediate gearbox (UH-1-81-06, AH-1-81-11, 022120Z Jul 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Is PRAM required for weather delay?

There is some confusion in the field about whether or not a PRAM is required for aborted takeoffs and unplanned landings because of weather. A PRAM is not required when a takeoff from a base airfield must be aborted solely because of the onset of unforeseen weather phenomena that is beyond the capability of the crew or equipment, even though intent to fly was present. However, if a mechanical or similar problem occurs that would dictate an aborted takeoff in any event, a PRAM is required. If a flight departs for a certain destination and weather dictates an unplanned landing at an interim field site, a PRAM is not required if the PIC can complete the mission after waiting a reasonable time for the weather to abate. If the weather is so severe the mission has to be terminated, a PRAM is required.

The final judgment for submission of PRAMs rests with the commander of the aircrew. ■

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# Pilot techniques—how important are they?

The pilot-in-command (PIC) of a U-21A was cleared for a visual approach to a 10,000-foot long runway. However, he was not told that the first 500-foot section was closed because of ice and snow. He began final approach at 1 ½ miles, correcting for a right crosswind reported as 360 degrees at 10 knots, gusting to 19.

During approach and touchdown, the right wheel struck a snow and ice ridge that stretched across the end of a runway at a height that varied from 18 to 36 inches. As a result, the right wheel and lower strut assembly separated from the aircraft. The copilot (SIP) took command of the aircraft and made a go-around. After assessing the damage, the crew made a successful gear-up landing to a foamed runway.

On the surface, this appears to be another of those unfortunate mishaps that could have been prevented had the pilot been told of the hazard that was present. This is partly true. The air traffic controller did fail to notify the aircrew, as required by Air Traffic Control Manual 7110.65A, section 401, that the first 500 feet of the runway was closed because of snow and ice buildup. And, of course, had the pilot been aware of this hazard, he would have surely avoided it. However, the matter is not as simple as that.

To begin with, a U-21A mechanic on OJT status failed to reinstall a sleeve bushing in the upper knee landing gear assembly after he had dismantled it for inspection. As a result, the gap between the bolt and the knee joint may have assisted forces generated during the impact to overstress and fracture the upper torque knee joint. Further, the mechanic's failure to reinstall the bushing may have resulted from his inexperience with fixed wing aircraft, inadequate supervision by his immediate supervisor—because of excessive supervisory responsibilities—and because of his failure to use appropriate manuals.

**Upper right strut assembly of U-21A trails freely as pilot prepares to make gear-up landing.**

But despite the mechanical defect present and failure on the part of the air traffic controller to warn the pilot of the snow and ice hazard, the mishap would not have occurred had the pilot followed proper flight procedures.

## Normal landing

The PIC allowed the right main gear to strike a snow-ice ridge that stretched across the entire width of the runway. He failed to perform a normal landing as outlined in the Aircrew Training Manual (TC 1-145, task number 3501, page 6-49) in that the aircraft was not at an altitude of 50 feet when it reached the approach end of the runway.

The impact with the snow and ice ridge caused the improperly assembled torque knee assembly to break. This allowed the right main wheel to turn inward toward the fuselage, causing the drag strut to fail. As a result, the lower strut and wheel assembly fell free from the aircraft.

## VASI

During the visual approach to the runway, the PIC failed to perform a course of action required by Federal Aviation Regulation (FAR), part 91.87(D)(3) in that

he did not use the visual approach slope indicator (VASI). Had VASI been used, the PIC would have touched down approximately 700 to 1,000 feet past the snow and ice ridge.

## ATIS

The aircrew did not use good pilot technique of monitoring the Automatic Terminal Information Service (ATIS). This resulted in the crew not receiving the information that the first 500 feet of the runway was closed.

Although poor maintenance practices existed, and although Air Traffic Control could have prevented the mishap by telling the aircrew of the snow and ice hazard, in reality, safe termination of this flight depended on good pilot techniques. Had the aircrew monitored the ATIS, they would have known the first 500 feet of the runway was not to be used. Also, had the PIC used VASI as required, the aircraft would have safely cleared the snow and ice ridge. Failing in these, the PIC could have prevented the mishap by making a normal landing as outlined in the Aircrew Training Manual (TC 1-145). This would have placed the aircraft at an altitude of 50 feet above the approach end of the runway, providing ample clearance between the aircraft and the obstruction.

Finally, one other point needs to be addressed, and it concerns the runway. The runway being used was 10,000 feet long. Obviously, no need existed for the U-21A to use its entire length. In fact, this mishap is reminiscent of the numerous ones that have occurred over the years because pilots attempted to land short. In most of those instances the aircraft involved were multi-engine, and the pilots' reasons were the same—to make the first turnoff. But regardless of the reasons, failure to use ample runway available has caused more than one pilot regret.

While it it essential that maintenance be performed correctly and that Air Traffic Control as well as all other supporting personnel perform their jobs in a responsible manner, pilots must never rely on others to the extent they become negligent in their own responsibilities. That is why you have preflight inspections and cockpit checks to perform, and why you have regulations, SOPs, and training manuals to follow.

How important are good pilot techniques? A review of this mishap provides the answers. ■

**Close-up view of the severed strut assembly and some of the damage that resulted from gear-up landing.**

**Aircraft settles to uneventful stop after slide on foamed runway.**

# Recap of TSARCOM and AVRADCOM messages

Following is a list of AIG 8881 addressed messages transmitted by TSARCOM and AVRADCOM from 1 July through 30 September 1980.

**AH-1-80-17** Maintenance notice concerning the AH-1S heads-up display night filter operation

**AH-1-80-18** Maintenance notice concerning the inspection of chamfered washers

**AH-1-80-19** Maintenance notice concerning change in engine start procedures for AH-1S (mod) aircraft

**UH-1-80-12** Maintenance notice concerning honeycomb panel replacement and elevator inspection criteria

**UH-1-80-13** SOF operational message concerning suspension of closed circuit refueling of UH-1C/M helicopters with rollover vent valves installed

**CH-47-80-08** SOF message concerning one-time inspection for all CH-47A/B/C aircraft to inspect engine to engine transmission installation

**CH-47-80-09** SOF message concerning one-time inspection for all CH-47A/B/C aircraft to inspect aft transmission

**CH-47-80-10** Maintenance notice concerning CH-47 rotary head protective cover

**GEN-80-18** SOF operational preventive maintenance in volcanic ash environment for all exposed Army aircraft

**GEN-80-19** SOPE message concerning leg garter assemblies used with MK-J5D ejection seat

**GEN-80-20** SOF maintenance notice on aircraft altimeters, three pointer and counter drum pointer type

**GEN-80-21** SOPE message on safety vest assembly for hoist operator

**GEN-80-22** SOPE message concerning deadlining of the FF-2 automatic ripcord release

**GEN-80-23** SOPE message concerning fitting of OV-1/RV-1 lap belt assembly to individual aircrew personnel

**GEN-80-24** SOPE message on disposition instructions for medical materiel

**UH-60A-80-28** SOF message for UH-60A electromagnetic interference

**UH-60A-80-29** SOF message concerning one-time inspection of UH-60A main transmission housing flight control locator dowel pins

**UH-60A-80-30** SOF message on tail wheel bearings

**UH-60A-80-31** SOF message concerning one-time inspection of pressure refueling receptacle bolt torque

**UH-60A-80-32** SOF message maintenance notice for main transmission housing dowel pins

**UH-60A-80-33** SOF message maintenance notice concerning APU hot end inspection

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Addressees requiring copies of messages should contact their next higher headquarters. ■

# Stacom

## Operators Manual and Checklist update

Listed below are the effective dates of the current aircraft operators manuals and checklists with the number and date of the latest change. Please check your weekly AG Publication Center Bulletin for subsequent changes.

| Fixed Wing TM 55-1510 | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 201-10/4 | RU-8D | | | | |
| | U-8D/G | 3 Apr 78 | | Jul 78 | |
| 201-10/5 | U-8F | 21 Mar 78 | 1, 18 Dec 78 | Jul 78 | |
| 204-10/3 | OV-1B | 9 Mar 79 | 1, 14 Jan 80 | Feb 79 | |
| 204-10/4 | OV-1C | 10 Apr 79 | 2, 14 Jan 80 | Apr 79 | |
| 208-10 | T-42A | 27 Feb 79 | | Feb 79 | |
| 209-10 | U-21A | 25 Mar 77 | 4, 11 Oct 78 | Feb 77 | 5, 12 Jun 80 |
| 209-10-1 | RU-21A/D | 28 Feb 77 | 5, 24 Jul 80 | Mar 77 | 2, 23 Aug 78 |
| 213-10 | OV-1D/RV-1D | 4 Aug 78 | 2, 16 Jan 80 | Nov 78 | |
| 214-10 | RU-21B/C | 15 Mar 77 | 5, Undated | Apr 77 | 4, 12 Jun 80 |
| 215-10 | U-21G | 11 Mar 77 | 4, 26 Jun 80 | Apr 77 | 3, 12 Jun 80 |
| 215-10-2 | RU-21H (GR-V) | 29 Dec 78 | | Dec 78 | |
| 216-10 | U-3A/B | 11 Dec 78 | 1, 3 Jul 89 | Dec 78 | |
| | C-12A | 8 Jan 80 | | Jan 80 | |
| | C-12C | 1 Dec 78 | | Jan 79 | |

| Rotary Wing TM 55-1520 | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 209-10 | CH-47A | 9 Jan 79 | | Dec 78 | 1, 2 Feb 79 |
| 210-10 | UH-1D/H | 18 May 79 | 4, 7 May 80 | Feb 79 | 2, 1 Apr 80 |
| 214-10 | OH-6A | 17 Dec 76 | 9, 6 Jun 80 | Dec 76 | 3, 20 Jun 80 |
| 217-10-1 | CH-54A | 8 Apr 77 | 2, 10 Oct 79 | Mar 77 | 1, 13 May 77 |
| 217-10-2 | CH-54B | 15 Apr 77 | 2, 10 Oct 79 | Mar 77 | 2, 22 Aug 79 |
| 219-10 | UH-1B | 16 Jan 69 | 16, 10 Sep 79 | Dec 68 | 8, 11 Apr 79 |
| 220-10 | UH-1C/M | Nov 68 | 20, 10 Jan 80 | Jul 71 | 8, 13 Apr 79 |
| 221-10 | AH-1G | 18 Mar 80 | | Mar 80 | |
| 227-10-1 | CH-47B | 23 Aug 78 | 2, 15 Sep 80 | Dec 78 | 2, 22 Aug 79 |
| 227-10-2 | CH-47C | 23 Aug 78 | 3, 1 Nov 79 | Nov 79 | |
| 228-10 | OH-58A | 7 Apr 78 | 8, 24 Jul 80 | Jul 78 | 2, 20 Jun 80 |
| 233-10 | TH-55A | 30 Sep 76 | 2, 14 Jul 78 | Oct 76 | 4, 17 Oct 78 |
| 234-10 | AH-1S (MOD) | 17 Nov 76 | 11, 6 May 80 | Nov 76 | 3, 3 Nov 79 |
| 235-10 | OH-58C | 7 Apr 78 | 13, 11 Aug 80 | Jul 78 | 4, 11 Aug 80 |
| 236-10 | AH-1S (PROD) | 11 Jan 80 | 2, 20 May 80 | Jan 80 | |
| 237-10 | UH-60A | 21 May 79 | 6, 7 Feb 80 | Dec 78 | 6, 7 Feb 80 |
| 239-10 | AH-1S (MC) | 11 Jan 80 | 2, 30 May 80 | Jan 80 | |

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Selected mishap briefs

## uh1

**Class A mishap** ☐ (H series) Engine failed while aircraft was flying 200 feet agl. Pilot autorotated and had to turn to miss wires. Aircraft landed hard, damaging skids, tail boom, and underside. 8101

**Class E mishaps** ☐ (H series) Right fuel boost light came on and crew smelled electrical odor. Caused by failure of fuel boost pump. ☐ (H series) Hydraulic power could not be restored after simulated hydraulics failure. Caused by failure of hydraulic check valve. ☐ (H series) Main generator loadmeter indicated 50% during flight. Battery was turned off. On final approach, crew smelled fumes. After aircraft was landed, smoke was seen coming from battery compartment. Caused by thermal runaway of battery. ☐ (H series) Whistling sound was heard during approach for landing, and vertical vibration developed. Caused by separation of main rotor blade outer skin behind spar. ☐ (H series) Two Infantry troops crossed in front of aircraft to enter on left side. Rucksack of one of the soldiers hit nose-mounted pitot tube, bending tube up and to left. ☐ (H series) Engine tachometer failed during power reduction, giving indication of engine failure or low side governor failure. Pitch was reduced to full down position and throttle reduced to engine idle. Governor switch was placed in emergency position and throttle was increased. When power was restored and all instrument indications were normal except engine tachometer, throttle was reduced and governor switch placed in normal position. Pilot said that during descent he saw rotor rpm exceed the limits to about 360 rpm. ☐ (H series) Crew smelled fuel fumes during flight. Fuel was leaking from drain valve.

## uh60

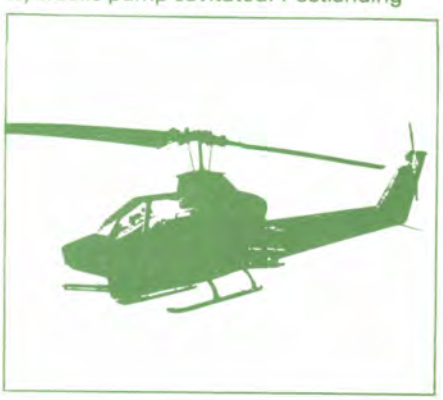
**Class C mishap** ☐ Postflight inspection revealed damage to all four main rotor blades. Damage probably occurred during landing in LZ.

## ah1

**Class A mishap** ☐ (G series) Aircraft was No. 5 in flight of 6. Pilot's first indication of trouble was one-to-one vibration. Pilot turned toward land and felt series of shudders and bangs. Aircraft yawed left, nosed down, and started to spin to left. C.G. shifted forward, and pilot rolled off throttle and entered autorotation. Spinning motion slowed but did not stop. Just before impact with water, pilot leveled aircraft and pulled pitch. Upon impact, gunner's door popped open and pilot activated canopy jettison system. All four panels jettisoned properly. Crew exited with no injuries. Aircraft sank within 1 minute. 8102

**Class B mishap** ☐ (G series) Aircraft hit tree during evasive maneuver to avoid simulated jet attack. Main rotor blades, drive train, and transmission were damaged. 8103

**Class E mishaps** ☐ (S series) After firing 20mm round, pilot heard secondary explosion. No abnormal instrument or control indications were noted. As second burst was fired, antitorque pedals became stiff. Pilot initiated precautionary landing. About 5 to 10 feet agl, No. 1 hydraulic pump cavitated. Postlanding



inspection revealed pin holes in tail rotor hydraulic line and both main rotor blades. Probably caused by round detonating beneath aircraft. ☐ (G series) Transmission oil pressure gauge indicated 5 psi during hover. Transmission oil bypass and oil pressure lights came on. Caused by failure of transmission oil filter gasket.

**ch47** **Class E mishaps** ☐ (B series) Transmission chip detector light came on. Large chips were found on vertical shaft plug. ☐ (C series) No. 2 engine oil pressure gauge indicated 170 psi. Caused by failure of oil pressure transmitter. ☐ (C series) As crew was preparing to load cargo, tee fitting to cargo winch failed, spraying hydraulic fluid throughout heater compartment.

**ch54** **Class E mishaps** ☐ (A series) Loud bang was heard and transmission oil hot light came on. Transmission oil temperature gauge indicated 136° C. Caused by failure of radiator oil cooler. ☐ (A series) Hoist oil line ruptured as aircraft was at hover with sling load attached.

**oh58** **Class E mishaps** ☐ (C series) Pilot was making primary directional control check. Disengage position was selected during runup. There was a lack of resistance and tail rotor response in backup system. Caused by failure of forward shear link terminal of backup control assembly. ☐ (A series) Aircraft was lifting to hover. As skids cleared ramp, rotorwash from nearby CH-47 forced aircraft to turn. Lower part of vertical fin hit handle of 50-pound fire extinguisher. ☐ (C series) Shortly after takeoff, copilot found it difficult to move collective pitch control because of loss of hydraulic pressure. Caused by failure of hydraulic pump and contaminated hydraulic fluid.

**c12** **Class E mishap** ☐ (A series) Pilot heard loud popping sound during runup and noticed 60% fluctuation in torque on No. 2 engine. Caused by failure of low pressure bleed valve.

**u8** **Class E mishap** ☐ (F series) Left gear down indicator showed unsafe on final approach. Flyby indicated gear appeared to be down. On next approach, gear was recycled and indicated safe. Caused by failure of sensitive switch.

**u21** **Class E mishap** ☐ (A series) Aircraft yawed and torque dropped 200 pounds on No. 1 engine. Engine was shut down and aircraft landed. Failure of main bearing in fuel control unit caused loss of control and metering of fuel to engine.

## Maintenance

**uh1** **Class E mishap** ☐ (H series) Loud noise was heard during takeoff. Master caution and hydraulic pressure lights came on, and feedback was felt in controls. Pressure line to tail rotor servo was chafed through by drain line, allowing hydraulic fluid to escape.

**oh58** **Class E mishap** ☐ (A series) During power recovery after simulated engine failure, $N_2$ bled down to 98% from 103%. Tee

*(continued on next page)*

# Mishap briefs

fitting on PC line at $N_2$ governor was not seated properly. Crew chief had disconnected only one end of line during engine flush.

**c12** **Class E mishap** ☐ (A series) During takeoff, landing gear warning system gave visual and audio signals that landing gear would not fully retract. Gear was recycled and unsafe indications remained. Pilot returned to airfield and landed. Cam of flap actuator was out of adjustment, causing lights and horn to malfunction.

**ov1** **Class E mishap** ☐ (D series) When No. 2 engine was started, fireguard saw fuel spilling from engine. Fuel control had been changed the day before, and preformed packing was damaged during installation.

## Messages received

• UH-60A safety-of-flight message concerning one-time inspection of inboard damper attachment bolts (UH-60A-80-35, 082020Z Oct 80). Summary: Three instances have been reported where the inboard damper attachment bolt was found to have two deep notches in the shank. The notches are the result of the bolt wearing against the damper bearing. Contact: Earl Parsons, AUTOVON 693-1661, commercial 314-263-1661.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# Throwing money out the window

Plexiglass windows in several UH-60, UH-1, and OH-58 cargo compartment doors have been damaged during past field training exercises. When placards were taped to the inside of the windows to identify aircraft, or when tape was stuck to windows for a distinctive marking, the heat from the sun baked the glue from the tape onto the plexiglass and the glue could not be removed without making the windows unserviceable. The only fix in cases like this is to replace the windows.

At $122 each for UH-60 windows, $128 for UH-1 windows, and $156 for OH-58 windows, you can see it wouldn't take long for a unit to spend a lot of dollars replacing windows.

When units are involved in field training exercises and there is a requirement to distinctively mark aircraft, it is suggested that placards be made large enough so they can be taped to the metal frame around the windows and not the plexiglass.

**Thanks to CW4 Thompson, C Company, 158th Aviation Battalion, Fort Campbell, for this info.** ■

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**Commanders, supervisors, SIPs, IPs, PICs, pilots . . . it's up to you. If the current upward trend in mishaps is to be stopped, a major effort is required in the weeks and months ahead . . . and the time to start is Now.**

# Costly violations

During the first 9 months of this fiscal year, 22 aircrewmembers died in 37 Class A mishaps and 31 aircraft were destroyed. This is an alarming increase over the same period in FY 80 . . . 26 Class A mishaps involving 24 destroyed aircraft. Flying hours for both periods were about the same.

Crew error was involved in 27 of the total 37, and this figure is expected to go up when all investigations are complete. IPs were at fault in 7 of the known 27 crew error mishaps.

The situation is not improving. As this issue goes to press, the record for July is already one destroyed UH-1H and a destroyed OH-6. The Huey crash was caused by crew error. Investigation of the OH-6 crash is still underway.

There's nothing exotic or new about the causes of these mishaps. In most cases they happened because **the personnel flying the aircraft or supervising the flights violated established procedures.**

Following are typical examples:

• **A UH-1H pilot violated AR 95-1 when he attempted an instrument takeoff without standard takeoff minimums.** His aircraft hit trees and crashed three-tenths of a mile from the takeoff point. An IP in another Huey had taken off under the same conditions just a few minutes earlier, influencing the decisions of the other crewmembers in the flight.

• **A UH-1H flight commander, in violation of procedures in TC 1-12,** led a flight of four aircraft in a close diamond formation to a landing in a fresh snow-covered field. The aircraft were not spaced out at 15- to 30-second intervals as prescribed. The crew of the No. 3 aircraft became disoriented because of rotor-induced blowing snow, and the aircraft crashed.

• **A UH-1H pilot applied aft cyclic before applying collective** during an attempted deceleration in a left turn over trees. This control action was in **direct conflict with the instructions for a deceleration on page 5-22 of FM 1-51 and the "standards" and "description" criteria for task 5007, TC 1-135.** The tail rotor pivoted downward into the trees, causing a tree strike and loss of the tail rotor assembly. The aircraft was autorotated into the trees and crashed.

• **A current weather briefing was not obtained as required by AR 95-1,** and a night formation flight was attempted with visibility below VFR minimums. The pilot of one of the Hueys became disoriented and inadvertently placed the aircraft in a descending left turn. The helicopter was destroyed on impact.

• **A UH-1H pilot attempted a VFR landing during IFR conditions at night.** When he entered a thick fog bank during approach, all outside visual reference was lost. The helicopter hit a fence and came to rest almost inverted. The pilot was flying from the left seat, **in violation of local regulations,** and had been on duty more than 20 hours, **a violation of the unit crew rest policy.**

There's also nothing new about what's needed as a cure. **Following established procedures is the key to preventing crew-error mishaps.**

Commanders, supervisors, SIPs, IPs, PICs, pilots . . . it's up to you. If this upward trend in mishaps is to be stopped, a major effort is required in the weeks and months ahead . . . and the time to start is now. ■

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **4** |
| | June | 2 | 4 | June | **7** | **3** |
| 4th Qtr | July | 2 | 1 | 1-22 July | **2** | **0** |
| | August | 6 | 1 | | | |
| | September | 3 | 1 | | | |
| | Total for Year | 37 | 26 | Total to Date | **39** | **22** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

# Check CH-47 wire bundles

During a recent mishap investigation, where there was a possible problem with the engine condition beep trim system, deficiencies were found in other aircraft in the unit.

Some aircraft were found with wire bundle clamps not installed on the wire bundle to the minimum beep resistors in the a.c. electrical equipment pod (photo 1). One aircraft was found with a chafed wire (pencil in photo 2 points to wire), which could explain some of the in-flight beep problems other aircraft Army-wide have had in the past. Not only were clamps found not to be installed, but some clamps were incorrectly installed. Photo 3 shows correct installation of clamps and wire bundle. Note clamp standoff on left side clamp.

PHOTO 2. Clamp missing and wire chafed.

In photo 1, the right side clamp is not installed, there is no standoff on the left side clamp, and there are no wire tie-wraps installed. These clamps and tie-wraps are essential to prevent the wire bundle from vibrating in flight, causing wires to chafe or break which, in turn, could cause problems with the engine condition beep trim system.

See figure 9-13, page 9-22, of TM 55-1520-228-23-3, and figure 9-14, page 9-24, of TM 55-1520-209-23-3 for correct installation of clamps, tie-wraps, and wire bundle.

Point of contact at the Safety Center is SFC James Wheeler, AUTOVON 558-4202/4198. ■

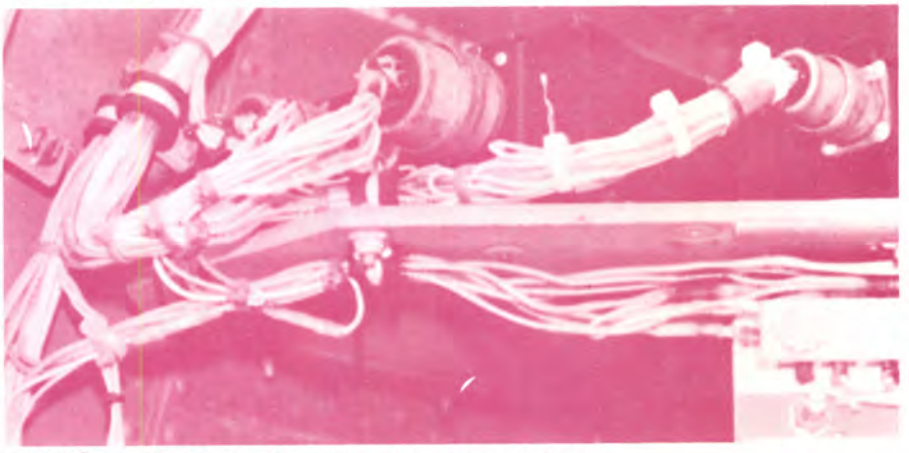


PHOTO 1. Standoffs, tie-wraps, and clamp missing.

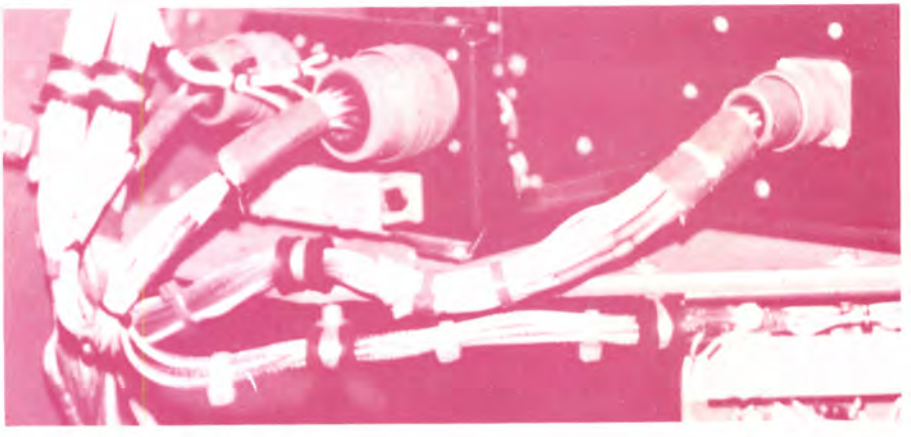


PHOTO 3. Correct installation.

# Selected mishap briefs

**uh1** **Class E mishaps** □ (H series) Baffle assembly damage was caused by air pressure generated by aborted engine start with engine covers installed. □ (H series) Main rotor blade hit tree during NOE flight, damaging tip cap. □ (H series) Master caution light came on during flight. Caused by failure of master caution box panel assembly. □ (M series) Loadmeter increased to .5 during flight. Caused by overheated battery.

**ah1** **Class E mishaps** □ (S series) Vertical vibration developed during landing. Caused by worn feather bearing. □ (S series) Aircraft was flown in heavy rainshower. When aircraft was shut down, blade skin was found separated. □ (S series) Crew heard banging sound from behind pilot's station. Postflight inspection revealed shroud around ECU blower fan had disintegrated. Fan blades were found in lower transmission compartment. □ (TH-1G) SCAS yaw channel motored 30 degrees left and right during flight. Caused by malfunction of SCAS amplifier.

**ch47** **Class E mishaps** □ (C series) Hydraulic fluid was seen spraying from broken line near ramp area during flight. Caused by failure of line. □ (C series) Normal beep trim failed to hold required rotor rpm during flight. Caused by broken wire at base of thrust control lever. □ (B series) No. 2 engine was started and then quit. Electrical short in engine fuel valve closed valve and caused circuit breaker to pop out.

**ch54** **Class E mishap** □ (A series) Rear pod door came open during flight. While aircraft was at hover, pod door hinges failed and door fell to ground. Door was not properly secured before flight.

**u21** **Class E mishap** □ (RU-21H) After 15 minutes of flight, fuel in left system indicated 71 pounds more than original reading. Continued checks indicated excessive reading plus and minus original reading. Caused by faulty fuel indicating system.

**c12** **Class E mishap** □ (A series) No. 1 engine fire detection light came on during start. Caused by water in fire detection cannon plug. Aircraft had been parked on ramp during heavy rainshower.

**c7** **Class E mishap** □ Fuel was seen leaking from drain line during flight. Caused by internal failure of No. 2 engine-driven fuel pump.

## Maintenance

**uh1** **Class C mishap** □ (H series) Test pilot initiated high power climb to conduct turbine engine analysis check. As power was increased, technical observer told pilot $N_1$ speed was at 104 percent. Pilot immediately decreased power setting and $N_1$ speed decreased to within normal limits. Caused by incorrect engine trim adjustments after installation of new fuel control.

**Class E mishaps** □ (H series) $N_2$ increased to 6800 rpm, egt rose to 580 degrees, and aircraft yawed to right during flight. Caused by shorted wires in pilot's collective. $N_2$ beep switch activated searchlight. Landing light switch caused $N_2$ to go to max beep. □ (H series) $N_2$ dropped to 6400 rpm during level-off check. When power was decreased, rpm rose to 6600. Caused by incorrectly rigged governor stops.

**ah1** **Class E mishap** □ (S series) Aircraft banked to left abruptly during flight. Pilot disengaged SCAS and landed. Caused by out-of-adjustment roll channel SCAS.

**ch47** **Class C mishaps** ☐ (C series) Sparks were seen coming from No. 2 engine after shutdown. Foreign object damage to engine occurred when nut and keeper from engine transmission cowling went into engine. When one of the bolts holding engine transmission cowling on was removed, nut and keeper were not removed or safetied. ☐ (C series) Inspection after test flight revealed 6-inch chisel in tunnel area and damage to No. 1 and No. 2 drive shafts and No. 1 pan. Final phase inspection had been done 4 days before mishap. Technical inspector located metal shavings and rivet heads in tunnel area because of failure of sheetmetal people to thoroughly clean up following work done in the area. Crew was told about this and area was cleaned. Individuals involved overlooked chisel.

**oh58** **Class E mishaps** ☐ (C series) Transmission oil pressure gauge fluctuated during flight. Caused by loose cannon plug on oil pressure transducer. ☐ (A series) Pilot smelled fuel fumes and landed. Check of engine compartment revealed fuel leak between fuel hose fitting and fuel nozzle. A few days before the mishap, fuel hose had been disconnected to check on fuel problem. Records do not indicate that fuel hose fitting was retorqued to 80-120 inch pounds. It is believed that aircraft vibrations caused fuel hose fitting to back off because it was incorrectly torqued. ☐ (A series) Pilot noticed oil leaking on chin bubble, and engine oil pressure decreased from 130 psi to 75 psi. Caused by stripped threads on torque gauge and faulty engine oil pressure gauge. ☐ (C series) During engine start, pilot saw smoke coming from lower right side of pilot's instrument panel. Wire to rear of marker beacon had shorted out. Wire was installed incorrectly.

## Messages received

• Safety-of-flight technical message on one-time inspection of CH-47A forward and aft pitch link assemblies (CH-47-81-13, 081315Z Jul 81). Summary: During an inspection of the forward rotor system on a CH-46 helicopter, a pitch link was found completely severed. The upper terminal was separated at the junction of the barrel and the checknut. As a result of this failure and due to the similarity of construction between the CH-47A pitch link and the CH-46 pitch link, an inspection is required to retorque the checknuts. The purpose of this inspection is to retorque pitch link checknuts. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# Stacom

## UH-1 and AH-1 gross weight validation factor (torque)

Task 2002, **Perform hover (power) check,** in TC 1-135 and TC 1-136 provides the methodology for computation of several different torque values. These computed values, entered on the performance planning card (PPC) and properly used by aircrews, enhance our ability to safely and effectively operate the aircraft.

Some confusion exists with regard to gross weight and its applicability to the go-no-go torque values. The go-no-go values derived for a specific set of environmental conditions are constant, regardless of aircraft gross weight. However, when the indicated torque at a 5-foot hover exceeds the go-no-go value, the only method available to the pilot that will reduce the indicated torque is the reduction of aircraft weight.

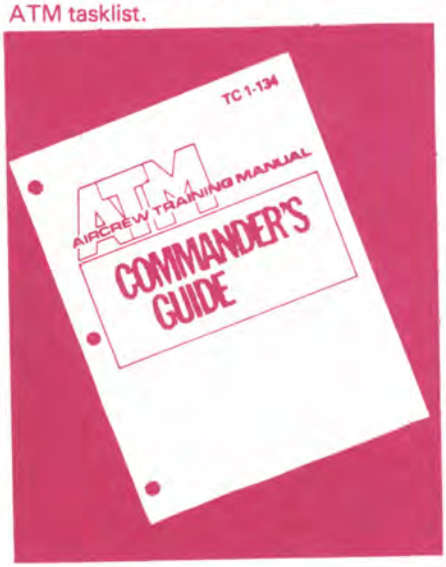
Because go-no-go values do not directly consider aircraft gross weight, they may equate to an aircraft gross weight in excess of the maximum allowable as specified within the operators manual. For this reason, a gross weight validation factor (torque) should be computed. The gross weight validation factor is computed in the same manner as "predicted torque," except that maximum allowable gross weight is used (i.e., 9,500 pounds - UH-1 and AH-1G; 10,000 pounds - AH-1S).

This torque value should be entered on the PPC and compared to the actual indicated torque during performance of the power check. Indicated torque values above the gross weight validation factor (torque) during the power check denote aircraft gross weight may be in excess of maximum allowable. Weight and balance forms and performance planning figures must be reaffirmed and/or aircraft gross weight must be reduced before continuation of the mission.

This gross weight validation factor (torque) has no effect on the go-no-go torque values and once aircraft gross weight is confirmed, the appropriate go-no-go torque values must be consulted to insure the availability of sufficient engine power. ■

## ATM tasklist

The Aircrew Training Manual Commander's Guide (TC 1-134) provides guidance for the development of ATM tasklists. Findings of recent ARMS Team visits have identified several areas of misunderstanding with regard to the purpose and disposition of the ATM tasklist.




A tasklist, as prescribed in paragraph 2-4 of TC 1-134, is required for each TOE/TDA operational flying position. Its purpose is to identify all tasks that are applicable to a group of or a particular TOE/TDA position. Tasklists do not change as different aviators are assigned to each TOE/TDA position; rather the aviator is trained to insure that he can perform the tasks required by the tasklist.

The tasklist is a separate requirement and should not be confused with the Aircrew Training Record, DA Form 4889-R, used to track accomplishment of task iterations. Future changes to the ATM will incorporate a standardized form to be used for the tasklist. In the interim, the commander should indicate by policy letter, standardization bulletin, SOP, or some other means the tasklists for his unit and must insure that:

- The TOE/TDA position(s) for which the tasklist is applicable is identified.
- The TOE/TDA position is identified as FAC 1 or FAC 2.
- **All** appropriate tasks are listed as defined by paragraph 2-4b(3), TC 1-134. (FAC 2 tasks may be identified by a general rotation, as opposed to listing each separate task.)
- Where applicable, tasks in addition to those specified within the ATM are identified as mandatory for evaluation.
- The tasklists are incorporated as a permanent part of the unit's training program.
- Each aviator is made aware of his total requirements as specified by the tasklist, those tasks which must be tracked, and any additional night and/or evaluation tasks not specified by the ATM. ■

## UH-60 PPCs

TC 1-138 will be the ATM for UH-60 units/operators when published. Task 1004, **Use Performance Charts,** will be incorporated in the new ATM. It contains all procedures for the correct completion of PPC items (e.g., go-no-go torque). UH-60 units/operators should implement Task 1004 at this time. The task is as follows:

**Task:** 1004, Use Performance Charts

**Conditions:** Given the appropriate aircraft performance charts and necessary aircraft and environmental information.

**Standards:** Compute with 100 percent accuracy the maximum torque available (30-minute limit), maximum gross weight, go-no-go torque, and required information from the cruise charts, as appropriate for planned mission.

**Description:** Before flight, compute the following:

1. Maximum torque available chart, 30-minute limit. Using either takeoff or arrival data (worst conditions), enter the chart at free air temperature (FAT), move horizontally to pressure altitude, then vertically to the maximum torque available, not to exceed transmission limits.

2. Maximum gross weight to hover. Using conditions in item 1 above, determine pressure altitude, temperature, and mission profile hover altitude (OGE or IGE). Enter chart at pressure altitude; move horizontally to FAT. Move vertically to maximum gross weight for mission profile.

3. Go-no-go torque. Using takeoff conditions, enter chart at pressure altitude. Move horizontally to FAT. Move vertically down to maximum gross weight (determined in item 2 above). Move horizontally to baseline and parallel closest line to FAT, then continue horizontally to mission profile hover height. Move vertically down to read go-no-go torque. ■

## Currency in CH-47D

Paragraph 2-8d, AR 95-1, lists the CH-47A, B, and C aircraft as series aircraft with similar operating and handling characteristics. Currency in either the CH-47A, B, or C satisfies currency requirements for the other two aircraft. The CH-47D is not included in the list as it is considered to have sufficient dissimilar operating and handling characteristics to necessitate separate currency.

Therefore, separate training records for the CH-47D to include tasks, iterations, flying hours, etc., are required to satisfy ATM requirements.

Furthermore, a separate annual standardization flight evaluation for the CH-47D is required to comply with the provisions of paragraph 6-15, AR 95-1.

For the purpose of clarification, the term "secondary aircraft" as used in paragraph 6-17b, AR 95-1, is synonymous with the terms "alternate and additional aircraft" as used in the ATMs. ■

## Form 4186 deficiencies

Change 32, AR 40-501, 15 August 1980, states that DA Form 4186 (Medical Recommendation for Flying Duty) is to be completed under the following conditions:

1. At the time of periodic medical examination.

2. After an aircraft accident.

3. When reporting to a new duty station.

4. When admitted to a medical treatment facility or sick in quarters.

5. When returning to flight status following (4) above.

6. When treated as an outpatient for conditions or with drugs which are disqualifying for aviation duty.

7. When being returned to flight status following restriction imposed under (6) above.

8. Other occasions, as required.

One copy will be sent to the examinee's unit commander who must **sign** and **forward** it to the flight records clerk for inclusion in the individual's flight records in accordance with the provisions of paragraph 7-13, AR 95-1.

Recurring deficiencies involve individuals performing flying duties without proper medical clearances (no DA Form 4186 in their flight records) or the form not being signed by the commander. ■

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Cooling the gas turbine engine

Judging from the feedback the Safety Center has received, it seems that the article "Temperature—Life to a Gas Turbine Engine" published in the 22 April 1981 issue of FLIGHTFAX has generated considerable interest among Army aviation personnel. While comments varied, most centered on whether or not a hot engine should be motored with the starter to reduce its temperature to acceptable limits before restarting it.

Use of the starter for this purpose appears to be an acceptable practice in both military and civilian aviation circles. Yet, evidence suggests that this method of cooling an engine before restarting it leads to premature failure of engine components.

In the past twelve months, the Safety Center submitted eight T63-A-700 engines for teardown analysis. Each of these engines had exhibited short coast-down time, usually accompanied with excessive noise. In each case, analysis revealed that extensive rubbing had occurred between the first gas producer turbine and the cylinder.

A check of between 30 and 40 T63-A-700 engines that are analyzed when inducted for overhaul each month at CCAD shows that about 75 percent of them also exhibit contact between the first gas producer turbine and the cylinder. Warpage of components in approximately half of these engines is so severe that both the turbines and cylinders have to be replaced.

One of the prime causes of warpage of hot end components is extreme temperature variations. And the temperature variations produced by blowing relatively cold air through a hot engine, then lighting off and raising the temperature back to the operating range are, without a doubt, extreme. Further, such a procedure for cooling the engine to acceptable levels for a restart is neither approved nor authorized by any Army operators manual at the present time. So, the obvious conclusion is **don't** use this method to cool an engine for a restart.

But remember, while this procedure for cooling an engine is taboo when the engine is to be restarted immediately, it is authorized—and is to be used—to provide cooling airflow when an engine overtemperature condition such as a hot start occurs.

Another point that needs to be made concerns the position of the bleed band actuator of T-53 series engines during cleaning. This actuator must be closed with 60 psi of air pressure to insure that cleaning fluid reaches the hot end components. In addition, the bleed band actuator should be covered whenever the engine is cleaned externally. Failure to do this will allow cleaning fluid, dirt, and other matter to enter the actuator through the opening on top of the housing around the piston shaft. Entrance of such foreign matter into the actuator is guaranteed to induce stall in a T-53 engine.

The best advice—whether cooling an engine for restart or cleaning it—remains the same: Follow approved and authorized procedures stipulated in the appropriate TMs.

Point of contact at the Safety Center is Jack Carter, AUTOVON 558-3913/3901. ■

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**August and September . . .**
critical months ahead in flight safety

# 20/20 hindsight

## A backward look at August and September aircraft mishaps

This article addresses the highlights, causes, and lessons to be learned from mishaps that have occurred in August and September the past 5 years. Why single out these 2 months? At the end of the third quarter mark this fiscal year, we have already had as many Class A mishaps as we had in all of FY 80. **As of 22 July 1981, two more Class A mishaps have occurred since the beginning of the fourth quarter of FY 81.**

If this trend continues, there is a good possibility that 10 more Class A aircraft mishaps will occur by the end of September. Can this projected number be eliminated or reduced? To answer this question, we need to take a look at our track record for August and September the past 5 years to see where we've been, before we can try to positively influence where we appear to be going.

### Exposure

Traditionally, August has been a high exposure month in terms of total hours flown, the annual emphasis on unit summer training by the Active Army and Reserve components, and the seasonal influence of a summer weather flying environment. Average summer monthly flying hour exposure beginning 1 June each year and continuing through August usually runs slightly above the norm and then decreases about 21 percent in September along with a decrease in the intensity and duration of training activities. Accordingly, the period 1 August to 30 September not only bridges the end of another fiscal year but, more importantly, it signifies the transition from peak summer training activities to less active months in terms of mishap exposure during the fall season. The cycle continues through the winter months with changes in flying hours and mishap exposure tied to major winter training exercises until the summer events begin again.

### Mishap record

A look at our aircraft mishap record for the months of August and September the past 5 years shows that 76 Class A, B, and C mishaps have been recorded. Of these 76 mishaps, human error, including maintenance error, was cited 77 times as a cause-related factor. Materiel failure or malfunction was listed 11 times. The human errors identified in these mishaps were not limited to pilots; however, **pilots were cited for 67 of the 77 errors reported.**

### Causes

The errors identified in the August and September mishaps and their underlying causes are neither new nor unique. In addition to pilots, they involved instructor pilots, flight commanders, mission commanders, and support personnel such as mechanics and technical inspectors. The one thing most of the errors had in common, however, is that in almost every case they wouldn't have occurred had there been a little more attention paid to prior planning, details, and correct performance. Instead, **most of the errors were caused by people neglecting to perform their jobs by the book.** Statistically this factor was identified as a cause in 39 percent of the 76 mishaps.

### The message

Much has already been said this year about noncompliance with task performance standards and other written procedures in recurring safety publications and other media. If the current record is any indication of the general reaction to the problem, it would appear that the message has not been getting across. This could be interpreted as an indication of inadequate command emphasis on the issue or a persistent indifference on the part of some members of our aviator population. **As the aviator constitutes the key element in mishap causation or prevention, it is essential that he perform his flying duties the way he was trained to perform them and as prescribed by current training directives.** Otherwise, he may eventually find himself involved in a mishap similar to the ones that follow:

*"Copilot attempted a nonstandard maneuver (made abrupt right turn at low altitude in high density altitude conditions) that exceeded aircraft antitorque control limits."*

*"IP attempted to maintain VFR when encountering IMC."*

*"Flight commander attempted to lead a flight through mountainous terrain in IMC when he knew pilot in following aircraft was not capable of flight through marginal weather."*

*"IP tasked a rated student pilot to perform an autorotation with turn without first demonstrating the maneuver."*

*"IP initiated simulated forced landing at an altitude/airspeed outside the height/velocity envelope."*

*"Pilot delayed go-around from approach to unsuitable confined area until power required exceeded power available."*

*"Copilot placed governor in emergency position while throttle was full on without informing pilot."*

*"Pilot allowed nonrated crewmember to hover aircraft."*

*"Mechanic improperly installed fuel control."*

*"Pilot buzzed and struck vehicle during tactical exercise."*

*"Overhaul facility improperly reassembled transmission."*

The list could go on; however, it should not be necessary to belabor the point. The examples were randomly selected and each error can be attributed in most cases to poor judgment, a lack of appreciation for the consequences, and a disregard for performing the job safely and correctly.

Another dominant factor that has appeared with alarming regularity has been crew error related to improper control inputs/actions. This cause factor was present in one-third of the 76 mishaps. Summarily, the control inputs/actions were too much, too little, too soon, too late, or out of sequence, and most contradicted specific task standards prescribed for the maneuver in current training circulars. Examples include late pitch application during the termination of autorotations, using cyclic ahead of collective during decelerations at low altitude, and making abrupt control movements not required by the flight conditions.

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **4** |
| | June | 2 | 4 | June | **7** | **3** |
| 4th Qtr | July | 2 | 1 | 1-22 July | **2** | **0** |
| | August | 6 | 1 | 23-29 July | **0** | **0** |
| | September | 3 | 1 | | | |
| | Total for Year | 37 | 26 | Total to Date | **39** | **22** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

## The bottom line

So where has this review of selected mishaps led to? Generally speaking, it has not identified any new mishap cause factors. The two major cause areas discussed, however, i.e., noncompliance with task performance standards and written directives, and improper control inputs/actions, together have appeared in a very large percentage of the aircraft mishaps that have occurred during this time of year. Although there are no magical panaceas available to address these problems, proper supervision and training continue to offer the best potential avenues for reducing mishaps.

The bottom line then is that closer supervision and enforcement of regulations, SOPs, and other directives are mandatory to insure proper performance, and improved training is necessary to remedy weaknesses in control techniques.

The aviator's role in this regard is already adequately expressed in paragraph 4-4 of AR 95-5 which states: "The Army aviator is the basic element in the command line of aircraft accident prevention. His duties in the prevention program are to -

"a. Build and maintain **proficiency** in the aircraft he is assigned to fly.

"b. Maintain sound physical and mental **fitness.**

"c. Maintain strict air **discipline** with respect to regulations, rules, and ethics."

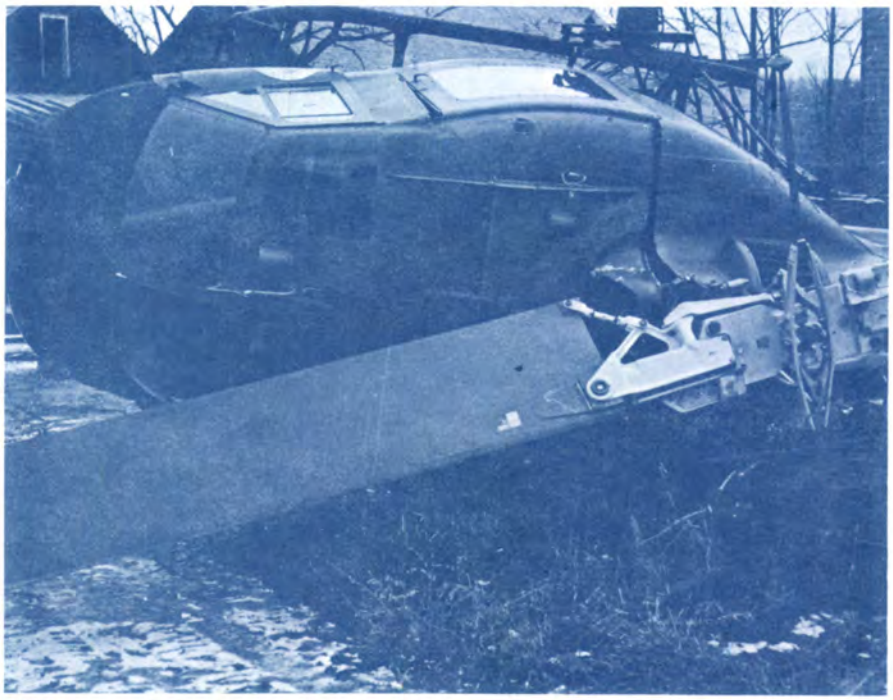
**Total dedication to these basic principles will do more than any other known remedy to prevent aircraft mishaps.** ■

# Followups

## Additional information on mishap briefs previously published

**uh1** **Class A mishap** in 18 Feb 81 issue (8120) ☐ About 2 minute after takeoff, tail rotor blade separated from aircraft and hit main rotor blade. The resulting main rotor imbalance and center of gravity shift caused in-flight breakup. Because significant components could not be recovered, the cause of the onset of the mishap is undetermined.

**Class A mishap** in 25 Feb 81 issue (8122) ☐ As aircraft was flying about 2,000 feet agl, the outer two-thirds of the red tail rotor blade separated from tail rotor assembly, causing out-of-balance condition which resulted in separation of 90-degree gearbox from aircraft. Pilot initiated autorotative descent. IP took controls and completed entry into autorotation but was unable to maintain control because aircraft was rolling left and yawing right. Aircraft hit ground hard and rolled on left side. Fatigue failure of tail rotor blade was caused by corrosion which originated on inner side of blade skin. Twelve separate fatigue points of origin were identified.



8122

8128

**Class A mishap** in 4 Mar 81 issue (8123) ☐ During takeoff to hover, copilot applied excessive right lateral cyclic, resulting in aircraft rolling about the longitudinal axis of right skid/ski assembly. Copilot and pilot did not detect rolling motion of aircraft in time to prevent rollover to right side.

**Class A mishap** in 4 Mar 81 issue (8124) ☐ Approximately 30 minutes after takeoff, crew made a position report and said they were looking for a place to cross a ridge. About a minute later, transmission was received indicating crew was having problems and trying to set aircraft down. Search efforts failed to locate aircraft, which is still missing.

**ah1** **Class A mishap** in 4 Feb 81 issue (8119) ☐ Reduced visibility in heavy snowshowers prompted IP to make downwind approach to snow-covered field. IP lost all outside visual reference and then lost control of aircraft. Aircraft crashed and came to rest almost inverted. IP had to make downwind landing because the flight he was a part of continued flying in rapidly deteriorating weather until all other options had been ruled out.

8119

**ch47** **Class B mishap** in 11 Mar 81 issue (8126) ☐ No. 1 engine transmission input pinnion support bearing failed during flight at 1,000 feet agl, resulting in overtemperature condition, fire, seizure of transmission, and ultimate loss of engine power because of foreign object damage. Pilot entered autorotation, and aircraft touched down in level attitude. No. 1 engine, engine transmission, and combining transmission sustained fire damage. Crew misinterpreted No. 1 engine transmission failure and fire as a No. 2 engine fire, and copilot shut down unaffected engine. According to TM 55-1520-227-10-2, instead of entering autorotation for this particular emergency, pilot should have made power-on approach and landing without delay.

**oh58** **Class A mishap** in 1 Apr 81 issue (8128) ☐ IP reduced throttle to idle stop to simulate engine failure while hovering over terrain unsuitable for a running touchdown. Ground was soft and boggy, covered with thick, bunchy grass. At touchdown, toes of skids dug into soil, and aircraft came to rest on its left side. ■

# Shortfax

## Five receive Broken Wing Award

The Broken Wing Award is given to aircraft crewmembers who demonstrate a high degree of professional aviation skill while actually recovering an aircraft from an in-flight failure or malfunction necessitating an emergency landing. Requirements for the award are spelled out in AR 672-74, dated 15 May 1979.

Five aviators received the Broken Wing Award from April through June 1981.

**Broken Wing Award recipients**

**CW3 Robert A. Estes**
Company E, 24th Combat Aviation Battalion, Hunter AAF

**CW3 Clarence H. Hendricks**
54th Medical Detachment, Fort Lewis

**CW2 Bennie P. Priddy**
D Troop, 4th Squadron, 7th Cavalry, APO San Francisco 96251

**CW3 John C. Robb**
D Troop, 4th Squadron, 7th Cavalry, APO San Francisco 96251

**CW2 Lawrence E. Robinson**
D Troop, 1st Squadron, 9th Cavalry, 1st Cavalry Division, Fort Hood ■

## ALSE bits and pieces

• Some Army units are submitting reports of Item Discrepancy (ROID) to the Defense Personnel Support Center (DPSC), disclosing that helmets, NSN 8415-00-144-4981 and -4985, have been shipped to Defense Logistics Agency (DLA) depots for maintenance, repair, cleaning, and painting. In almost all instances of this type, DPSC directed the depot to dispose of the helmets in accordance with current procedures. DLA depots do not have the mission of repairing and servicing SPH-4 helmets. TM 10-8415-206-13 contains instructions for inspection, maintenance, troubleshooting, painting, and marking at various maintenance levels. Army units should perform required maintenance and repair at levels authorized. If uneconomically reparable, the helmets should be disposed of at organizational level and the usable parts "cannibalized" for legally stocking ALSE shops. Do not submit ROIDs for this purpose or send helmets to DLA depots for maintenance and/or repair. Once we get the ALSE MOS career field, these types of problems will subside.

• The following parts can now be requisitioned for the MK-896A headset in accordance with TM 11-5965-279-13&P, 15 February 1981:

| Source of Supply (RIC) | Nomenclature | NSN |
|---|---|---|
| S9E | Kit, Cord Assembly | 5965-00-177-2897 |
| N32 | Swivel Assembly | 8475-00-117-4538 |
| S9I | Screw, Machine | 5305-00-616-8543 |
| S9I | Washer, Lock | 5310-00-579-5554 |
| S9E | Plate, Jack Holder | 5340-01-007-8366 |
| B16 | Microphone, Dynamic CC7A/AIC | 5965-01-094-6574 |
| S9E | Earphone H-143A/AIC | 5965-01-094-6602 |
| B16 | Boom Assembly | 5965-01-094-6573 |
| B16 | Cable Assembly, Microphone | 5965-01-094-6572 |
| S9I | Grommet, Earcup | 5325-01-096-1189 |
| S9I | Grommet, Helmet | 5325-01-096-1190 |

For more information on headsets, contact Mr. Bluford, CECOM, AUTOVON 992-3812, or Ms. Lyles, Army Support Activity, AUTOVON 444-2537. ■

# Selected mishap briefs

**uh1** **Class E mishaps** ☐ (H series) Aircraft was flying about 1,000 feet agl when pilot heard loud noise and aircraft vibrated. Postlanding inspection revealed one main rotor blade had skin separation on outboard edge at spar. ☐ (H series) Engine lost power during flight. Caused by failure of fuel control. ☐ (H series) Pilot felt sharp jolt in cyclic during flight. Caused by failure of right lateral servo. ☐ (M series) Crew smelled fuel odor during climbout. Caused by ruptured fuel line. ☐ (H series) Master caution and chip detector caution lights came on during touchdown. Caused by failure of 90-degree gearbox input shaft seal.

**ah1** **Class C mishaps** ☐ (G series) Pilot misjudged rate of descent on pinnacle approach, and aircraft began to settle with power. Pilot overtorqued engine to 58 psi as he flew out of the area. ☐ (S series) Access cover to fifth drive shaft was found damaged when aircraft landed. Pilot and crew chief did not insure cover was fastened before takeoff. ☐ (S series) Power loss occurred during takeoff from confined area. Pilot maintained collective until clearing an obstacle and adjusted aircraft attitude to autorotate to small, near-level area. Full application of throttle failed to regain rpm and needles remained split during touchdown. Tail boom hit large rock, causing damage to tail boom, access panel, and transponder antenna. Loss of power was probably caused by fuel control failure.

**Class E mishaps** ☐ (S series) When generator switch was turned off during shutdown, all electrical power was lost. Caused by overheated battery. ☐ (S series) D.c. generator and master caution lights came on during hover/taxi. Caused by failure of voltage regulator.

**ch47** **Class E mishaps** ☐ (A series) Crew chiefs noticed high frequency vibration near aft transmission area during flight. About 2 minutes later, crew smelled hydraulic fluid and heard loud noise. No. 1 SAS caution light and No. 1 flight boost caution light came on. Hydraulic fluid sprayed throughout aircraft. Caused by failure of No. 1 hydraulic boost pump. ☐ (C series) Static beep failure on No. 2 engine occurred during climbout. Caused by failure of $N_2$ control box. ☐ (C series) No. 1 engine did not respond when engine condition lever was positioned to ground for No. 2 engine HIT check. Caused by malfunction of $N_1$ actuator.

**oh6** **Class E mishaps** ☐ Pilot heard thumping sound during flight and landed. Fire extinguisher bracket was open and extinguisher was missing. Red paint was found on right skid. Pilot's right pant leg may have unhooked clamp on fire extinguisher. ☐ Binding was felt in cyclic control during takeoff to hover. Caused by excessively worn retaining bearing plates on rotor head.

**oh58** **Class E mishaps** ☐ (A series) Pilot in transition training was repositioning aircraft on runway at 3-foot skid height with slight forward movement. IP announced "hovering autorotation" and reduced throttle to engine idle. Pilot overreacted, allowed aircraft to drift laterally to left, and applied forward cyclic just before ground contact. As aircraft touched down on toes of skids, pilot lowered collective full down, causing aircraft to rock back on heels of skids. Loud banging noise was heard and IP suspected spike knock. Maintenance inspection revealed no damage. ☐ (A series) Aircraft yawed to left, and low rotor rpm and engine-out lights came on. Caused by failure of engine-driven fuel pump. ☐ (A series) Passenger in left seat got out of aircraft as engine was idling just before shutdown. Aircraft was sitting on a rise and shift in c.g. caused aircraft to rock back on skids. Tail skid hit the ground several times.

**c12** **Class E mishaps** ☐ (C series) Six minutes after takeoff, pilot noticed an indication of 70 on both d.c. loadmeters. Smoke was seen coming from battery compartment. Battery switch was turned off and loadmeters returned to normal range. Postflight inspection revealed battery fluid had overflowed into battery compartment. ☐ (D series) No. 1 engine oil pressure fluctuated from 130 psi to maximum. Caused by failure of oil pressure snubber assembly.

**ov1** **Class C mishap** ☐ (D series) Pilot applied excessive braking action to right main landing gear during rollout, causing right main tire to blow out. Wheel and tire were replaced.

**u21** **Class C mishap** ☐ (A series) Left engine disintegrated during flight, leaving large holes in upper nacelle cowling. Single-engine landing was made.

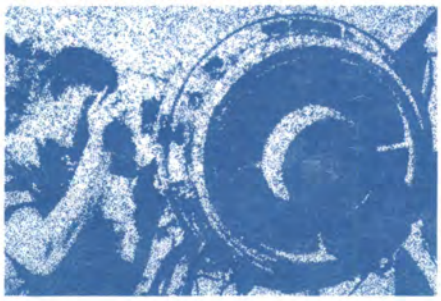
**Class E mishap** ☐ (RU-21H) As aircraft was landed, pilot was told to taxi to parking ramp and park between hangar and parked aircraft on ramp. While pilot was maneuvering between hangar and parked aircraft, left brake grabbed and left wing pod tip hit corner of hangar.

*(continued on next page)*

# Mishap briefs

## Maintenance

**uh1** **Class E mishaps** □ (V series) Master caution and hydraulic lights came on during landing. Cyclic became stiff, and running landing was made. Hydraulic line failed at a point showing old chafing marks. Line appears to have been repositioned some time before this mishap and was not chafing when failure occurred. □ (H series) $N_2$ rpm fluctuated 300 to 400 rpm when power changes were made. Running landing was made. Caused by out-of-adjustment linear actuator. □ (M series) Vertical vibration occurred when collective pitch was increased for takeoff. Vibration stopped when torque exceeded 20 psi. When collective was reduced for approach to landing, vertical vibration began when torque went below 20 psi. Postlanding inspection revealed white scissors lever was binding. Thrust washer had been installed on new scissors assembly which already had a new thrust bearing installed. The additional thrust bearing caused a clamping action on scissors pivot, causing it to bind. □ (H series) During hover before takeoff, pilot noticed there was not enough left pedal to maintain directional control. Mechanic had inadvertently changed adjustment on red tail rotor pitch change link during tail rotor purge. □ (H series) Transmission oil pressure fluctuated during landing. Large amount of oil was found on pad after shutdown. Caused by chafing of oil cooler to transmission return line.



**ch47** **Class E mishap** □ (B series) No. 1 engine chip detector light flickered three times within three seconds and then remained off. Inspection revealed bare wire near chip detector and intermittent grounding.

**oh58** **Class E mishap** □ (A series) Master caution and hydraulic lights came on, and loss of hydraulics occurred during runup. Failure to correctly torque hydraulic line fitting allowed fitting to back off.

**c12** **Class E mishap** □ (A series) No. 2 engine ITT started rising, oil pressure began fluctuating, torque started to drop, and flames were coming from exhaust stacks during climbout. Single-engine landing was made. Incorrectly installed engine compressor assembly caused bearing failure.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# The invisible wire

The pilot was feeling a sense of pride mixed with just a hint of apprehension as he guided the OH-58A on short final approach for landing into the football stadium. Pride was the natural product of the confidence he had in his flying ability coupled with the opportunity to demonstrate this ability to the crowd gathered in the stands. His apprehension was the direct result of the utility poles he had discovered along the sides of the field. His tactical training and prior experience around built-up areas had taught him to suspect wires any time poles were sighted, but then he had taken every precaution required by "the book," plus he had cautioned the other people aboard the aircraft to watch for wires. And he was holding a slower than normal airspeed on short final to make a go-around easier should a wire be detected.

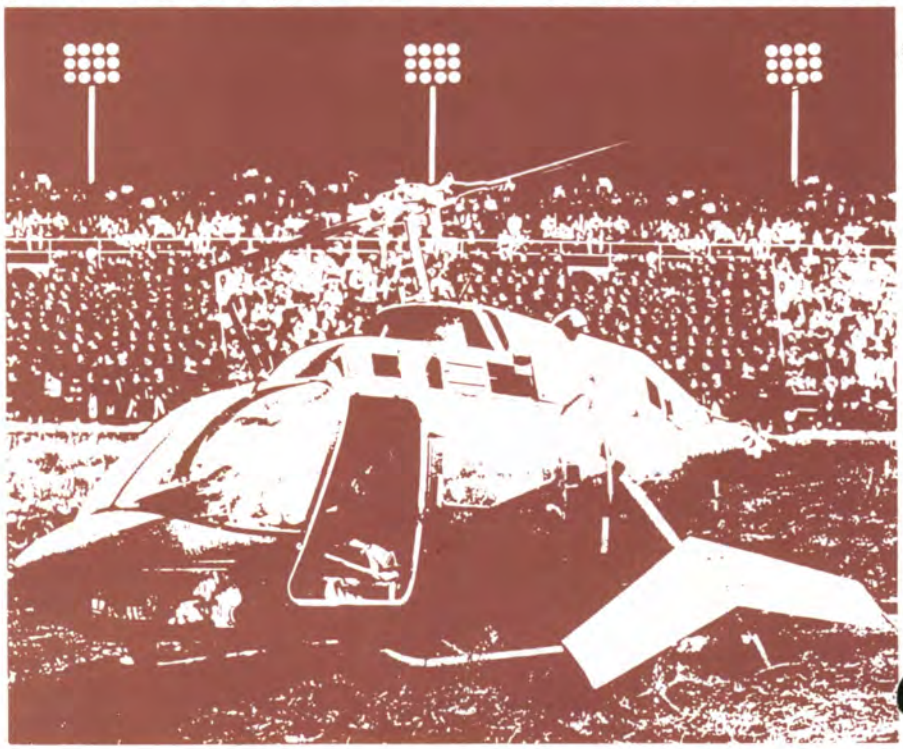
The winter mission in support of the district recruiting command had been a good one and this was the last stop on the third and final day of aircraft static displays at the various area schools. The local recruiting NCO, who was a passenger in the rear seat, had coordinated the times of the visits and proposed landing sites with the appropriate school officials. Both he and the crew chief, who was in the left front seat, had helped the pilot identify hazards during the aerial reconnaissance of the previous landing areas. The school students had been generally interested both in the presented information and the aircraft, and recruiting personnel seemed well pleased with the mission results to date.

Flying about 50 feet above the ground on final approach, the pilot had verified his touchdown point and was approaching loss of effective translational lift when his peripheral vision detected a wire cable as it passed just above the windscreen. The aircraft immediately shuddered and pitched slightly nose up. At this point all cyclic and collective control was lost and an explosive noise was heard from the rear as the aircraft entered a near-vertical descent. Reflex actions caused the pilot to pull cushioning pitch as the aircraft neared the ground in a level attitude, but the pilot could detect no response from the collective application.

During the jarring impact with the ground, the pilot felt the right side of his seat collapse and saw the left cockpit door leave the aircraft. The crew chief didn't seem to be hurt but the rear seat passenger's knees appeared to collapse when he tried to stand up as he stepped from the aircraft. The pilot yelled at him to stay down because the rotor blades were lower than normal due to the collapsed skids. The pilot couldn't tip the rotor system away from the passenger because of the lack of cyclic control. By the time he had finished shutting down the aircraft, the local rescue unit and fire truck were arriving on the scene.

After a doctor had examined everyone on board the aircraft, the pilot and crew chief were released and returned to the crash site. The passenger was admitted to the hospital with a severely strained back.

The cable the aircraft hit severed the No. 2 FM antenna from over the cockpit before destroying the pitch link connector



assemblies above the swashplate. This explained the loss of both cyclic and collective control. The explosive noise apparently was the main rotor blade severing the tail boom when the main transmission isolation mount and drag pin assembly were destroyed, allowing the transmission and rotor system to tilt aft. Both crew seatpans were deformed and major structural damage was visible throughout the airframe.

As he stood examining the broken ends of the multistrand galvanized steel wire cable which had destroyed the aircraft, the pilot mentally reviewed the sequence of events in an attempt to understand why he had failed to see the cable. Although the mid-day high gray overcast condition had reduced the normal ambient light, the visibility had been practically unlimited in all quadrants as he approached the town at cruise altitude. The passenger had pointed out the stadium location and the pilot had started his reconnaissance as they passed over it. Passing the field, he had started his letdown as he told the crew chief and passenger to be especially alert for wires and obstacles as they were entering a high-hazard environment in the stadium area.

Passing at 500 feet along the west side of the stadium, the pilot had noticed the banks of floodlights on utility poles along both the east and west sides of the playing field which made it appear narrower than the other stadiums they had visited which had no lighting. He had also located two sets of powerlines off the north end of the field which he would have to stay above when he started his final approach to the south into the stadium.

Turning left around the south end of the field, the pilot had dropped to 300 feet agl to prepare for his downwind leg along the east (opposite) side of the stadium away from the school buildings and playgrounds. This had given him a good view of the long axis of the stadium and, although there were numerous wires between the utility poles along either side of the stadium, no wires were visible crossing the stadium. The reconnaissance had been continued on an extended downwind and base leg. Turning final, the pilot had slowed his airspeed more than normal to give additional time to look over the area. He again reminded the crew chief and passenger to "keep their heads up."

Airspeed was just above effective translational lift and the helicopter had just cleared the goalpost at the approach end at about 50 feet agl when the pilot saw the cable pass above the aircraft windscreen. From where had it come? How could three sets of eyes on three separate passes over and along the field and during a slower than final approach into a recognized high-hazard environment fail to detect a multistrand cable directly across the flight path?

Environmental factors probably contributed substantially to the pilot's inability to see the cable. Reduced ambient light due to cloud conditions, coupled with the gray color of the galvanized cable, caused it to blend with the bare hardwood trees, dead grass, and paint-faded buildings in the background as the pilot conducted his aerial reconnaissance. The single course of action with the highest probability of success in preventing similar mishaps would be a physical ground reconnaissance of helicopter landing areas located in or adjacent to hazardous environments, e.g., in or near built-up areas.

School and city officials were not aware of the cable and were unable to provide a logical explanation for its presence as it appeared to serve no useful purpose at that location and height. ■

# Shortfax

## Something to think about

As adults, we would be hard pressed to come up with a valid argument to disprove the statement that nothing is faster than thought. Not so with a 3-year-old who looked into his mother's eyes while she changed his clothing and innocently exclaimed, "I'm sorry, Mommy. I did it before I thought."

Similarly, when we fail to sufficiently consider a given situation before going into action, we too can produce some unexpected and undesirable results. For example, a test pilot noted vibration during flight in an OH-58. Following the flight, the crew chief removed the tail cone to perform troubleshooting and to insure that tail rotor rigging was correct. The tail cone was left dangling by the wiring to the tail light.

The pilot momentarily left the aircraft. On his return, he inspected the work before climbing into the cockpit. The crew chief observed the pilot's actions and thought he was running the pedals through—until he heard the pilot call out, "Clear!" Knowing that the pilot had inspected the work, the crew chief assumed that he was aware of the dangling tail cone and knew what he was doing. So he made no attempt to question the pilot's actions.

The pilot started the engine, and as he brought the aircraft to operating rpm, the tail rotor blades struck the dangling cone. On hearing the noise, a maintenance supervisor rushed to the aircraft, reached around the vertical fin, and pulled the tail cone out of the path of the rotating blades. Damage to the tail rotor blades and cone assembly was assessed at about $1,900.

In retrospect, personnel failed to properly plan and coordinate the work to be done. Individuals were not aware of their specific responsibilities, and the operation was conducted in a hurried manner. The result was damage to equipment and exposure of personnel to unnecessary risk. Although his intentions were noble, the supervisor who pulled the tail cone out of the path of the tail rotor blades could have been seriously injured.

The need to have qualified personnel and to insure adequate training of these personnel is essential for effective maintenance and safety. Toward this end, it is recommended that aviation units review the maintenance practices and procedures being used and determine if any changes are in order.

Ironically, inspection of the damaged OH-58 revealed the tail rotor gearbox mounting bolts had been improperly torqued and were loose—the most probable cause of the vibration that was encountered in flight. ■

## Lost anything lately?

If you can't find your favorite screwdriver, hammer, pliers, or some other tool, or if you're missing some personal object such as a pen or watch, go take a good look in and about the aircraft you worked on. As a matter of fact, don't wait until you miss some item before checking your aircraft. Make a thorough inspection after completing every maintenance job.

A case in point concerns a hole noted in the tail rotor drive shaft cover of a UH-1 during a recent postflight inspection. On opening the tunnel cover, a broken-up pocket knife was found lying in the tunnel area. In this instance, internal damage was slight, consisting of small nicks on the drive shaft and on the bearing clamp sets. In other instances, however, severe damage to aircraft and serious injuries to personnel have resulted from foreign objects left aboard aircraft.

In a second case, sheet metal workers failed to clean metal shavings and rivet heads from the tunnel area of a CH-47 after performing maintenance work in that area. During final inspection, the discrepancy was noted and mechanics were assigned to clean the tunnel. A daily inspection was then completed, and the aircraft was preflighted for a scheduled test flight. On completion of the flight, mechanics performing a postflight inspection found a 6-inch chisel in the tunnel area. A further check revealed damage to the No.1 and No. 2 drive shafts and to the No. 1 drive shaft flex coupling.

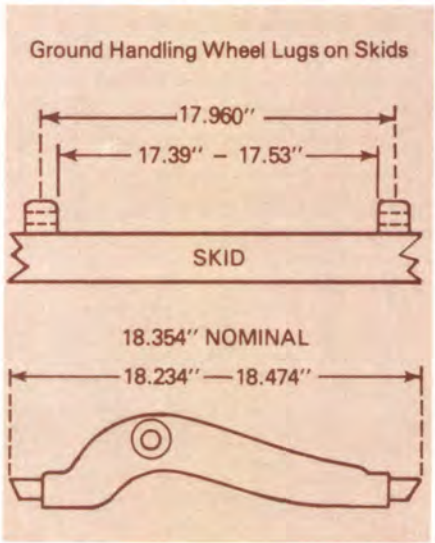
In this instance, the maintenance personnel assigned to clean the tunnel area became totally keyed to one particular deficiency that they overlooked the other—FOD in the form of a chisel.

Thorough preflight inspections coupled with good housekeeping practices and realistic tool inventories can put a halt to the potential hazards posed by FOD. Do your part. After all, it's your aircraft and your life. ■

# More on UH-1 ground handling wheel assembly

We ran an article on UH-1 ground handling wheels in the 17 June 1981 issue. This article was originally published in the USATSARCOM Information Bulletin. AVRADCOM tells us the following measurements should be used for ground handling wheels.

Point of contact at the Safety Center is SFC Toler, AUTOVON 558-4202/4198.



# Selected mishap briefs

**uh1** **Class E mishaps** □ (H series) Aircraft was participating in airshow. Two safety observers were in aircraft but only one had intercom capability. A safety observer was also located at dropoff site to radio information which might be needed during landing. Crew was told to fly by the crowd, keeping pathfinders, suspended from ropes, about 100 feet off the ground. During flyby, aircraft descended and, before pilot could complete recovery, pathfinders touched the ground. Crew continued to touchdown point, about one-fourth mile, and landed. Pathfinders received first aid treatment. Safety observers said they had been looking at the crowd and when they checked altitude pathfinders were close to the ground. □ (H series) During engine start procedure, blade was not visually cleared and engine was engaged with main rotor tied down. Torque did not exceed 2 to 5 pounds and egt did not exceed 550° C. □ (H series) Squeal was heard from transmission area. Hydraulic light came on and hydraulic controls became stiff. Caused by cracked hydraulic line to hydraulic filter. □ (H series) During hot refueling operation, crew chief noticed excessive oil draining from vicinity of secondary hellhole. Investigation revealed transmission oil cooler return line was leaking at T fitting between thermal valve and drain valves.

**ah1** **Class C mishaps** □ (S series) Main rotor blade hit tree limb during NOE flight. □ (S series) Postflight inspection revealed tear in skin at top of blade. It is not known when blade strike occurred.

**Class E mishaps** □ (S series) Transmission oil hot light came on during landing. Caused by failure of thermostatic switch. □ (S series) Engine oil pressure fluctuated, oil bypass light came on, and oil temperature increased during hover. On shutdown, crew saw fire coming from exhaust. Caused by failure of aft No. 1 bearing seal or forward No. 2 bearing seal.

**ch47** **Class C mishap** □ (A series) Copilot, flying from right seat, had dropped off sling load in confined area. Aircraft drifted to right, and main rotor blades hit tree.

**Class E mishaps** □ (C series) No. 2 engine condition lever was positioned to ground for single-engine maneuver. After landing, IP moved lever toward flight after applying minimum beep. Rotor rpm was too high for beep and condition lever position. Advancement to flight was stopped when rotor rpm reached 240 and 30 percent torque. Caused by failure of No. 2 engine $N_2$ actuator. □ (B series) No. 2 engine oil low light came on. Flight control pressurization line was leaking engine oil. □ (B series) No. 1 engine tachometer dropped to zero. Caused by failure of tachometer generator. □ (A series) Rear of aircraft filled with smoke and hydraulic fluid during takeoff. Utility cooling fan hard line had cracked and fluid sprayed through cooler into aircraft.

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **4** |
| | June | 2 | 4 | June | **7** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | 1-5 August | **0** | **0** |
| | September | 3 | 1 | | | |
| | Total for Year | 37 | 26 | Total to Date | **38** | **22** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

**oh6** **Class B mishap** ☐ Pilot noticed decrease in engine noise and power about 25 feet agl while landing. Pilot continued forward, flared, and used remaining collective to try to cushion landing. Skids collapsed and rotor blades severed tail boom. 8152

**Class C mishap** ☐ As aircraft was shutting down, another aircraft landed nearby. Rotorwash from landing aircraft caused rotor blade to flex down and hit tail boom.

**oh58** **Class C mishap** ☐ (C series) IP had completed hover power check at about 4 feet. When controls were given to student, IP felt aircraft dropping and noticed $N_2$ at 83 percent. Aircraft landed hard, damaging tail fin, skids, cross tubes, and underside of fuselage. Student may have inadvertently hit beep switch while stowing a map.

**Class E mishaps** ☐ (A series) As aircraft was making slow pass over range targets, passenger in left seat threw smoke grenade from aircraft to mark target. Grenade was thrown up, hitting main rotor blades. Last-minute pilot change had been made and new pilot was not briefed on requirement not to throw smoke grenades from aircraft. ☐ (A series) Engine quit after aircraft was landed. Fuel filter was contaminated with dirt. ☐ (A series) Master caution and generator lights came on during takeoff. Caused by broken wire from voltage regulator to start generator.

**c7** **Class E mishaps** ☐ When gear was extended, red light remained on in gear handle. Gear was visually checked down and locked, and aircraft was landed. Caused by corroded J-box cannon plug. ☐ No. 2 generator light came on during takeoff and would not reset. Arcing occurred near voltage regulator. Rain water had leaked through overhead flood light in cockpit and dripped on voltage regulators, causing arcing.

# Maintenance

**uh1** **Class E mishaps** ☐ (H series) During engine HIT check, egt gauge indicated 480° C., fluctuated to 350°, and, after 2 minutes, went to 0°. Caused by loose egt gauge sensor wires. ☐ (H series) Postflight inspection revealed fuel on fuel control. Caused by low torque on cap on fuel control O-ring.

**ch47** **Class E mishap** ☐ (C series) Crew chief identified oil leak from No. 2 engine cowling area during start. Caused by loose jam nut to elbow fitting on No. 2 hydraulic supply line to No. 2 engine starter.

*(continued on next page)*

# Mishap briefs

**oh58** **Class E mishaps** □ (A series) Fuel boost and master caution lights came on during hover. Aircraft was landed and engine quit 15 seconds later. Caused by incorrectly installed hose clamp, allowing hose to come off upper valve breakaway assembly in side fuel cell. □ (A series) Transmission oil pressure light came on during hovering autorotation. Caused by loose wire on transmission oil pressure switch.

**ov1** **Class E mishap** □ (RV-1D) When pilot reduced power during level-off, aircraft yawed to right. Torque decreased to 18 percent and egt increased to 720° C. Single-engine landing was made. Fuel control was out of rig.

## Messages received

• Safety-of-flight technical message on one-time inspection of UH-60A gearbox assembly (UH-60A-81-18, 231600Z Jul 81). Summary: An aircraft participating in a recent exercise was at a 15-foot hover when the crew heard a loud thump and noticed that rotor speed had decayed considerably. Disassembly of the gearbox assembly, main module (MGB), revealed a spiral crack in the constant section of the outer shaft between the bevel gear flange and the lower bearing support. The total time on the gearbox assembly was 296 hours. The contractor will supply seven 1-man teams to inspect the MGB on all fielded Black Hawk aircraft and spare MGBs with operating time. Contact: Earl Parsons, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight maintenance notice on internal T53-L-13B/BA engine wash procedures (UH-1-81-09, AH-1-81-19, 231930Z Jul 81). Engines of aircraft operating in dusty and sandy conditions should be internally washed every 25 hours. For other operating environments, engines should be washed at each phase maintenance period. Use washing procedures in applicable maintenance manuals.

• Safety-of-use message concerning inspection and replacement of housing shaft, rescue hoist assembly (GEN-81-07, 221550Z Jul 81). Some housing shafts will not afford sufficient height adjustment for adequate retention in utility aircraft. Aircraft in which hoists are installed will be carried as partial mission capable in accordance with AR 95-33 until safety-of-use action has been accomplished.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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## They're not just numbers

# $25,000,000

## 22 aircrewmembers dead

## 39 class A aircraft mishaps

# They're not just numbers

When people talk aviation safety, they almost always include numbers in their discussion. Mishap rates, numbers of destroyed aircraft, and percentages of crew error are some of the more popular figures used in aviation safety discussions and articles. While the use of these numbers is essential in conducting trend analyses and various statistical studies, their full meaning often seems to get lost in the process.

A good example of numbers that really mean something are this year's number of fatalities and dollar losses as a result of Class A aircraft mishaps. As of 12 August, 22 aircrewmembers have died in 39 Class A aircraft mishaps. These are not just numbers out of the Safety Center computer; they are dead people—dead irreplaceable crewmembers. Their loss affected not only the manning level of their units, the overall readiness of the Army, and the number of replacement aircrewmembers required from the training command next year, but also the morale of their unit and the lives of their families. They were 22 valuable soldiers. And the truly sad fact is that most of these people contributed to their own deaths through crew error . . . in most cases those flying the aircraft or supervising the flight violated established procedures.

While these 22 dead crewmembers are a tragic loss to the Army, the loss in combat readiness does not stop there. The 39 Class A aircraft mishaps this fiscal year have cost the Army close to $25 million . . . enough to put 16 new Cobras on the flight line.

As you walk out to your aircraft on your next flight, think about the fact that as an Army aviator, you are the basic element in the command line of aircraft mishap prevention. Your total dedication to strict air discipline with respect to regulations and rules will do more than any other known remedy to prevent Army aircraft mishaps. ■

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| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | 1-5 Aug | **0** | **0** |
| | September | 3 | 1 | 6-12 Aug | **1** | **0** |
| | Total for Year | 37 | 26 | Total to Date | **39** | **22** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

# Loose UH-1 pitch horn assemblies found

When one unit recently pulled a phase inspection of a UH-1H, the pitch horn assembly (NSN 1615-00-085-3887, P/N 204-011-120-5) that transfers movement from the main rotor pitch change link to the main rotor grip assembly (NSN 1615-00-057-1827, P/N 204-011-121-5) was found to be loose and working at the main rotor grip. The safeties were cut and the bolts retorqued to 190 inch pounds, and the bolts did not move. Three of the nine aircraft inspected had the same problem.

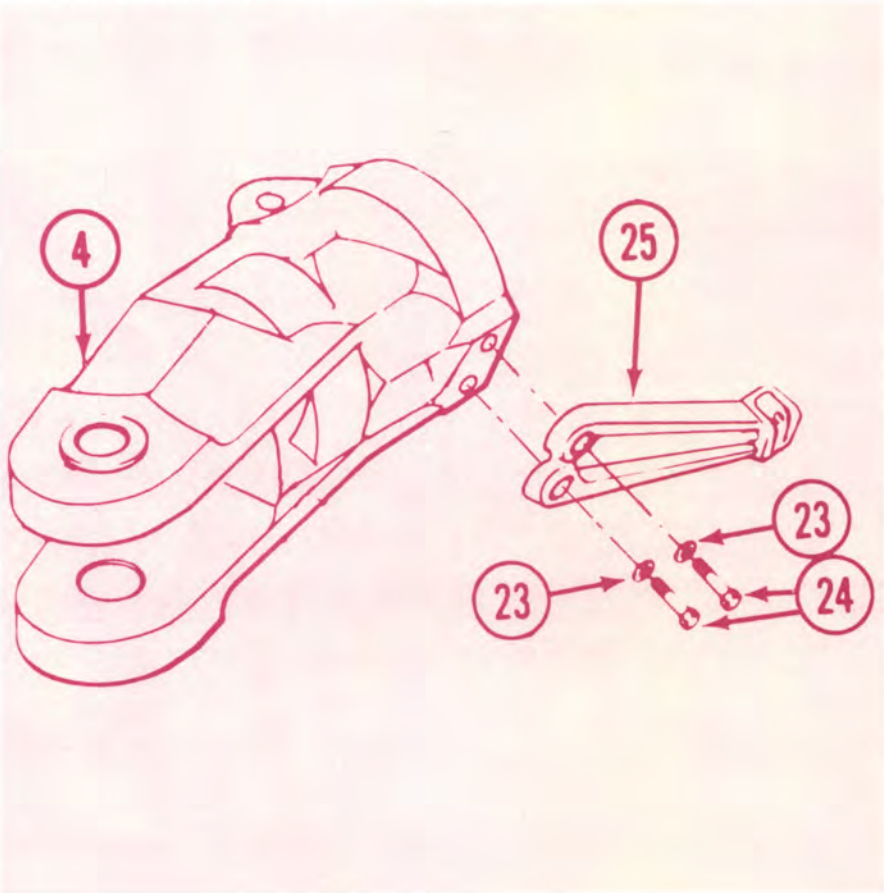
The working pitch horn assembly can be detected by a grey oily substance coming from the main rotor grip assembly and the pitch horn assembly. Inspection of the pitch horn assembly and main rotor grip assembly revealed that the pitch horn assembly was installed on the main rotor grip assembly after the primer was dry.

Instructions contained in TM 55-1520-210-23-1, page 5-34, paragraph 5-22h, are both clear and specific as to assembly of pitch horn assembly to main rotor grip assembly. "Coat the mating surface of pitch horn (25) and grip (4) with primer (C253). While primer is still wet, install pitch horn (25) on grip (4) and secure with bolts (24) and washer (23). Torque bolts 160 to 190 in. lb. and lockwire (C127)."

The wet primer when dried serves as a sealer and adhesive for the pitch horn to main rotor grip assembly. If the pitch horn assembly and main rotor grip assembly are not assembled while the primer is still wet, it could lead to premature failure of screw thread (NSN 5340-00-710-9416, P/N RD208SB80), causing a catastrophic mishap.

All supervisors and technical inspectors must impress mechanics with the need to perform all maintenance **by the book.**

**Thanks to SSG James Plummer, Fort Hood.** ■



# Mishap review

## Synopsis

The OH-58 pilot was practicing for a helicopter competition. He placed the heel of the right skid on the ground, held it there with right/aft cyclic, and pivoted around the heel to the right. He then tried to pivot to the left by applying left pedal, and the helicopter rolled over on its right side.

## History of flight

The mission was an authorized training mission in preparation for the flyoff competition for the World Helicopter Championship. A pilot and crew chief were aboard the OH-58A.

Arriving at the training area, the pilot made two normal approaches to the sod area and then practiced some precision hovering maneuvers that he would be attempting in the flyoff competition. After completing some slope operations, the pilot positioned the helicopter on the flat ground, picked up the left skid so that it just cleared the ground, and rocked the aircraft back onto the heel of the right skid. He then applied right pedal and allowed the aircraft to pivot to the right on the right heel. Completing the maneuver to the right, the pilot tried the same maneuver to the left. When he applied left pedal, the aircraft immediately rolled onto its right side. The crew chief sustained a broken hand.

## Crewmember experience

The 23-year-old pilot had almost 1,100 rotary wing flight hours, with more than 800 in the OH-58A.

## Commentary

The pilot was trying to develop a maneuver to be performed in the free style event of the flyoff competition. He had been practicing the maneuver to the right and had considered the dynamic rollover characteristics of the aircraft. He determined that right pedal inputs reduced tail rotor thrust and, therefore, would not cause a problem. However, he made a spur-of-the-moment decision to try to pivot the aircraft to the left. He applied left pedal which increased the thrust of the tail rotor and exceeded the rollover limits of the aircraft. The pilot said he would not have attempted the maneuver to the left if he had taken the time to consider the effect of the left pedal input.

The aircraft operators manual states that with one skid on the ground and thrust (lift) approximately equal to weight and a bank angle of 15 degrees, the aircraft will roll over on its side. It further states that the critical rollover angle is reduced by the roll rate, a right skid-down condition, crosswinds, lateral center of gravity offset, and left pedal inputs. The maneuver the pilot attempted met these conditions except for the crosswind. Additionally, the aircraft was in a right bank of about 4 degrees when left pedal was applied. The pilot had previously pivoted the aircraft to the right about 90 degrees and intended to perform a 360-degree pivot during the competition. If the pilot had attempted the maneuver to the right with a wind present, somewhere during the 360-degree pivot an adverse crosswind probably would have been encountered that may have exceeded the rollover limits of the aircraft.

Detailed written procedures for operation of aircraft participating in aerial flight competition and sufficient clarification of the events were not provided. The minutes of the International Helicopter Committee list the free style event as aerobatic competition and state that only experienced pilots should be allowed to enter (i.e., team members, not individuals). An article in AIRLINE PILOT, February 1979, stated that the free style aerobatic event was potentially the most dangerous and that the last competition was won by two West Germany pilots in a BO-105 helicopter, performing a split "S" maneuver from 500 feet. The description of the free style event for the competition stated that all proposed maneuvers **should not**, instead of **will not**, exceed the limitations of the aircraft. It also said that points will be scored for the degree of program difficulty and flying technique/skill. Some of the helicopters participating in the world competition are capable of aerobatic flight; however, the OH-58 is prohibited by the operators manual from aerobatic flight.

Six weeks before this mishap, an errata sheet was published requiring participants wishing to enter the free style event to submit their proposed exercise to the division safety officer before attempting the maneuver. However, because of a problem in the distribution system and failure to insure all participants received the information, the pilot involved in the mishap was not aware of the requirement.

The aviation section leader relied on the pilot's judgment and allowed him to develop his own program for the free style event. The section leader knew the criteria for the free style event and told the pilot not to do anything stupid but to see what maneuvers he could come up with. The section leader was not aware the pilot was practicing the right heel pivot maneuver even though he had been developing it for over a month. ■

# Selected mishap briefs

**uh1** **Class C mishaps** ☐ (H series) Aircraft landed hard during practice straight-in autorotation, damaging cross tubes, skids, cargo hook, and sling well. ☐ (H series) Skids dug into ground as aircraft was landed on unlevel and extremely soft terrain. Cross tubes and skid tubes were damaged.

**Class E mishaps** ☐ (H series) Aircraft was landed at field site because of deteriorating, unforecast weather conditions. After weather improved, aircraft could not be started because of low-charged battery. ☐ (H series) Postflight inspection revealed vertical fin door was open and damaged. Caused by failure to properly secure door before flight. ☐ (H series) As fog oil tank was being filled, crew chief noticed fog oil looked and smelled different than it should. Crew chief told pilot it smelled like JP4, and pilot stopped filling operation and shut down aircraft. Manufacturer of fog oil apparently stenciled fog oil on a barrel of some other substance suspected to be PD-680 solvent. ☐ (H series) As throttle was closed and main fuel shut off, pilot noticed white vapor rising from nose of aircraft. Fluid was coming out of top battery vent. Caused by failure of battery cells.

**uh60** **Class C mishap** ☐ Aircraft hit metal bar across landing zone during landing. Tail wheel and yoke assembly was torn from aircraft.

**ah1** **Class E mishaps** ☐ (S series) Boost pump light flickered, followed by loss of engine rpm. Caused by failure of forward boost pump. ☐ (G series) Master caution and 90-degree gearbox warning lights came on. Caused by failure of 90-degree gearbox. ☐ (S series) Master caution, alternator, and rectifier lights came on, and SCAS went off line. Loud grinding noise was heard. Caused by malfunction of generator alternator.

**ch47** **Class E mishaps** ☐ (C series) Pilot of lead aircraft in flight of three lost visual contact with ground, followed inadvertent IMC procedures, and recovered to airfield. Pilots of the other two aircraft landed in field and remained overnight. ☐ (B series) Rotor tachometer dropped to zero during hover/taxi. Caused by failure of tachometer generator. ☐ (B series) Accessory gearbox motor was leaking oil excessively during runup. Caused by failure of accessory gearbox pump.

**oh58** **Class E mishaps** ☐ (A series) Low rpm audio and light activated at 50 feet agl during approach. Rpm deteriorated below 100 percent $N_2$. Caused by loose connection between pneumatic line and double check valve. ☐ (A series) $N_2$ increased from 103 percent to 110 percent during flight. Pilot increased collective and reduced throttle to stabilize $N_2$ at 103 percent. During descending left turn, pilot was unable to stabilize $N_2$ enough to make safe landing. Pilot entered autorotation at 100 feet agl and landed. Metal tube was fractured aft of fitting at power turbine governor. ☐ (A series) Pilot was unable to reduce throttle during runup. Caused by corrosion in throttle cable. ☐ (A series) Pilot landed for passenger dropoff and reduced throttle to engine idle. $N_2$ was at 52 percent and $N_1$ at 57.5 percent. Engine would not respond to increases in throttle. Caused by failure of double check valve.

**th55** **Class C mishap** ☐ During approach at 60 to 70 feet agl, IP advanced throttle to hit overspeed device. Overspeed device activated, aircraft yawed left, and rpm started to decrease. IP started recovery at 30 to 40 feet as engine rpm went to zero. IP leveled aircraft and lowered collective. Aircraft hit hard, pitched forward, rolled left, and came to rest on left side. Engine has been submitted for teardown analysis.

**ov1** **Class E mishaps** ☐ (D series) Smoke entered cockpit through air conditioner vents. No. 2 propeller rpm rose to 1760. Technical observer saw fluid coming from No. 2 engine. Pilot shut down No. 2 engine and landed. Inspection revealed propeller magnetic plug had fallen out of propeller control. ☐ (C series) No. 1 hydraulic system pressure dropped to zero, then went to 2000 psi during approach for landing. No. 2 system then did the same thing. Brakes and power steering became inoperative during landing roll. Hydraulic line connected to main hydraulic filter leading to left inboard aileron actuator had hairline fracture at sleeve.

**c12** **Class E mishaps** ☐ (A series) Cabin overpressurized during climbout. Caused by failure of pressurization controller. ☐ (A series) Fuel was siphoning from left main fuel tank cap during climb. Postflight inspection revealed cap was seated but appeared to be slightly tilted in filler neck. Fuel nozzle had been incorrectly inserted through fuel port, bending antisiphon assembly.

**c7** **Class C mishap** ☐ (YC-7A) Generator on No. 2 engine failed, causing engine fire. Gear-down landing was made in field.

*(continued on back page)*

# Stacom

## Operators Manual and Checklist update

Listed below are the effective dates of the current aircraft operators manuals and checklists with the number and date of the latest change. Please check your weekly AG Publication Center Bulletin for subsequent changes.

| Fixed Wing TM 55-1510- | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 201-10/4 | RU-8D | | | | |
| | U-8D/G | 3 Apr 78 | | Jul 78 | |
| 201-10/5 | U-8F | 21 Mar 78 | 2, 14 Nov 80 | Jul 78 | 1, 14 Jan 81 |
| 204-10/3 | OV-1B | 9 Mar 79 | 2, 25 Mar 81 | Feb 79 | |
| 204-10/4 | OV-1C | 10 Apr 79 | 2, 14 Jan 80 | Apr 79 | |
| 208-10 | T-42A | 27 Feb 79 | | Feb 79 | |
| 209-10 | U-21A | 25 Mar 77 | 5, 6 Oct 80 | Feb 77 | 5, 12 Jun 80 |
| 209-10-1 | RU-21A/D | 28 Feb 77 | 5, 24 Jul 80 | Mar 77 | 2, 23 Aug 78 |
| 213-10 | OV-1D/RV-1D | 4 Aug 78 | 5, 9 Apr 81 | Nov 78 | 1, 24 Dec 80 |
| 214-10 | RU-21B/C | 15 Mar 77 | 6, 1 Aug 80 | Apr 77 | 4, 12 Jun 80 |
| 215-10 | U-21G | 11 Mar 77 | 4, 26 Jun 80 | Apr 77 | 3, 12 Jun 80 |
| 215-10-2 | RU-21H(GR-V) | 29 Dec 78 | 1, 28 Jun 80 | Dec 78 | 1, 12 Jun 80 |
| 216-10 | U-3A/B | 11 Dec 78 | 1, 3 Jul 80 | Dec 78 | |
| | C-12A | 8 Jan 80 | | Jan 80 | |
| | C-12C | 1 Dec 78 | | Jan 79 | |
| T01C-7A-1 | C-7A | 1 Oct 70 | 10, 11 Jan 80 | Oct 70 | 13, 11 Jan 80 |

| Rotary Wing TM 55-1520- | Aircraft | Basic Manual | Last Change | Basic Checklist | Last Change |
|---|---|---|---|---|---|
| 209-10 | CH-47A | 9 Jan 79 | 1, 17 Apr 79 | Dec 78 | 1, 2 Feb 79 |
| 210-10 | UH-1D/H | 18 May 79 | 10, 17 Apr 81 | Feb 79 | 3, 21 Mar 81 |
| 214-10 | OH-6A | 17 Dec 76 | 9, 6 Jun 80 | Dec 76 | 3, 20 Jun 80 |
| 217-10-1 | CH-54A | 8 Apr 77 | 2, 1 Oct 80 | Mar 77 | 1, 13 May 77 |
| 217-10-2 | CH-54B | 15 Apr 77 | 2, 10 Oct 79 | Mar 77 | 2, 22 Aug 79 |
| 219-10 | UH-1B | 16 Jan 69 | 17, 11 Feb 81 | Dec 68 | 8, 11 Apr 79 |
| 220-10 | UH-1C/M | 8 Sep 80 | 7, 26 Mar 81 | Sep 80 | |
| 221-10 | AH-1G | 18 Mar 80 | 1, 6 Nov 80 | Mar 80 | |
| 227-10-1 | CH-47B | 23 Aug 78 | 3, 14 Nov 80 | Dec 78 | 3, 30 Oct 80 |
| 227-10-2 | CH-47C | 23 Aug 78 | 6, 30 Mar 81 | Nov 79 | 2, 9 Apr 81 |
| 228-10 | OH-58A | 7 Apr 78 | 13, 30 Jun 81 | Jul 78 | 7, 26 May 81 |
| 233-10 | TH-55A | 30 Sep 76 | 2, 14 Jul 78 | Oct 76 | 4, 17 Oct 78 |
| 234-10 | AH-1S (MOD) | 17 Nov 76 | 12, 4 Apr 81 | Nov 76 | 3, 30 Nov 79 |
| 235-10 | OH-58C | 7 Apr 78 | 19, 6 Jul 81 | Jul 78 | 9, 29 May 81 |
| 236-10 | AH-1S (PROD) | 11 Jan 80 | 2, 20 May 80 | Jan 80 | |
| 237-10 | UH-60A | 21 May 79 | 8, 18 Nov 80 | Dec 78 | 8, 19 Nov 80 |

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Mishap briefs

## Maintenance

**uh1** **Class E mishaps** ☐ (H series) Shortly after takeoff, crew noticed small crack at bottom center of right windshield. Just before takeoff, crew chief had washed very hot windshield with cool water, probably causing tension fracture. ☐ (H series) As governor was increased from 6200 rpm during runup, engine rotor rpm surged to 7500 and governor emergency caution light came on. Caused by cracked governor emergency switch. Maintenance personnel had been performing maintenance on center console and may have cracked switch.

**uh60** **Class E mishap** ☐ Preflight inspection revealed oil on tail boom. Transmission filler cap O-ring was incorrectly installed, allowing oil to siphon overboard.

### Messages received

• Safety-of-flight technical message concerning one-time inspection for UH-60A reactivation of panel lights switch night vision goggle dimming mode (UH-60A-81-17, 311915Z Jul 81). Summary: The dimming mode of panel lights for the caution/advisory and master warning panels has been reactivated on Black Hawk aircraft, SN 79-23301 and subsequent, by production line change. TB 55-1520-237-20-15, a routine TB to reactivate the dimming system in the UH-60A, has been delayed in printing. A change to TM 55-1520-237-10 is being printed on schedule and will remove the current limitation to flight with night vision goggles. This message must be applied to the aircraft before flight with night vision goggles. A few fielded aircraft have had the dimming mode reactivated. This message will instruct maintenance personnel how to activate the NVG dimming mode for the caution/advisory and master warning panels. Contact: Charles Vanartsdalen, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of flight operational notice concerning information for aircrews flying UH-60A aircraft with an operational panel lights switch night vision goggle dimming mode (UH-60A-81-19, 311920Z Jul 81). This message supplements the information contained in TM 55-1520-237-10 and acquaints aircrews with certain features in UH-60A cockpit instrument lighting when using night vision goggles.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

### Urgent change

Urgent change 6, dated 15 May 1981, to TM 55-1520-228-CL for OH-58A helicopter has been published.

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# Mishap review

## Synopsis

The OH-58A was flying about 10 feet agl and 50 knots when the tail rotor blades hit the antenna mount of a jeep. The tail rotor blades separated and the aircraft crashed, killing the pilot.

## History of flight

The scout platoon was participating in a field training exercise. The mission was to provide the commander with enemy locations, movements, and targets. The first part of the mission was accomplished without incident and, following refueling at the unit's FAARP, the four helicopters were landed in a field.

The next part of the mission was coordinated and the platoon leader, followed by another aircraft, left the field site on a westerly heading, flying about 10 to 15 feet agl and 40 to 60 knots. As the lead OH-58 approached a road running north and south, a jeep was spotted going south at about 30 to 40 mph. A shallow left turn was initiated, as well as a slight descent, to place the aircraft on a converging path with the jeep.

As the aircraft approached the jeep, the pilot realized he would pass too close and applied power, as well as aft cyclic, to try to gain altitude. As the aircraft passed over the rear end of the jeep (crossing from left to right), the tail boom hit the jeep's antenna and both tail rotor blades hit the antenna mount and separated. The tail stinger hit the two jeep-mounted gas cans and the back of the jeep's rear seat. The helicopter yawed right, hit the ground in a nose-down attitude, rolled left, and came to rest on its right side.

During the crash sequence, the white main rotor blade struck the right front side of the aircraft, hitting the pilot's helmet and causing immediate death. The observer and passenger were not injured. The two occupants of the jeep were also uninjured.

## Crewmember experience

The pilot had almost 1,000 rotary wing flight hours, with almost 400 of these in the OH-58A. The observer was a properly qualified aerial observer.

## Witness accounts

The pilot was reported by his associates to be self-confident to the degree that he frequently pushed himself to the limit of his capabilities. He reportedly flew close to vehicles as a matter of habit and did so several times earlier on the day of the mishap. Neither mission nor circumstances dictated using the aircraft in this manner.

Two flight violations had been filed against the pilot, one for flying 20 minutes with an engine chip detector light on and one for "cowboying" the aircraft. The pilot was said to occasionally attempt to bend the rules, such as flying in marginal weather conditions even after other members of the flight had chosen to land.

## Commentary

The pilot chose to exceed the requirements of the mission and made a low gunrun-type maneuver at an opposing force vehicle. He incorrectly estimated distance to and rate of closure with the jeep. The jeep was moving uphill from right to left at about 35 mph in a direction nearly perpendicular to the aircraft's flight path. To intersect the jeep's ground path, the pilot placed the aircraft in a shallow left descending turn and approached the jeep over upsloping terrain. These factors, plus the fact that the aircraft was being operated at near gross weight, reduced the pilot's margin for error and probably contributed to his failure to recognize the point beyond which contact with the jeep became unavoidable. Though he made an effort to clear the jeep by using aft cyclic and collective, the application of aft cyclic rotated the tail rotor section of the aircraft downward, causing it to hit the jeep.

Unauthorized maneuvers and "cowboying" are serious violations of flight discipline indicative of unprofessional flight operations. Unit commanders must take positive action to discourage unsafe actions attributable to poor judgment and misdirected motivation/confidence. Aviators should be strongly reminded that they must refrain from performing maneuvers not required by the mission. Aviators exhibiting overconfidence in their abilities must be counseled and closely monitored to insure this trait is channelized toward more productive goals. ■

# Shortfax

## Checklists

Despite the warnings periodically issued concerning the use of checklists, it seems that either everybody hasn't gotten the word or it hasn't registered.

Since publication and distribution of the 3 December 1980 issue of FLIGHTFAX, which carried an article entitled "Use Your Checklists," additional mishaps have occurred because Army aviators failed to heed this sage advice. In three of the most recent ones, UH-1 pilots started their engines while the main rotor blades were still tied down. A small matter to kick up such a fuss over? Common human error? The answer is a resounding NO! on both counts.

Although the damage that resulted from these mishaps may appear insignificant when compared with that produced by more serious ones, these mishaps are not to be taken lightly. As the old saying goes: "Giant oaks from little acorns grow." So do Class A and B mishaps result from minor oversights.

In the past, aircraft have been destroyed when engines failed because fuel quick disconnects were improperly secured; and personnel have been killed when flight controls were rendered immovable because all the external gust locks had not been removed before flight. Properly used checklists would have prevented all these mishaps. Further, these "minor" oversights cannot be properly classified as the result of human error. They are caused by failure to abide by the book. In short, willful violation of regulations—specifically AR 95-1.

Don't wait for some catastrophic occurrence to shock you into performing your duties as you ought to. Checklists are designed to help eliminate human error. Use them. ■

## ALSE bits and pieces

• Technical Order 11-A-1-1, change 4, 1 May 1981, gives the following information on L-275 (day/night) flares:

| Lot Number | Status |
|---|---|
| 20-HK-0367 | Permanently suspended from issue and use |
| 31-HK-0367 | Permanently suspended from issue and use |
| 73-P-1271 | Permanently suspended from issue and use |
| KGM-1-5 | Permanently suspended from issue and use |
| 97-KC-0765 | Training use only |
| 9-KC-1073 | No restrictions (code A) |

All lots of L119 pen flares should be inspected to determine if the rounds fit in the launcher. It has been reported that some lot numbers may be too thick to fit into the launcher and that others are so small they may fall out before firing. The L119s do not have a shelf life but have been given an "indefinite" status. ■

• TSARCOM message 081455Z Jul 81 grants a temporary 1-year age/service life extension for the drogue container, NSN 1670-00-949-4563, and the main parachute container, NSN 1670-00-196-1922, used on the MK-J5D ejection seat in the OV-1 aircraft. This age/service life extension will end 10 July 1982. POC at TSARCOM is James Dittmer, AUTOVON 693-3715.

• According to message 091920Z Jul 81, issued by USAMMA, Fort Detrick, Maryland, all activities will destroy the medical materiel listed below in accordance with par. 3-48, AR 40-61, and par. 2-28, AR 735-11, as unsuitable for issue and use.

All lot numbers involved were manufactured by the Van Brode Milling Company. ■

| NSN | Nomenclature | Lot No. | Mfd Date |
|---|---|---|---|
| 6850-00-985-7166 | Water Purification Tablet, Iodine, 8mg, 50s | 120-2737-353 | Mar 67 |
| 6850-00-985-7166 | ,, | 2007-664 | May 73 |
| 6850-00-985-7166 | ,, | 2007-667 | Jun 73 |
| 6850-00-985-7166 | ,, | 4641-489 | Mar 69 |

# From National Transportation Safety Board

The fatal crash of an airplane heading for Spokane, Washington, last January 20 was probably caused by the flight crew's misuse of navigational aids that can indicate distance from the runway, according to the National Transportation Safety Board.

Based on its investigation and analysis the Board concluded the airplane descended prematurely because the crew had mistaken which of two navigational aids they were using to determine distance from the runway. The two navigation beacons are nearly aligned with the runway, but are 4.2 miles apart.

Seven persons, including the two-man crew, were killed and two others were seriously injured when the Beech 99A struck the top of a fog-shrouded hill at an elevation of 2,646 feet.

Use of the wrong distance-measuring equipment (DME) radio frequency would account for a descent beginning 4.2 miles prematurely, the Board said, but it could not account for the fact that the flight had dropped below the minimum altitude for the instrument approach in instrument meteorological conditions.

If the crew had held to the proper minimum altitude of 2,760 feet, it would have cleared the final hill on its path to the runway. However, the Board said, the flight descended another 114 feet and was just low enough for its landing gear to strike a hilltop and have the plane come to rest on the other side of the hill.

The Spokane VORTAC, which the Board believes the crew was using to obtain distance measurements, is 4.5 miles from the runway threshold. The runway 3 DME for the "localizer" approach being attempted is three-tenths of a mile from the threshold.

Although both navigational radios were found to have been tuned to the correct DME frequency, the Board said it is probable that the crew had earlier tuned to the Spokane frequency and then placed their aircraft's DME selector on "hold" while tuning to the runway 3 "localizer" frequency. The Board noted that the mileage displayed would continue to be from the Spokane VORTAC and the crew "would have had to remember the source of the DME mileage since the use of the 'hold' button is not accompanied by a frequency display."

The flight crew had originally been heading for Spokane's runway 21, before being diverted to runway 3, and would have tuned to the Spokane VORTAC before the time it should have switched to the runway 3 DME. Once aligned with the runway and mistaking their proximity to it, the crew's attention "was probably temporarily diverted to the landing gear and the landing checklist and away from the DME mode selector and the navigational radios," the Board said.

The survivor who testified at a Board hearing into the crash said that the initial impact caused him to immediately take a brace position in which he bent over and put his head on his knees. Both survivors were wearing seatbelts, and both had their seats fail.

The Board said, "The value of the brace position as a lifesaving technique was demonstrated in this accident. The survivors, who reacted immediately in placing their bodies in the least vulnerable situation, were able to both withstand the g forces that were technically beyond human endurance for an upright seated person. Furthermore, they were able to survive the failure of the seat and restraint system because the assumption of the brace position situated the body in a position where the vertical g forces were transmitted longitudinally through the upper body."

Following the accident, the Safety Board issued two recommendations to the FAA dealing with reducing the chances of an error in connection with an approach to Spokane's runway 3. Two other recommendations were aimed at other airports with similar approach procedures and distance measuring equipment positioned at two points along their final approach course, "leading to the possibility of erroneous tuning."

A fifth recommendation adopted by the Board addressed the fact that the navigational receiver on the airplane would provide a distance readout without displaying the source of the signal. The Board said that the FAA should require that in future navigational instrument installations the source of the navigational signal can be easily discerned by the pilot. ■

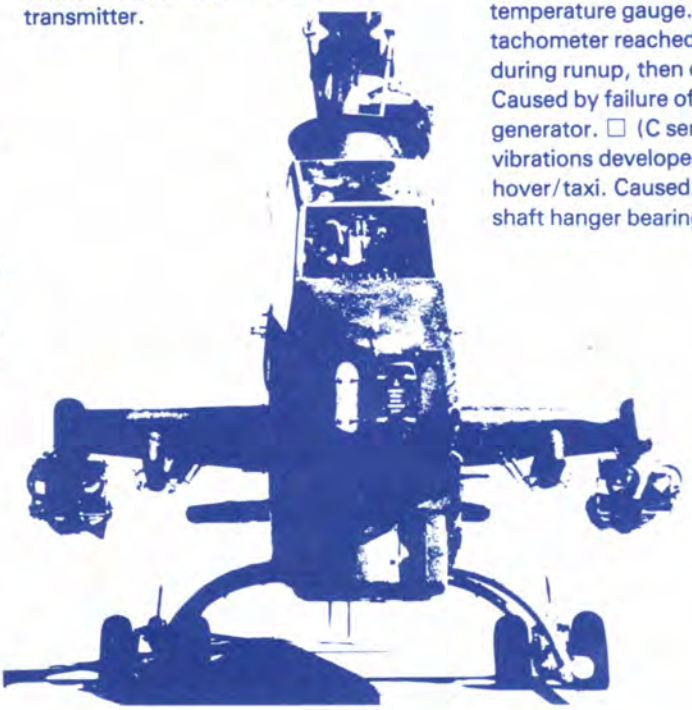
# Mishap briefs

**uh1** **Class C mishaps** ☐ (H series) Aircraft, on mountain training mission, was landed on rocky surface. Right skid was bent when it came to rest on large rock. ☐ (H series) Large bird hit and broke chin bubble and lodged between pilot's antitorque pedals. Pedals did not bind and aircraft was landed. Large flocks of birds are common in the area. ☐ (M series) As aircraft crossed ridge line and started down slope during NOE flight, main rotor blade hit dead tree limb. Limb was not readily visible because of glare from the sun.

**Class D mishap** ☐ (H series) On termination of STABO demonstration exercise, during final approach, aircraft descended too low and short of intended touchdown point. This resulted in two passengers, who were suspended from ropes beneath helicopter, touching the ground and being dragged through several trees about 10 feet high and a barbed wire fence. Both passengers received minor abrasions and contusions. Sloping terrain approaching point of intended touchdown may have affected the safety observer's depth perception, resulting in false visual clues as to rate of closure and height above touchdown.

**Class E mishaps** ☐ (H series) Transmission oil pressure light came on during shutdown. Pressure dropped to 20 psi and loud growling noise was heard from transmission area. Caused by failure of main transmission. ☐ (H series) Cyclic binding in flight was caused by failure of swashplate control assembly. ☐ (H series) Master caution and hydraulic pressure lights came on, accompanied by feedback in controls and grinding noise from hydraulic pump. Caused by failure of hydraulic line. ☐ (H series) Cyclic feedback occurred during flight. Caused by failure of right lateral bellcrank. ☐ (H series) Smoke was seen coming from battery vent tube during touchdown. Caused by failure of battery.

**ah1** **Class E mishaps** ☐ (G series) Loud bang was heard during climbout, and aircraft was landed. Left turret door had fallen from aircraft. One dzus fastener had been missing before flight, and remaining fasteners worked loose during flight. ☐ (S series) After aircraft was landed, smoke and fumes were seen coming from battery vents. Five of nine AH-1s in the unit are being operated without alternators due to nonavailability of parts. ☐ (S series) Engine oil pressure fluctuated from 70 to 90 psi during flight. Caused by bad pin in cannon plug on engine oil pressure transmitter.



**ch47** **Class E mishaps** ☐ (A series) Crew chief noticed hydraulic fluid spraying from flight control closet during flight. Caused by cracked hydraulic line. ☐ (C series) Transmission oil hot light came on when pilot moved engine condition levers to flight. Caused by broken wire to aft transmission temperature bulb. ☐ (C series) Utility oil cooler started spraying hydraulic fluid during flight. About 3 minutes later, utility oil cooler fan failed and pressure dropped to zero. Caused by internal failure of fan motor.

**oh58** **Class E mishaps** ☐ (A series) Ground personnel heard loud whistling noise coming from aircraft during takeoff and called pilot. Postflight inspection revealed O-ring was partially hanging out of coupling on bleed air line. O-ring was decayed and had blown out under pressure. ☐ (A series) Engine oil temperature fluctuated during flight. Caused by malfunction of temperature gauge. ☐ (A series) $N_2$ tachometer reached 70 to 80 percent during runup, then dropped to zero. Caused by failure of tachometer generator. ☐ (C series) High frequency vibrations developed in pedals during hover/taxi. Caused by failure of tail rotor shaft hanger bearings.

**u21** **Class C mishap** ☐ (A series) As aircraft was on short final for landing, wind shear caused nose gear to hit ground. Main gear hit ground and aircraft bounced back into air. IP took control and landed. Tips of propeller blade were damaged. Winds were changing velocity and direction. Winds on final were different than reported by tower and appeared to be shifting about 45 degrees left and right of center line.

**Class E mishap** ☐ (A series) Light in gear handle stayed on after gear was raised on takeoff. Gear handle was placed in down position and light in handle went out. Pilot tried to raise gear a second time and gear appeared to start up and stop. Gear handle was placed in down position again and proper indications were received. Aircraft was flown to airfield and landed. Caused by failure of landing gear motor and gear drive.

**c12** **Class E mishaps** ☐ (C series) Right brake failed during taxi. Preformed packing in tee fitting connecting brake hose to right main landing gear inboard and outboard brake housing failed, allowing all hydraulic fluid in right brake to drain. ☐ (A series) No. 1 power lever friction lock failed during climbout, allowing power lever to move freely. ☐ (A series) Flap lever was moved to up position after aircraft was landed, and pilots did not notice that flaps failed to retract. About 2 minutes later, as aircraft was being parked, strong electrical burning odor and smoke were detected in cockpit. Caused by burned-out flap motor.

**ov1** **Class E mishap** ☐ (D series) As aircraft took off, airspeed indicator started climbing, then slowly returned to 80 knots and stopped. Caused by clogged pitot system lines.

# Maintenance

**uh1** **Class E mishaps** ☐ (V series) Master caution light came on and aircraft was landed. Pilot, who was also the unit maintenance officer, could not find the cause for the illumination and cleared the aircraft for a one-time 20-minute flight to airfield. En route, hydraulic light came on, followed by partial hydraulic failure. Complete hydraulic failure then occurred, with cyclic hardover to right rear. Running landing was made at airfield. Failure of left cyclic servo was caused by loose bearing retaining nut. ☐ (H series) Crew chief noticed fuel leaking from fuel inlet strainer during runup. Caused by pinched O-ring in fuel strainer. ☐ (H series) After initiation of autorotation with turn, $N_1$ continued to deteriorate and engine failed. IP took control and autorotated to ground. The wrong bolts had been used to mount throttle idle detent solenoid, possibly allowing idle detent solenoid to slip down, which increased gap between solenoid button and idle detent cam enough to allow cam tooth to bypass solenoid button and let throttle go to full off position, rather than flight idle as intended. ☐ (H series) After 10-minute

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **4** |
| | June | 2 | 4 | June | **7** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | 1-12 Aug | **1** | **0** |
| | September | 3 | 1 | 13-19 Aug | **3** | **2** |
| | Total for Year | 37 | 26 | Total to Date | **42** | **24** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

# Mishap briefs

hover, pilot noticed a ground crewman signaling for him to land. About 3 quarts of oil had been pumped out of oil supply line. Nut holding oil supply line to output side of oil pump was only finger tight.

**oh58** **Class E mishap** □ (A series) During passenger dropoff, with engine idling, pilot heard high-pitched noise, hydraulic pressure light came on, and loss of hydraulic power occurred. Incorrectly installed tee fitting on top of cyclic servo resulted in failure of gasket and leak.

## Messages received

• Safety-of-flight technical message concerning one-time inspection of CH-47A/B/C engine mechanical transmission (CH-47-81-14, 051600Z Aug 81). Summary: Sixty-two CH-47 engine transmissions, P/N 114D6200 and P/N 114D6001, are suspected to have improper clutch assemblies installed. Failure of an engine transmission could cause loss of an aircraft. The purpose of this message is to locate suspect engine transmissions and remove from service. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

• Safety-of-flight maintenance notice concerning flight control servo cylinders used on AH-1 helicopters (AH-1-81-20, 051230Z Aug 81). This message is to alert users of the AH-1S Cobra that they may be receiving servo cylinders with bearings that need to be greased.

• Safety-of-flight maintenance notice concerning AH-1S modernized wing stores jettison switch relays (AH-1-81-21, 071920Z Aug 81). The purpose of this message is to alert users of the AH-1S Cobra that the wing stores jettison switch relays may have been interchanged during production.

• Safety-of-flight emergency message concerning immediate grounding of all AH-1S Cobras with Kaman main rotor blades installed (AH-1-81-23, 131825Z Aug 81) (supercedes AH-1-81-22, 121515Z Aug 81). Summary: Tentative findings of an AH-1S Cobra mishap indicate that a Kaman main rotor blade failed. The tip weight separated from the blade. This message immediately grounds all AH-1S Cobras with the Kaman main rotor blade until further notice. Contact: John Morris, TSARCOM, AUTOVON 693-3300, commercial 314-263-3300.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## Changes to TMs

The following urgent changes to TMs have been published:

• Change 6, 1 Jul 81, to TM 55-1520-228-23-2.

• Change 18, 29 May 81, to TM 55-1520-235-10.

• Change 11, 14 May 81, to TM 55-1520-228-10.

• Change 12, 26 May 81, to TM 55-1520-228-10.

• Change 16, 24 Jun 81, to TM 55-1520-228-23-1. ■

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# Enforcing the be-noes

On Monday, a job technique results in a mishap. Tuesday, the commander puts out the word that there will **be no** more of those techniques. Another be-no is added to the growing list of be-noes, and the grumbles are heard. Was the be-no required? Will they abide by the be-no?

From top to bottom, supervisors issue be-noes based on their assessment of risks versus gains for a given act. Writing or announcing a rule, however, doesn't guarantee compliance. Supervisors must do more than just establish the be-noes; they must motivate their subordinates to follow the guidelines.

One way is fear. Take the first poor soul that gets caught disobeying and make such an example of him that everyone else's blood will curdle at the thought. Historically, punishment has been an early choice as a tool for enforcement. Historically, it hasn't worked very well.

That's not to say it won't work at all. There are times when it can be very effective. It can inhibit the committing of a be-no, at least temporarily. If you were going to be drawn and quartered for violating a tech order, you'd stop and think before you did it. But after a while, the threat isn't enough, and somebody does violate the tech order. Why? To prove to himself or his peers that he has both skill and guts.

What has happened is that his perceived need for esteem has become more important than his need for safety. Hierarchy-of-needs theories, such as Maslow's, indicates that once the basic needs are essentially satisfied the higher needs predominate. Theories aside, experience shows that people will knowingly risk their lives for more abstract causes. When the causes are idealistic, we cheer them on; when they are self-centered, we think they are crazy. We call one a hero, the other a daredevil; but the daredevil is probably trying to prove to himself that he's a hero. There are no "rebels without a cause," but there are plenty of rebels with ego as their only cause.

Punishment alone can create rebellion instead of compliance. The supervisor needs to provide a means of satisfying that ego need for esteem in his subordinates in a way that will serve the mission. Reward his ego for complying with the be-noes. Victor H. Vroom has said that motivational impact on an employee is based on two factors; the value of the outcome to him and his confidence that his behavior will achieve that outcome. Esteem is of high value to him. His question is whether compliance with the be-noes will gain it for him.

If the appointed supervisor is unable to inspire respect in his subordinates, he will be equally unable to fill their need for esteem; and he will be unofficially replaced or circumvented by the workers. It might be the group at the bar encouraging the misdirected individual, but someone is going to fill the vacuum. That informal group often develops its

own goals which are in conflict with the organization's. They may subtly reward breaking the rules, getting away with a be-no.

The official supervisors must find ways to influence the formal leadership to aim for the goals of the organization, to be heroes not daredevils. A crisis normally unifies the official and informal leadership temporarily. The imminent danger of battle inspires a common concern. They confer esteem on those who succeed at the mission. When the crisis dies down, however, everyone reverts to their old ways. The favorite "Happy Hour" theme becomes "bad mouthing" the system.

Competition can also unify the official and informal leadership. Participation in contests like William Tell and wing "turkey shoots" channels everyone's behavior toward winning, when the reward is considered desirable and winnable. But the rules, the be-noes, must be clearly enforced during the competition; otherwise, the actual effect may be to reward those who break the rules and get away with it. Instead, the purpose should be to reward compliance with the rules and to show that compliance leads to success.

All of this assumes that the be-noes are clear and reasonable. If they aren't, it will be impossible to demonstrate the advantages of compliance. Of course, being reasonable doesn't mean that everyone agrees with it, but that everyone can see that it was based on logic, not emotions. In some cases, the be-noes have grown uncontrollably without a good pruning; they overlap and often contradict each other. Some are obsolete. Some are so obscure that they are unknown, except for that inspector or evaluator who specializes in trapping the unaware. Rules like these are unenforceable in the long run because they lack credibility. According to Vroom, the worker has to believe that his behavior can achieve the desired outcome; if the rules seem impossible, he'll quit trying. Then the informal group will set up their own goals and rules to achieve them. Rebellion will be the channel to gain esteem.

If the be-noes are clear and reasonable, the informal leadership can align their goals with the organization's to achieve their desired reward. Then, instead of making martyrs of violators, supervisors can rely on the informal group to ostracize those who disregard the be-noes. Losers are not tolerated in the group.

The end result is a unit that enforces discipline from top to bottom. A unit that gains esteem for the people in it by doing the mission safely and recognizing them for it. In such a unit there will **be no** daredevils, only heroes. ■

**—from TAC ATTACK**

# Shortfax

## There I was

. . . on a touch and go, rolling down the runway at 100 miles per hour when approach control called up and asked "Did you hear tower call you to go around for vehicles on the runway?"

I shall leave our intrepid aviators on the runway for a few minutes while I retrace the events leading up to this moment. We were practicing multiple approaches and landings and were talking to approach control. Because of incessant chatter on GUARD during an approach, the IP turned it off, planning to turn it back on. However, he got wrapped up in other things and forgot, and I failed to notice it. We also planned this approach to be our last and to go to tower for VFR touch and gos. Therefore, on short final (about one-half mile from runway) approach control cleared us for the approach and landing and told us to contact tower. Because we were in such a critical phase of flight, I wasn't about to play with the radios until later. Besides, if tower needed to contact us, they could always call us on GUARD.

Well, let's return to our heroes. With the instinct of many years flying, and the pucker factor increasing at an alarming rate, the IP jammed the throttles forward to go around. I'm happy to report that we got off safely and were already well airborne when we passed over the vehicles. Oh, yes, one other thing. We were making a 100 percent flap landing, and on the go we couldn't figure out why the aircraft accelerated so slowly. Yes, you guessed it. The flaps were still at 100 percent instead of the normal 50 percent for takeoff. We had forgotten about the go-around procedures requiring resetting the flaps to 50 percent. Fortunately we were lightweight, and the extra drag didn't give us much problem in the C-130.

There are two kinds of pilots: those who have done it and those who will do it. By relating this story, maybe we can prove this old axiom to be wrong. Remember, **keep your guard up/on.** ■

**BG Leland K. Lukens**
**Director of Aerospace Safety**
**—from FLYING SAFETY**

## The huddle

A funny thing happened at the football stadium today! After taking the opening kickoff, the home team went into a huddle as usual to get information from the quarterback and to encourage one another. Then came the unusual: The team did not break out of the huddle to move into action! Soon the yellow flag was dropped and the referee stepped off a 5-yard penalty for delay of the game.

What happened (or did not happen) next will be discussed for years! The team still did not leave the huddle! They seemed to be talking among themselves and encouraging one another, but it appeared they had forgotten that the object of the game is to move to the line and carry the ball across the goal. Again the yellow flag went down! Another 5-yard penalty! The crowd howled!

At this point the team was overheard talking about ways to improve the appearance of the huddle. As the crowd watched with amusement, the team changed the shape of the huddle from a circle to a triangle and then to a square. But they never left the huddle to move into action. Their coach watched them with a hurt look on his face.

Then the tailback led several players out of the huddle to the line. They wanted to get in the game, but their teammates would not join them. So they returned to the huddle to try to persuade the team to move toward the goal. The coach, now thoroughly exasperated, sent in another quarterback. And the talking continued.

Another yellow flag and another penalty. The amusement of the crowd gave way to anger. First they pleaded, then booed until they were bored. But the team kept talking in the huddle and patting each other on the back.

Then came the unbelievable conclusion. The referee ruled that the home team had forfeited the game, and he awarded the victory to its opponent. The crowd filed out of the stands, but the home team, still talking, did not seem to notice that the stadium was empty.

What has this got to do with Army aviation? Plenty. Some safety programs are just like this team—a lot of talk but little action. And some commanders are just like this coach. They do the obvious—send in another quarterback (replace the company commander)—when their safety team doesn't work. Then they stay on the sidelines and watch instead of taking the positive action needed to get things going.

In any topflight aviation unit, the supervisor supplies the leadership and never lets up. The result is a team effort that puts points on the scoreboard—another way of saying the mishap rate goes down. ■

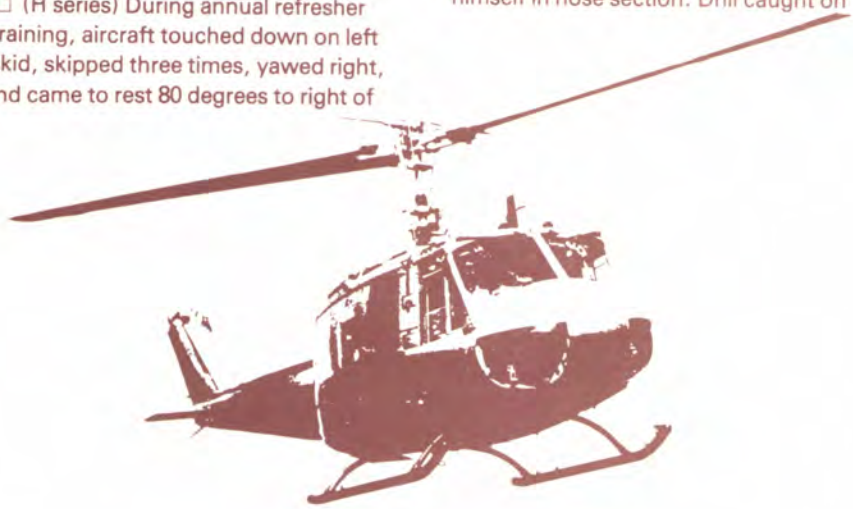
# Selected mishap briefs

**uh1** **Class A mishap** ☐ (H series) Power loss occurred during approach to heliport, and aircraft was autorotated into trees. 8153

**Class C mishaps** ☐ (H series) During power recovery from simulated forced landing at 200 feet agl, $N_2$ speed started to drop from 5500 rpm and grinding noise was heard from aft part of aircraft. IP took control and landed. During descent, egt went up through 625° C. Engine was not running after aircraft was landed. Tail rotor blades were hit by flying debris. Inspection revealed that hot end had an extreme overtemperature condition, causing destruction of power turbine wheels and damage to second gas producer wheel. Further inspection revealed that throttle rod (rigid connecting link) had failed in a threaded root of adjustable end that connects to fuel control. This failure caused fuel control to dump excessive fuel into combustor section without accompanying $N_1$ speed which caused overtemperature and failure of hot end. The third thread from the lock nut appears to be the origin of the fatigue. ☐ (H series) During annual refresher training, aircraft touched down on left skid, skipped three times, yawed right, and came to rest 80 degrees to right of original heading. Cross tubes, skid, and airframe were damaged.

**Class E mishaps** ☐ (H series) White vapor was seen coming from battery vent, and loadmeter was at .5 and climbing. Battery was turned off and aircraft landed. Caused by bad cell in battery. ☐ (H series) Crew smelled smoke during flight. As descent was initiated, smoke became more intense from main inverter area and main inverter light came on. Caused by failure of inverter relay solenoid. ☐ Loud whining noise during flight was followed by illumination of master caution and hydraulic lights and feedback in controls. Running landing was made. Caused by cracked line to hydraulic filter. ☐ (H series) $N_1$ gauge went to zero during hover. Caused by failure of $N_1$ tachometer generator. ☐ (H series) Aircraft started vibrating during flight. Caused by failure of No. 1 hanger bearing.

**Aviation-related mishap** ☐ Mechanic repairing sheetmetal in forward section of aircraft set drill on radio to reposition himself in nose section. Drill caught on mechanic's clothing and hit and broke chin bubble.



**uh60** **Class C mishap** ☐ Approach was made between two trees as aircraft was on short final to landing zone. Pilot told copilot there was ample space on left side of aircraft. Copilot thought pilot said he was close to tree on left and moved aircraft to right. Main rotor blade hit tree on right side, damaging tip cap.

**ah1** **Class A mishap** ☐ (S series) As aircraft landed, main rotor blade separated and aircraft rolled over. 8154

**Class E mishaps** ☐ (S series) Pedals froze and then released during low-level flight. This occurred two more times en route to airfield. Caused by failure of SCAS actuator servo. ☐ (S series) Transmission oil bypass light came on during approach. Caused by failure of pressure switch. ☐ (G series) No. 1 hydraulic and master caution lights came on during hover, and pedals became stiff. Running landing was made. Prior to flight, No. 1 hydraulic reservoir sight glass had been replaced. Air may have entered system, causing momentary stiffness in antitorque pedals and illumination of warning system.

**Aviation-related mishap** ☐ Aircraft was being pulled by a tug from parking pad into hangar. As aircraft passed between two parked aircraft, driver of tug started right turn. Tail boom hit right wing store fairing of parked aircraft. Only two ground guides were used.

*(continued on next page)*

# Mishap briefs

**ch47** **Class E mishaps** □ (B series) Master caution and transmission oil pressure lights came on. Caused by failure of oil pressure transducer. □ (B series) No. 2 engine oil temperature gauge fluctuated during runup. Caused by failure of oil temperature transmitter. □ (B series) No. 1 engine chip detector light came on during landing. Caused by failure of engine transmission. □ (C series) Maintenance test pilot had landed and was performing engine vibration test on No. 1 engine. No. 2 engine condition lever was in ground position with engine stabilized at 61 percent $N_1$. Test pilot beeped rotor rpm to 240 with No. 1 engine beep. No. 2 engine then dropped below 50 percent $N_1$ and PTIT immediately increased to 1,200° C. No. 2 engine then failed.

**Aviation-related mishap** □ Aircraft was being pushed out of hangar. Three blade watchers were positioned at front of aircraft to clear hangar door. As aircraft was pushed forward, tiedown rope attached to aft blade caught on dampner retaining bolt of a rotor blade stored on horizontal blade rack. This blade was then pulled into another stored blade, punching hole in blade skin.

**ch54** **Class E mishap** □ (A series) Aircraft was on short final to landing zone with external load of 8,000-pound concrete block. No. 2 engine fire light came on. Aircraft did not have single-engine hover capability. Load was jettisoned and No. 2 engine secured. Postlanding inspection revealed faulty fire detection system.

**oh58** **Class C mishaps** □ (A series) Aircraft was flying cover for convoy returning from the field. While pilot was flying up the side of the convoy, checking for locked brakes on trailers, he inadvertently lost altitude. Aircraft hit wire strung across highway. Pilot maintained control and landed in field. □ (A series) Pilot heard loud whistling sound, followed by loud thump and severe lateral vibration. Pilot initiated straight-ahead descent, while slowing to 75 knots. Flight control vibrations increased almost to the point of uncontrollability. Aircraft was landed in small field. The last 4 inches of white main rotor blade tip had separated.

**Class E mishaps** □ (A series) Aircraft yawed during flight, and torque, TOT, $N_1$, and $N_2$ fluctuated. Engine noise increased and decreased. Aircraft was landed with power. Internal fuel control failure caused engine to surge. □ (C

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **4** |
| | June | 2 | 4 | June | **7** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | 1-19 Aug | **4** | **2** |
| | September | 3 | 1 | 20-26 Aug | **1** | **0** |
| | Total for Year | 37 | 26 | Total to Date | **43** | **24** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

series) Pilot was performing out-of-ground-effect maneuver when cyclic moved abruptly to left and forward about 2 inches and then recentered. Left cyclic control stick had been removed for aerial observer training. Observer may have stepped on or kicked left cyclic lever assembly, causing abrupt movement of cyclic. ☐ (A series) Stiffness was felt in cyclic and collective during flight. About 10 seconds later, loud whining sound was heard from transmission area. Hydraulic and master caution lights then came on. Running landing was made. Caused by failure of hydraulic pump. ☐ (C series) Transmission oil warning light came on during flight. Caused by failure of oil pressure transmitter.

**Aviation-related mishaps** ☐ Mechanic was moving aircraft inside hangar. When he pushed tail to left, right front chin bubble hit metal rod on ground power unit rectifier. ☐ Tail rotor assembly removed from aircraft was placed near edge of parking ramp. As the driver of a 1¼-ton truck started down ramp, steering gearbox failed. Steering locked up and, before truck could be stopped, right front tire ran over one of the tail rotor blades.

**c12** **Class E mishaps** ☐ (A series) Landing gear would not extend. Aircraft returned to airfield and gear was manually extended. Caused by worn-out landing gear motor brushes. ☐ (C series) Left brake began leaking after aircraft was parked. Preformed packing in "T" fitting connecting brake hose to inboard brake housing failed, allowing hydraulic fluid to drain.

**u21** **Class E mishaps** ☐ (A series) Fuel was seen to be siphoning around fuel cap on left nacelle tank. Fuel cap was incorrectly positioned. ☐ (A series) No. 1 engine fuel pressure dropped, and left boost pump light came on. Caused by failure of boost pump.

# Maintenance

**uh1** **Class E mishaps** ☐ (V series) Copilot saw smoke and small flame under instrument panel and landed. Battery vent hose clamp had chafed against battery relay, causing short. ☐ (H series) Odd smell was noted in cockpit and aircraft was landed. Thermal runaway of battery was caused by incorrect voltage regulator setting. ☐ (H series) Engine oil temperature fluctuated from 85 degrees to 130 degrees. Caused by loose cannon plug on sending unit.

**uh60** **Class E mishap** ☐ Crew chief noticed hydraulic fluid on right side of aircraft during shutdown. Second-stage tail rotor servo return line was found chafing against aircraft, causing pin hole in hydraulic line. Hydraulic line was installed without correct standoff.

(continued on back)

# Mishap briefs

**ah1** **Class C mishap** ☐ (S series) Loud bang was heard during runup following main rotor pitch change link adjustment. Inspection revealed hole in main rotor blade caused by wrench left on top of rotor system. Wrench was found 100 meters away. Mechanic had just adjusted pitch change link and did not inventory tools. Pilot did not notice wrench during preflight inspection.

**Class E mishaps** ☐ (G series) Oil temperature rose during flight. Debris, grass, and dirt granules were lodged in engine oil cooler radiator gills, preventing full flow of air through radiator. Unit SOP will now contain requirement for full flush of radiator with aircraft wash at 45-day intervals. ☐ (S series) Pilot heard grinding sound from transmission area, followed by No. 2 hydraulic light. Running landing was made. Hydraulic fitting in turret had not been torqued after installation of turret pump.

**oh58** **Class E mishap** ☐ (A series) Transmission oil hot light came on during hover for takeoff. Caused by loose wire on sensing unit.

**c7** **Class E mishap** ☐ As aircraft was returning to ramp, when flaps were lowered, hydraulic fluid in reservoir dropped about 1 inch below refill line. Mechanic had not reserviced hydraulic reservoir after brake change.

## Messages received

• Safety-of-flight technical message concerning one-time and recurring inspections for UH-60A main rotor blade assembly (UH-60A-81-20, 101800Z Aug 81). Summary: Inspection of a loose main rotor blade tip cap attachment revealed a crack in the lower surface of the tip cap. When the tip cap was removed, a

disbond was discovered between the skin and the shims at the blade tip rib. Other blades may exhibit this same problem. The airframe manufacturer is currently developing the corrective action for this problem. Pending incorporation of this corrective action, the affected blades must be inspected before each flight. Contact: Earl Parsons, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight maintenance notice concerning OH-58A power turbine governor eccentric shaft adjustment (OH-58-81-06, 111215Z Aug 81).

• Safety-of-flight maintenance notice advising maintenance personnel of the correct installation procedures when installing CH-54 intermediate gearbox (CH-54-81-03, 141230Z Aug 81).

• Maintenance information message for correction of UH-60A aircraft inventory record (UH-60A-81-21, 121245Z Aug 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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**Winter operations demand advance planning and preparation.**

# Flight operations over snow

While any number of events can crop up unexpectedly to ruin a pilot's day during winter operations, few can instill a feeling of utter helplessness as can sudden and complete whiteout. When a pilot encounters this condition—whether taking off, landing, or taxiing—the end result is usually disorientation and a mishap. Following is a paraphrased version of one pilot's encounter with whiteout during a training exercise:

## Too late for prevention

"It was about 1300 when we got the word that our company area was under a simulated air attack and for all elements to take appropriate action. According to the company SOP, our platoon was to dispense approximately 5 to 7 kilometers to the north. Our platoon leader had briefed us the night before that on receiving the warning, our flight of three aircraft would immediately start up and depart together, the two Cobras following the OH-58.

"The weather update was not available but had been forecast earlier to be better than 500 feet, 1 mile visibility, with decreasing visibility in snowshowers.

"Shortly after receiving the warning, my pilot and I were in our aircraft waiting for lead to take off. Although the weather was still fairly good, visibility had already begun to decrease because of light snow.

"I waited until the lead aircraft was about 300-400 meters away before lifting off. Fresh, loose snow approximately 6 to 8 inches deep covered the ground at the time I made a normal altitude-over-airspeed takeoff and followed lead, momentarily losing sight of him because of the blowing snow. I then joined up with lead, staying about 200-300 meters behind him, and followed him to the north at about 100 feet agl and 50 to 60 knots. The weather now appeared to be deteriorating rapidly. As we crossed a ridgeline, the snow began getting heavier as it moved toward us. At this time, lead stated he was going to make a right turn and return to the platoon location. Following lead, we turned toward the south and crossed over an open field with trees at the southern end and large powerlines to the north.

"By now, weather conditions had worsened substantially because of heavy snowshowers. I estimated visibility at 200 meters and obscured ceiling. As we completed our turn, I saw lead cross over some wires and disappear from view. I considered executing inadvertent IMC procedures but I had no idea where the cloud tops were, and I did not want to climb through icing conditions to find out. Since I still had visual reference with the ground, I decided to land. At this time, the platoon leader in the lead aircraft directed us to pick a spot and land because of the marginal weather.

"I began a right turn to the north toward an open field. I picked what appeared to be the most level spot, which happened to lie in the northern end of the field, and began my approach. On final at about 5 feet skid height and above effective translational lift, the aircraft completely whited out. My first reaction was to initiate a go-around, but I remembered the powerlines stretched across our path somewhere ahead of us. Simultaneously, my pilot also informed me of the existing wire hazard. Consequently, I applied aft

cyclic and continued my descent to the ground.

"From this point on, I can only speculate as to what happened as I had no outside reference. As I continued to set the aircraft down, I felt what seemed to be the right skid contacting the ground. The aircraft rolled left and the left skid struck the ground, after which the aircraft rolled again to the right. That was when the main rotor blades struck the ground. The rpm audio activated momentarily, went out and then the aircraft snap rolled to the left and came to rest almost inverted on its upper left side.

I exited the cockpit through a hole that was made in the right forward section of the canopy during the crash sequence. I then went to the aft compartment and opened the canopy. The pilot, who was also unhurt, got out of the aircraft. I glanced at my watch. We had been airborne approximately 10 minutes...."

## Easily trapped

This mishap points out the relative ease with which any pilot can be trapped into a whiteout situation. The IP involved in this mishap was not new to winter operations. He was well qualified, highly experienced, current and proficient in the type of flying he was performing when the mishap occurred. The aircraft was properly maintained and suitable for the mission. Likewise, while the weather conditions at the onset of the mission were not the best, they were adequate.

Once the crew was airborne, the procedures they followed as the weather began to deteriorate were, in all probability, the same procedures any pilot in a similar situation would have followed. The problem arose when the IP had to make the decision to land—a landing he was committed to make downwind. As was pointed out during investigation of the mishap, "...The IP had to make a downwind landing because the flight he was a part of continued flying in rapidly deteriorating weather until all other options had been ruled out..."

Without weather information concerning cloud tops and icing conditions, the IP had to rule out performing the vertical helicopter instrument recovery procedures. Further, the IP could not attempt a go-around after encountering whiteout because of the danger posed by the powerlines in his flight path. And this points out another important need—that of being thoroughly familiar with the terrain features and hazards present in any vicinity of operations. While damage costs for this mishap totaled nearly $240,000, had the crew been unaware of the wire hazard, fatalities could have easily resulted.

What might possibly have prevented this mishap? First and foremost, the availability of all weather information necessary to conduct flight operations during field exercises; and second, an earlier decision to set the aircraft down—before it became necessary to make a downwind landing.

But snow doesn't have to engulf an aircraft for the pilot to become disoriented. Its presence alone can do the job when it blankets the ground, hiding all visual cues. One pilot found this out the hard way. *(continued on next page)*

# Flight operations over snow

## Sans cues, sans rotor

In this instance, an IP who was to conduct NVG training in an AH-1 and his pilot flew their aircraft to a designated flight area. On their arrival, the IP reconnoitered the area, then landed the aircraft approximately 400 feet from a wood line ahead of him. Both pilots donned their night vision goggles and made the necessary adjustments.

After performing a before-takeoff check, the IP lifted the aircraft to a 3-foot hover for a final check before allowing the pilot to assume control of the aircraft. However, he felt uneasy and commented to the pilot that he didn't believe the area was suitable for the training mission. With that, he decided to land the aircraft so that they could remove their NVGs before returning to the airfield where they would continue the NVG training.

Because a small ditch was below them, the IP moved the aircraft forward toward more level ground. As he did, he noted—by looking at the tree line ahead—that the aircraft was drifting left. As he turned his head to the left to pick up some midrange cues he had previously identified, he found that the rotorwash had either blown them away or covered them with snow. When he looked back toward the tree line—his only remaining reference point—he noted the aircraft was tilted to the left. As he applied right cyclic and lowered the collective to land, the main rotor blades struck the ground, tearing the main rotor system and the transmission free from the aircraft. The aircraft remained upright and neither pilot sustained injuries. Damage to the aircraft was estimated at more than $70,000.

In this instance, rotor-induced blowing snow did **not** impair the pilot's vision. The problem lay with the training area selected. It was virtually devoid of visual cues, causing the IP to become disoriented. FM 1-51 and the NH/NVG Exportable Training Package do not contain procedures for such NVG operations as hovering, taking off, and landing over snow. Further, the type of NVGs in use (AN/PVS-5) may not be suitable for certain operations over snow-covered terrain.

Neither of the mishaps described embodies any of the common cause factors normally associated with these types of mishaps. Pilot experience and proficiency were present in both instances and there were no violations of any published regulations or SOPs. Yet, under the prevailing conditions of weather and terrain, both mishaps occurred.

In a third instance, the pilot was equally qualified, experienced and proficient in winter operations; but a single erroneous assumption was all that it took to produce a mishap.

## Overconfidence

During a night training mission, the pilot of an OH-58 landed at a field site that was covered with snow. Prior to his landing, he had been warned that a "blowing snow" condition existed at the LZ. The landing, however, was uneventful. It was when he lifted his aircraft to reposition it that he found himself in trouble. As he made a right pedal turn and started a forward hover, the rotorwash recirculated the snow, causing him to lose ground

reference and begin drifting to the left. As he applied collective, the left skid dug into the ground and the aircraft rolled onto its left side. His error? Although he was aware of the recirculating snow conditions in the LZ, he hovered his aircraft at 2 to 5 knots at a height of 2 to 5 feet agl instead of using an airspeed just above translational lift or a high hover as prescribed by TC 1-137.

Not only was this pilot experienced and proficient in winter operations but he had been routinely flying under recirculating snow conditions for several days before the mishap occurred. During this time, he had not experienced any problems. Consequently, he believed himself capable of coping with this kind of environment. By his own admission, he was caught unaware when he inadvertently encountered a "whiteout" situation.

Finally, a fourth mishap occurred under almost identical conditions as the previous one described. Again, the aircraft involved was an OH-58; the training mission was being conducted at night; and the terrain was covered with snow.

## No warning

With two pilots and a crew chief aboard, the OH-58 gently settled on the thick layer of snow that covered the ground. The night landing had been normal and without incident. The problems began shortly after the pilot switched on the landing light and lifted the aircraft to a hover for takeoff. Blowing snow created a whiteout condition that was intensified by the glare from the light reflecting off it. The pilot promptly switched off the landing light, regaining limited visibility; but it was not sufficient for him to immediately note that the aircraft had begun to drift backwards.

The copilot was first to realize they were moving rearward and he attempted to warn the pilot. However, because of an intercom malfunction, the pilot did not receive the warning in time to prevent the tail rotor from striking some trees.

Following the tail rotor strike, the aircraft pivoted over the trees and began to spin to the right. As the pilot rolled off throttle and applied collective, the aircraft settled into the trees. Fortunately, all occupants escaped injury.

Although both aviators were experienced and well qualified for the mission, neither had been given the opportunity to develop proficiency in night operations over snow. In addition, the intercom system malfunction caused the copilot's warning to be sufficiently delayed that timely application of corrective measures by either pilot became impossible.

From the few examples described, you can readily see the potential hazards associated with flight operations over snow. And as evidenced, experience and proficiency do not necessarily exempt a pilot from these types of mishaps. With winter weather just around the corner for most parts of the world, it becomes imperative that units establish effective training programs that will insure pilots are knowledgeable and capable of safely operating aircraft over snow-covered terrain, especially at night. And TC 1-137 is a good place to start. Further, don't forget there are other hazards related to cold weather operations besides those associated with snow. In-flight icing problems, for example, are a formidable threat and have caused catastrophic accidents in the past.

The point is that now is the time to prepare for winter flying—not when you suddenly find yourself in trouble. For specialized techniques required for safe flight operations in a snow environment, the publication to consult is DA Training Circular 1-12, Cold Weather Flying Sense. Do it now! ■

# Mishap review

## Synopsis

While making a formation landing to a snow-covered landing zone, the pilot of the No. 3 UH-1H became disoriented in blowing snow. The Huey crashed and rolled inverted.

## History of flight

The mission was a troop insertion during a field training exercise. The flight included four UH-1Hs. The formation prescribed was a diamond formation from liftoff until the mission was completed. The flight platoon leader received the mission from the infantry platoon leader with a request for an immediate departure. This permitted only a sketchy briefing and no time for flight planning.

The troops were loaded and the aircraft took off. After 25 minutes in flight, the pilot of the lead aircraft decelerated and began an approach toward the wood line of a large, open, snow-covered field. Both the pilot and copilot (PIC) of the No. 3 aircraft were surprised—the copilot because he did not recognize the field ahead of them as the coordinates of the first LZ that had been briefed, and the pilot because he had begun to overtake the lead aircraft before he realized lead was decelerating in an approach without advance warning. The No. 3 pilot was able to regain his relative position in the flight and maintained that position almost until he landed.

During termination of the landing, rotor-induced blowing snow developed, and the pilot lost outside visual reference with everything except the top of the tree line to his front. The copilot, looking down through the chin bubble on the left side, told the pilot he thought they were moving backwards. The pilot did not sense any backward movement but, almost simultaneously, he saw the trees on the horizon tumble as the aircraft rolled right and came to rest inverted.

The copilot jettisoned the door on the left side of the cockpit and exited, followed by the pilot. One of the passengers seated on the left side of the aircraft removed the emergency window in the cargo door and exited, followed by the crew chief and the other seven passengers. Two of the passengers sustained minor injuries.

## Crewmember experience

The 29-year-old pilot had almost 200 rotary wing hours, with almost 150 in the UH-1H. The 25-year-old copilot had more than 300 rotary wing hours, with more than 250 in the UH-1H.

## Commentary

Adequate time to plan the mission was not given to the aircrewmembers.

Although the mission was received before the start of the training exercise, final details were not available until the morning of the mishap. The flight leader, in his haste to meet the requested departure time, did not provide route of flight data or adequate time for the other pilots to plot the coordinates before takeoff. When the flight leader began a deceleration and approach without warning to an area that did not coincide with any of the map coordinates he had given the flight, the rest of the flight was somewhat surprised. Although the flight leader evaluated weather and performance planning, time was not available for the others to do the same. Radio silence was imposed on the flight and an alternate means of controlling the flight was not provided.

Contrary to instructions in TC 1-12, the flight leader led the four aircraft in a close diamond formation to a landing in a snow-covered field, instead of spacing them out at 15- to 30-second intervals. This resulted in enough rotor-induced blowing snow for the No. 3 pilot to become disoriented. The flight leader was not aware of the instructions in TC 1-12.

When the approach was initiated, the No. 3 pilot used a greater than normal decelerative attitude to regain and maintain position in the formation throughout the approach. This aft cyclic condition was probably present when the aircraft entered the rotor-induced blowing snow and resulted in the aircraft drifting to the rear once outside visual reference was lost by the crew. The copilot (PIC), concerned with landing at the wrong LZ, was engrossed in his map during termination of the landing and did not initiate a go-around. The pilots of the No. 2 and 4 aircraft did not land in the LZ after seeing the blowing snow induced by the first aircraft. ■

# Selected mishap briefs

**uh1** **Class A mishaps** ☐ (M series) Aircraft flew over lake, crashed, and sank. Pilot may have been performing unauthorized, unsupervised, low-level flight. 8155 ☐ (H series) Smoke entered cockpit and two loud bangs were heard. Engine audio and rpm light activated, aircraft yawed right, and rpm deteriorated to 6000. Collective was lowered, and pilot turned left to only available forced landing area. As aircraft was landed, rotor rpm deteriorated. Aircraft hit ground with skids level, causing hard landing. 8156

**Class C mishap** ☐ (H series) Crew heard loud bang while on downwind for landing. Postflight inspection revealed right front cargo door was missing. Door may not have been secured correctly before flight.

**Class E mishaps** ☐ (H series) Crew heard banging sound from engine during landing. Portion of sheared first-stage gas producer nozzle bolt was ingested through all stages of the hot end, causing erratic power change. ☐ (H series) Preflight inspection revealed main rotor blade skin separation at outboard scarf joint. Bonding separation was found 3 inches inboard of scarf joint on both main rotor blades. Caused by sand erosion. Aircraft had been operating in desert environment.

**ah1** **Class E mishaps** ☐ (TH-1G) When collective was increased to 25 psi torque during hover, forward boost pump light came on. Caused by failure of pressure switch. ☐ (S series) Smoke was seen coming from pylon cowling during refueling operation. Caused by ruptured nonmetallic hydraulic pressure line.

**ch47** **Class E mishaps** ☐ (B series) No. 2 engine $N_1$ fluctuated during hover/taxi. Caused by failure of actuator. ☐ (B series) Hydraulic leak in ramp area was caused by cracked T fitting in utility hydraulics.

**ch54** **Class A mishap** ☐ (A series) Aircraft was on transition training flight, with 10,000-pound slingload. Aircraft crashed in trees during confined area approach. Two fatalities. 8157

**oh58** **Class C mishaps** ☐ (A series) Aircraft hit wire during landing. Wire broke and aircraft landed hard. ☐ (A series) While on NOE flight, aircraft approached a valley with wires drooping across it. Copilot decided to try to go under wires. As aircraft neared wires, it was discovered there was not enough clearance to go under them. Copilot banked aircraft sharply to left, but rotor blades hit three powerlines. Pilot took control of aircraft and landed. Wires were marked on map, and pilot and copilot saw the wires.

**Class E mishaps** ☐ (A series) Aircraft vibrated during flight. Main rotor blade support cap had come off. ☐ (C series) HIT check during runup indicated +50 degrees. Crack was found in combustor section of engine.

**ov1** **Class E mishap** ☐ (D series) While pilot was performing stall maneuvers, left gear indicator showed "in transit." Cycling gear resulted in "up" indication. After gear was blown down, gear-up indication remained. Caused by stuck gear-up switch.

**u21** **Class E mishaps** ☐ (RU-21H) No. 2 engine was shut down during training flight. Engine would not restart, and single-engine landing was made. Caused by corroded regulator ignition box assembly. ☐ (A series) When copilot tried to lower gear on base leg, loud noise was heard and gear stopped motoring. Gear handle red lights were on. Gear was confirmed extended by Air Force runway safety officer. Crew extended pattern, followed emergency checklist procedures for unsafe gear indications, and attempted manual extension, which failed to produce safe gear indications. Crew then tried to land with approach flaps only. Aircraft touched down into crosswind with left gear first. As right main gear touched down, crew began to drop abnormally low. Crew was told that gear was collapsing. Pilot applied power and initiated go-around. C-12 aircraft was launched for visual inspection of U-21 landing gear. C-12 pilot reported that both main gears were hanging at the same angle and no damage to right gear was apparent. A civilian aircraft mechanic recommended that crew attempt a high g maneuver to try to lock gear in place. Crew entered a dive, followed by abrupt nose-up attitude. Procedure was successful and landing was made with safe gear indications. Caused by failure of landing gear actuator. **Well done to the crew.**

## Maintenance

**uh1** **Class E mishap** ☐ (H series) Pilot noticed rapid decrease in $N_2$ at 30 pounds of torque to 6100 rpm. Caused by incorrectly adjusted No. 12 rod on fuel control throttle lever.

**uh60** **Class E mishap** ☐ Engine oil pressure dropped during HIT check. Crew chief had not correctly secured filler cap, resulting in loss of oil and decrease in pressure.

**ah1** **Class E mishaps** ☐ (S series) Unusual thumping sound was heard during takeoff. Caused by insufficient friction on fore and aft servo cylinder uniball. ☐ (S series) Aircraft rolled slightly left, back to right, and then hard left. Caused by out-of-balance roll channel SCAS card. *(continued on next page)*

# Mishap briefs

## FY 81 Fourth Quarter Countdown

| | Month | FY 80 Class A Mishaps | FY 80 Fatalities | Month | FY 81 Class A Mishaps | FY 81 Fatalities |
|---|---|---|---|---|---|---|
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **5** |
| | June | 2 | 4 | June | **6** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | August | **7** | **3** |
| | September | 3 | 1 | 1- 2 Sep | **0** | **0** |
| | Total for Year | 37 | 26 | Total to Date | **44** | **26** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

## Messages received

- Safety-of-flight operational message concerning operation limits for UH-60A main module gearbox assembly and inspection criteria for outer shaft (UH-60A-81-22, 191745Z Aug 81). Summary: UH-60A-81-18 message was issued to accomplish a one-time ultrasonic inspection of the outer shaft. In addition to this inspection, the operating oil temperature limit has been changed and supplementary inspection criteria established for the main module gearbox assembly. This message lists procedures in effect until further notice. Contact: Charles Vanartsdalen, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

- Safety-of-flight maintenance notice concerning use of metal blades on AH-1S helicopters (AH-1-81-24, 182000Z Aug 81).

- Safety-of-flight maintenance notice advising maintenance personnel of CH-54B rotating swashplate retirement interval (CH-54-81-04, 171215Z Aug 81).

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## Let's stop hitting the trees

# Let's stop hitting the trees

One of the most costly categories of pilot-error mishaps during the past year has been tree strikes. The 11 February 1981 issue of FLIGHTFAX carried a detailed discussion of the tree strike problem and suggestions for commanders, aviation safety personnel, and aviators to help deal with the costly tree strike problem. Although there has been a slight drop in tree strikes since that issue, which may or may not be a result of added emphasis in this area, tree strikes continue to adversely affect operational readiness.

Considering tree strikes which occurred only during the 12-month period July 1980 through June 1981, we are talking about $2.6 million damage, and if you count the two CH-47s which taxied into telephone poles, that total rises to $3.7 million in damage to equipment alone. There was also one fatality and 12 injuries from tree strikes during this period. These statistics only include tree strikes resulting from crew error, not tree strikes which occurred incidental to some other problem such as engine or tail rotor failure.

The most recent tree strike analysis shows the rate by type aircraft (table 3) to be similar to the rate shown in the 11 February FLIGHTFAX (table 1). The latest UH-60 rate may be inflated since FY 80 flying hours were used in determining the rate and UH-60 flying hours will increase significantly during FY 81. Recognizing the pilot tasks in employing the Cobra, the exceptionally high tree strike rate for the AH-1 points to the problem that inadequate division of attention can significantly compromise the effectiveness of one of the Army's major weapons systems.

**TABLE 1.—Tree Strike Mishaps by Type Aircraft From 1 January 1978 to 30 September 1980**

| Type Aircraft | Total Tree Strikes | Rate per 100,000 Flying Hours |
|---|---|---|
| UH-1* | 99 | 4.78 |
| AH-1** | 69 | 26.25 |
| OH-58 | 76 | 9.56 |
| CH-47 | 9 | 6.11 |
| UH-60 | 6 | 30.05 |

*Includes EH-1
**Includes TH-1

**TABLE 2.—Tree Strike Mishaps by Classification From 1 July 1980 to 30 June 1981**

| Classification | | | | Injuries | Fatalities | Cost |
|---|---|---|---|---|---|---|
| A | B | C | E | | | |
| 4 | 2 | 67 | 24 | 12 | 1 | $2,596,479 |

**TABLE 3.—Tree Strike Mishaps by Type Aircraft From 1 July 1980 to 30 June 1981**

| Type Aircraft | Total Tree Strikes | Cost | Rate per 100,000 Flying Hours* |
|---|---|---|---|
| UH-1 | 45 | $2,038,460 | 5.78 |
| UH-60 | 5 | 60,026 | 27.12 |
| OH-6 | 2 | 140,833 | 6.46 |
| OH-58 | 22 | 126,220 | 7.80 |
| AH-1 | 23 | 230,940 | 25.62 |
| Total | 97 | $2,596,479 | 8.09 |

*Based on FY 80 flying hours

A review of the four Class A tree strike mishaps (table 2) will bear out why poor judgment and failure to follow approved procedures on the part of pilots are the most often cited system failures. It also demonstrates the validity of why most aircraft mishaps are attributed to pilot error.

• UH-1H - 1330 hours - On an NOE reconnaissance training mission, the PIC initiated a climbing right turn to about 150 feet agl to observe a terrain area of interest and subsequently entered a dive back to treetop level. The level-off from the dive back to NOE altitude was initiated late and the rate of descent carried the aircraft into the trees. A tree strike separated the tail rotor assembly from the aircraft, which then entered a spin. The Huey was then autorotated into the trees. All occupants exited unassisted and the aircraft was consumed by a postcrash fire. The pilot inaccurately estimated the aircraft's closure rate with the top of the trees, flew at an excessive NOE airspeed, and, upon seeing his plight, applied aft cyclic. This caused the tail rotor to hit the trees and separate from the aircraft. Cost of aircraft damage was $618,055 (total loss) and there was one minor injury.

• UH-1H - 1445 hours - As the helicopter was approaching a confined area, the main rotor blades struck trees on the left side of the approach path. Debris was thrown into the tail rotor blades, causing separation of the tail rotor system and the 90-degree gearbox. The aircraft hit the ground while spinning to the right and came to rest upright. All passengers and crew exited without assistance. The deficiency in the system was again the pilot/crew.

Earlier in the flight, as the aircraft was taking off from a confined area, an unexplainable loss of 200 engine rpm ($N_2$) occurred. The pilot continued the flight even though he perceived a significant maintenance or materiel problem. He should have landed as soon as practicable.

During the initial portion of the approach, the pilot was distracted because the rpm warning light had come on. This resulted in his failure to establish a proper approach angle. During the approach, the pilot's attention was focused inside the cockpit on the engine tachometer in anticipation of an engine rpm droop, and he did not maintain an approach angle that would allow obstacle clearance. The pilot didn't discuss the potential problem with the other crewmembers because he didn't want to unduly alarm the passengers who were monitoring the intercom. This mishap resulted in two minor injuries and a damage cost of $618,055 (total loss).

• UH-1H - 1040 hours - During terrain flight at an airspeed of about 60 knots and an altitude of 35 to 50 feet agl, the pilot attempted a deceleration maneuver during a left turn by rotating the aircraft about the center of gravity rather than the tail rotor horizontal plane. This decreased the altitude of the aft tail boom, causing it to strike the treetops. The tail rotor system and 90-degree gearbox separated, and the aircraft spun twice before the

(continued on next page)

# Let's stop hitting the trees

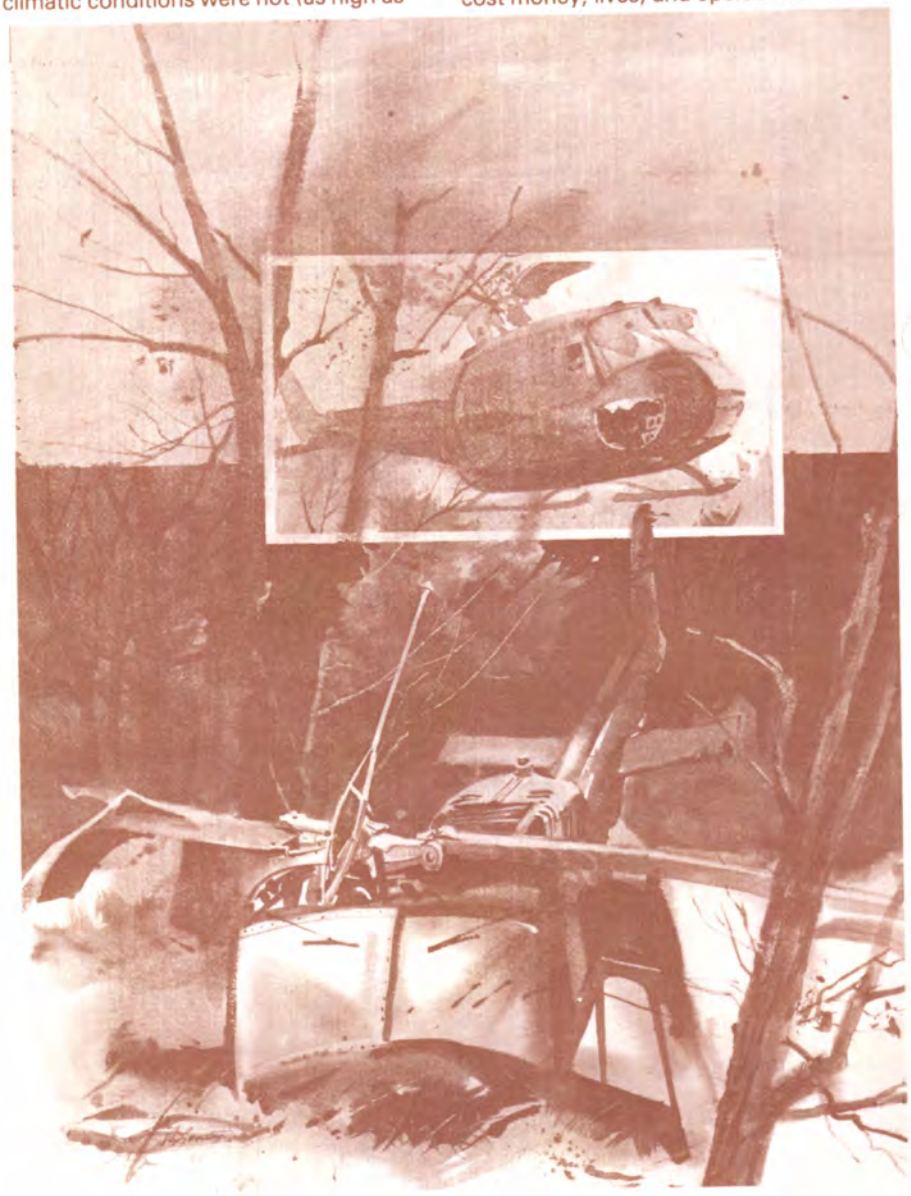
pilot closed the throttle and autorotated into the trees. Three passengers were thrown from the aircraft at impact and the copilot sustained fatal injuries from penetration of the cockpit by the horizontal stabilizer bar. The aircraft was equipped with a tactical utility restraint device in lieu of passenger seatbelts. This system was ineffective in restraining passengers and mission equipment and contributed to the degree of injury of at least two personnel.

The pilot's actions probably resulted from his inaccurate estimate of his height above the trees. The combined deceleration and left turn maneuver compounded the degree of difficulty in estimating obstacle clearance. This mishap resulted in six major injuries and one fatality. Use of the tactical utility restraint device was discontinued. Damage cost was $673,532 (total loss).

• OH-6A - 2345 hours - As the aircraft was picked up to a hover, it was enveloped in a dust cloud. The pilot turned on the landing light, which further complicated the loss of visual reference. He then turned off the light and tried to set back down. The aircraft drifted into a nearby tree and the main rotor blade hit a 10-inch branch. The aircraft then landed hard and rolled over on its left side.

The pilot did not execute a maximum performance takeoff, the recommended course of action from a dusty area (TC 1-13, page 27), because of poor judgment and overconfidence in his abilities. Fatigue probably contributed to the pilot's improper actions. The mishap occurred at 2345 hours, the pilot had a short, restless sleep the night before, and the climatic conditions were hot (as high as 115° F.). The cumulative effects of these factors very likely led to fatigue and an accompanying letdown in alertness. Damage cost was $140,450.

These mishaps are typical examples of how erosion of pilot judgment and breakdowns in crew coordination have cost money, lives, and operational



readiness. Can we afford to keep this up? It's apparent the taxpayers can overcome the cost of these pilot deficiency mishaps and we can get new people in the cockpit to replace those we've killed or maimed. In peacetime, the niche in our operational readiness is of little significance, but what about the real thing? When the enemy tanks are crossing the FEBA, can we accept our Cobra's sticking their tail rotors in the trees? We all know the answer, yet tree strikes continue to be common and the pilots who are responsible escape unscathed. If we are to be effective in combat, we must train for combat realistically and this infers not compromising our assets needlessly through preventable mishaps. Remember, the assets lost on the way to the battle cannot favorably influence its outcome.

We can't attack the tree strike problem like we did wire strikes and develop a protective system, so we must concentrate on the source of the problem to get it under control. The individual aviator who understands the need to keep his aircraft airworthy and who exercises good judgment and professional flying techniques will lick the problem. Some measures have been identified which should be effective in reducing tree strikes. A brief discussion of each should help you start your tree strike prevention campaign.

• **Awareness.** All crewmembers should be aware of the tree strike problem and the adverse or potentially adverse effect it has on operational readiness and/or the unit's ability to accomplish its mission. Other items of information that can be publicized are the cost, in terms of money and injuries, and the extra work it causes already overworked maintenance personnel. The tree strike problem should be kept alive during briefings, safety meetings, and plain old hangar talk. One thing is certain. We can't prevent a problem unless all parties are aware there is a problem and understand its consequences.

• **Procedures.** Review SOPs and directives relative to terrain flight and make sure they reflect measures for minimizing inherent risks to the types of missions being flown. SOPs should also spell out crew duties in detail, not just PIC and copilot, but pilot at the controls and pilot not at the controls. Specific duties of other crewmembers relative to flying and nonflying functions also should be addressed.

• **Crew coordination.** Using all crewmembers to look for and warn of obstacles is a key to eliminating tree strikes. The pilot at the controls generally has his hands full flying the aircraft. He must be assisted in maintaining clearance and spotting obstacles outside. Things that require attention inside the cockpit should be accomplished by the other crewmembers so the pilot can keep his head out. When using the weapons systems, the pilot must not forget about flying the aircraft and the copilot must be especially cognizant of obstacles and drift.

• **Supervision.** Supervision is very important. A tolerant attitude toward tree strikes will do little to reduce the problem. Pilots who demonstrate errors in judgment and/or flight discipline, whether they result in aircraft damage or not, should be made aware of their shortcomings and challenged to do better. Supervisory personnel should also insure that they don't contribute to the problem by overmotivating or by not observing rest requirements.

• **Flying skills.** Professional pilots know their aircraft, its capabilities, and its limitations. They understand its dimensions and clearance requirements. They also know its weaknesses, such as tendency to run out of left pedal when hovering in a quartering tailwind condition and/or with high gross weight. They understand power requirements and know how much their helicopter will carry safely. They understand their own capabilities and those factors, such as fatigue, that affect their judgment and ability to react to unforeseen events. If they will take all the things they know and tie them together, the Army will no longer have a tree strike problem.

Point of contact at the Safety Center concerning tree strikes is Major Kenton, AUTOVON 558-3901/3913. ■

# Selected mishap briefs

**uh1** **Class C mishaps** ☐ (H series) Aircraft flew through flock of birds at night. Three birds hit aircraft, breaking left chin bubble. ☐ (H series) Crew chief was getting out of aircraft after runup so pilot could get in. When crew chief got up, his foot lifted the collective and aircraft came up 12 to 18 inches. Copilot in left seat felt aircraft come up and pushed down collective, resulting in hard landing.

**Class E mishaps** ☐ (H series) After engine was started, copilot got out of aircraft to check for leaks and found fuel streaming from engine cowling. Fatigue failure of coupling assembly resulted in fuel leak. ☐ (H series) Combat-loaded soldier was confused about which side to load on. He changed directions and snagged his gear on nose-mounted pitot tube, cracking mount. ☐ (H series) PIC allowed copilot to make approach too fast in downwind mode with moderate turbulence forecast. Aircraft was overtorqued to 55 pounds.

**uh60** **Class A mishap** ☐ Dual engine power loss occurred during approach and aircraft crashed into trees. Pilot, copilot, and crew chief were injured. 8158

**Class C mishap** ☐ When jumper was told to open door, he accidentally pulled left cargo door window jettison handle. Cargo door window was lost.

**ah1** **Class E mishap** ☐ (TH-1G) Increase/decrease switch would not beep up or down during runup. Caused by failure of linear actuator.

**ch47** **Class E mishaps** ☐ (B series) High side beep failed on No. 2 engine during flight. Caused by failure of $N_2$ actuator. ☐ (C series) Master caution and transmission hot lights came on. Caused by deteriorated snubber. ☐ (C series) Oil leak from combining transmission area was caused by failure of elbow tube. ☐ (C series) No. 2 rectifier light came on, and circuit breaker would not stay in. Caused by defective transformer.

**oh58** **Class E mishaps** ☐ (A series) Compressor stall during simulated antitorque maneuver was caused by bleed valve failure. ☐ (A series) As pilot was hovering aircraft over grassy area, small hand-held flare parachute flew into rotor blade. Weight on parachute hit and dented bottom of blade. Tall grass concealed parachute.

**c7** **Class E mishaps** ☐ Hydraulic pressure was lost and hydraulic reservoir showed loss of fluid during flight. Caused by failure of hydraulic flex line. ☐ As pilot was taxiing from parking area and turning right, he stopped when it appeared left wing tip was too close to parked aircraft. Ground personnel signaled there was room and pilot continued to taxi forward at slow rate. After departure, pilot was told wing tip might have touched the other aircraft. Small crack was found in fiberglass of left

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **5** |
| | June | 2 | 4 | June | **6** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | August | **6** | **3** |
| | September | 3 | 1 | 1-9 Sep | **0** | **0** |
| | Total for Year | 37 | 26 | Total to Date | **43** | **26** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

wing tip. Aircraft had been written up that turns to the right took a wider radius than turns to the left. Maintenance inspection revealed that the nose wheel would turn 60 degrees to the left and only 35 degrees to the right. Normal turn is 60 degrees in both directions. Nose steering actuator was changed.

**u21** **Class E mishaps** ☐ (G series) Flaps would not extend beyond 60 percent before landing or retract after landing. Caused by failure of flap motor. ☐ (RU-21H) Right fuel transfer light came on, and fuel quantity in right nacelle tank indicated zero. Shortly afterward, No. 2 engine flamed out. Single-engine landing was made at home base. Failure of thermal relay caused fuel transfer pump to become inoperative. Eighty gallons of fuel remained in right wing. ☐ (A series) Smoke and electrical odor in cockpit during taxi were caused by binding axial vane fan.

# Maintenance

**uh1** **Class C mishap** ☐ (H series) Grinding noise was heard from tail rotor drive shaft cover after engine shutdown. Screwdriver was found under No. 2 drive shaft section.

**Class E mishaps** ☐ (H series) Takeoff was aborted when fuel began spraying from starting fuel hose assembly onto engine and engine deck. Nut attaching fuel hose assembly to check filter valve on top right side of engine was not secure and could be turned by finger pressure. ☐ (H series) When throttle was closed during shutdown, engine oil pressure light did not come on. Caused by overtorque of cannon plug. ☐ (H series) Transmission oil pressure dropped to 3 psi during runup. Self-locking nut on transmission oil filter clamp had backed off.

**ah1** **Class C mishaps** ☐ (S series) Loud bang was heard during flight. Pilot lowered collective and started right turn into the wind. He then noticed $N_2$ and rotor speed beginning to increase. Engine throttle was rolled back slightly and rpm was controlled by increased collective. About 75 feet and 70 knots, pilot decelerated. Running landing was made. Just before touchdown, pilot heard another loud bang. After shutdown, pilot noticed the area around scissors and sleeve assembly was red hot. Smoke was coming from scissors and sleeve area and rising from upper pylon cowling area. Bearing stack of sleeve assembly had failed because of lack of lubrication. Lack of lubrication was most probably the result of failure of vendor to hand pack bearings and failure of contractor to grease assembly correctly during buildup. ☐ (S series) Crew heard unusual noise from tail boom area during flight. Postflight inspection revealed screwdriver had been left under tail rotor drive shaft cowling, causing damage to drive shaft. ☐ (G series) When 42-degree gearbox was checked during preflight, pilot noticed pair of pliers under No. 4 tail rotor drive shaft and damage to drive shaft and clamps. Aircraft had been test flown three days before for installation of tail rotor, and damage was not noted on postflight because 42-degree gearbox cover is not removed for postflight inspections.

**Class E mishap** ☐ (S series) Master caution and No. 2 hydraulic lights came on, and cavitation of hydraulic pump was heard. Running landing was made. Caused by overtorque of hydraulic line. *(continued on next page)*

# Mishap briefs

**ch47** **Class C mishap** ☐ (C series) Postflight inspection revealed No. 3 drive shaft was scored by resilient mount bolt which had lodged under drive shaft. Bolt had been removed during phase inspection and a new one installed. Old bolt was left in tunnel area.

**Class E mishaps** ☐ (B series) High frequency vibration around No. 1 engine area was noticed during ramp check. Caused by lack of lubrication in drive shaft on engine to transmission shaft. ☐ (C series) Crew chief noticed oil leak in aft transmission area. Retaining clamp to aft transmission position of supply line was not installed, allowing line to chafe against combining transmission drip pan.

**oh58** **Class E mishaps** ☐ (A series) Generator would not stay on line during runup. Oil left from phase inspection seeped into generator and kicked generator off line. ☐ (A series) Master caution light came on, followed by stiffness in controls. Running landing was made. Hydraulic hose assembly was chafed after teflon bushing was worn away from hose clamp, resulting in ruptured hose and loss of hydraulic assist. ☐ (A series) Low rpm audio and engine-out light activated, and $N_1$ and $N_2$ decreased. Caused by loose dual accumulator and double check valve.

## Messages received

- Safety-of-flight maintenance notice concerning UH-60A stabilator actuator special inspection (UH-60A-81-23, 241545Z Aug 81).
- Safety-of-flight maintenance notice concerning UH-60A T700-GE-700 engine inlet particle separator blower failure (UH-60A-81-24, 261520Z Aug 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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# On crashing and burning

With today's sophisticated ejection seats, and extremely reliable aircraft (and crashworthy fuel cells), there remains little talk of the once common topic of crashing and burning. One might hear an infrequent reference to the subject in conversations between aircrewmen, but it is clear that crashing and burning does not receive the attention that it once did.

The fact that aircraft crashes and their subsequent fires are not everyday topics does not mean that these events have ceased to exist. Aircraft crews still practice the emergency procedures designed to combat the risk of emergency egress; in many aircraft that briefing is a required part of each mission brief. Most crewmen would agree that it is good judgment to have a predetermined plan of action ready for such emergencies, but it is not always clear how much critical thought has been given to these plans. Perhaps it would be beneficial to review the hazards associated with aircraft crashes and fires before continuing this discussion.

## Aircraft crashes

Every pilot has a vision of a stereotype aircraft crash, and most flyers have seen posters explaining the hazards of flight illustrated with pictures of early aircraft in interesting but unplanned attitudes. Every crewmember has also participated in the monthly safety meetings which discuss and show the results of aircraft crashes. However, it is not always true that these same flyers have examined all the forces that affect an object striking the ground.

Studies have shown that an aircraft crash is not an instantaneous smoking hole but instead is the result of a sequence of events that lead to that hole. The injuries associated with aircraft crashes can also be attributed to several factors. Clearly, one potential cause of injury is the deceleration of the occupants upon striking the ground. But, one must also consider the injuries resulting from the collapse of the aircraft structure, the impact of objects hurtled through the crew compartment, and the potential for the unrestrained or inadequately restrained passenger to also fly about the cockpit.[1]

The aircraft flown today have been designed to counter many of these potential hazards, but these forces cannot be eliminated. The crewmember protected by his helmet and secured to his ejection seat must still dissipate the energy of a crash. If that energy is great enough or his equipment fails, the crewmember is no longer as well protected, and he may be injured. If this equipment is improperly worn or adjusted, the flyer is again subjected to unnecessary risks. In a study of aircraft injuries,[1] it was found that 54 percent of the fatalities were caused by head injuries; 68 percent of the survivors also had injuries to the skull. The potential for injury, whether protected or not, is always present in an aircraft crash. Even if there are no injuries, we should still expect the aircraft to be damaged, making egress from the wreck all the more difficult. Besides the usual damaged canopy system or the jammed hatch, one of the most common hazards is the postcrash fire.

## Aircraft fires

After an aircraft impacts any object, one would expect damage to the aircraft. In aircraft impacts with the ground, 87 percent have caught fire.[2] These fires may be caused by ruptured fuel tanks or electrical faults or other causes, but the crew on board must still combat the fire if they are to escape. Not only must the crew counter the fire, they must also contend with the gases produced by the fire. In many cases, this combination of heat and fumes allows those on board the aircraft mere seconds to escape.[3] The high probability of a postcrash fire and the short time available to egress make it vitally important that all crewmembers understand the problems facing them during an emergency.

"FIRE" is usually the one word that no one ever speaks on an aircraft; it is a subject about which one does not ever jest. But there are certain characteristics of aircraft fires that are extremely important for the crewmember to know. Many people would argue that fire-related injuries are caused primarily by heat; some would more astutely answer that the most important fire-related problem is not heat but smoke inhalation. In aircraft fires the most critical factor is the toxic nature of the burning structure's fumes. These fumes and the potential for intense fuel fires make quick egress a necessity.

*(continued on next page)*

# On crashing and burning

All crewmembers are aware of the fire protection afforded by their Nomex gear; it will not burn or melt as easily as the old cotton or nylon suits. Nomex will eventually burn but, more importantly, the flyer will have lost the flight suit's thermal protection long before the suit burns. This equipment was not designed to allow flyers to stay in aircraft fires for a long period of time. The purpose of protective clothing is to offer protection from flash fires while the crewman quickly makes his escape. While it may be an unwritten requirement for flyers to wear their flight suits disheveled to project the proper image, this practice in flight only increases the possible injuries in a fire. Protective equipment is of little use if it is not used properly.

## Crashing and burning

The pilot who lands short of the runway, or fails to counter an excessive sink rate in the final turn, or departs the prepared surface is subjecting himself to a potentially hazardous situation. The potential for structural damage, excessive deceleratory forces, and flying objects are all very real threats. We would expect the average crewmember to be at least taken aback by all this and possibly stunned if not seriously injured. The situation can be infinitely worsened by the high probability of a postcrash fire, and the stunned or injured airman may have only seconds in which to accomplish his emergency egress. It is those few seconds which will determine if a survivable crash just became unsurvivable.

There are times when no amount of good looks, or flying skill, or even blind luck is going to get a flyer out of a bad situation. There are not many of us who have not been faced with an on-board fire, or brake or hydraulic failure. Likewise there are few instructors who have not sat through their student's learning to judge sink rate in the final turn. With this in mind, it might be wise to consider some improved protection. Wearing shoulder harnesses even when not required in your crew position is a good idea. It is also smart to roll down your flight suit sleeves and to carry two pairs of flight gloves—one for the dirty, greasy preflight and another clean pair for flight. Or one might consider wearing thermal underwear, which will provide additional thermal protection and help dissipate the heat of a fire.

Every aircraft operators manual recommends that aircrews not place loose items on the glareshield or leave such items lying anywhere around the aircraft. Those objects can become lethal projectiles during a crash. There are a great many other protective measures which could be taken but they, too, are often overlooked. When one is considering the hazards of an aircraft crash and the very few seconds a flyer may have to escape probable postcrash fire, every precaution taken beforehand becomes an aid to survival. Combined with a well thought out egress plan, those precautions could be the factor that makes a crash survivable. ■

## References


1. Pesman, Gerald J. and Eiband, A. Martin: *Crash Injury,* NACA Technical Note 3775.
2. Lucha, G. V., Robertson, M.A., Schooley, F.A.: *An Analysis of Aircraft Accidents Involving Fires,* NASA CR 137690.
3. Neel, Carr B. et al: *Heat Shields for Aircraft-A New Concept to Save Lives in Crash Fires,* Astronautics and Aeronautics.


**—from FLYING SAFETY**

# Mishap review

## Synopsis

The UH-1H pilot flared the aircraft during terrain flight, allowing the aft part of the tail boom to hit the tops of some trees. The tail rotor system and 90-degree gearbox separated. The aircraft spun twice and was autorotated into the trees. It was destroyed on impact with the ground.

## History of flight

The Huey was on a tactical service mission. A PIC, copilot, crew chief, and five passengers were aboard the aircraft with the cargo doors open. The PIC initiated a confined area takeoff from an LZ and climbed to 35 to 50 feet above the trees before accelerating to 60 to 70 knots indicated airspeed. The PIC, in the left seat, had been flying for about 2 to 3 minutes, using terrain flight techniques, and was in a left turn when he initiated a deceleration by raising the nose of the aircraft. The aft part of the tail boom hit the tops of some trees, knocking off the tail rotor and 90-degree gearbox. Collective was then increased and the aircraft began to spin to the right. After two or three revolutions, the PIC reduced the throttle to flight idle, which stopped the spin. The aircraft was then allowed to descend vertically. All remaining collective pitch was applied before the aircraft hit the trees. The Huey then hit the ground in a 30-degree nose-down attitude.

On impact with the ground, three passengers were ejected from the aircraft. Two sustained major injuries and one was slightly injured. The copilot was killed when the stabilizer bar hit him in the back and pinned him against the instrument console. The PIC, crew chief, and two other passengers sustained major injuries.

## Crewmember experience

The PIC had more than 600 rotary wing flight hours, most of them in the UH-1H. The copilot had more than 200 rotary wing hours. Most of his hours were also in the UH-1H.

## Commentary

The PIC misjudged his clearance from the trees and initiated a deceleration while in a left turn by applying aft cyclic instead of leading with collective pitch, as recommended by FM 1-51. The Huey rotated nose up around the center of gravity instead of the tail rotor horizontal plane. This decreased the altitude of the aft tail boom, resulting in the tree strike.

The aircraft was equipped with the tactical utility restraint device. This device was used to restrain the troops sitting on the UH-1 floor. It consisted of several lapbelts snapped together, with each end of the section of belts fastened to cargo tiedown rings. During the mishap sequence, three troops were injured when they were thrown out of the aircraft. The injuries probably could have been avoided or reduced in severity if troop seats and lapbelts had been used. The practice of removing troop seats any time troops are carried on board the aircraft substantially increases the risk of injury in the event of a crash. ■

# Selected mishap briefs

**uh1** **Class B mishaps** ☐ (H series) During right hover turn with sling load, full left pedal application did not stop turn. Aircraft pitched nose down in right turn. PIC took control and saw torque indicator at 60 psi. Left cyclic application did not correct bank and nose pitched further down. Sling load was jettisoned and aircraft stabilized, then landed. 8159 ☐ (H series) Student pilot did not apply initial pitch during low-level autorotation to sod LZ. IP took control and attempted power recovery. Aircraft yawed right and left skid and main rotor blades hit sod. Aircraft came to rest upright. 8160

**Class E mishaps** ☐ (H series) Garlock seal on starter generator failed, causing oil to saturate generator. Aircraft would not start. Garlock seal and starter generator were replaced. ☐ (H series) Pilot felt feedback in cyclic during approach. Caused by failure of main rotor mixing lever inboard bearing. ☐ (H series) Fireguard saw fuel leaking from main fuel filter during engine start. Caused by failure of coupling assembly.

**ah1** **Class E mishaps** ☐ (S series) Engine oil pressure fluctuated during hover. Caused by failure of transducer. ☐ (S series) Aircraft began to descend while hovering in firing position. To stop descent, pilot applied power. With power application, torque reached 101 percent for about 2 seconds. Overtorque light flickered, then went out. ☐ (S series) As aircraft was landing to confined area, sheet of corrugated metal blew up from ground and hit main rotor blade. Metal was rusted and blended with surrounding desert terrain.

**ch47** **Class E mishaps** ☐ (C series) Rotor rpm and torque fluctuated during runup. Caused by failure of tachometer generator. ☐ (C series) When pilot moved No. 2 engine condition lever to ground during HIT check, No. 2 engine quit. Caused by failure of $N_1$ actuator.

**oh58** **Class A mishap** ☐ (C series) Aircraft was seen in a spin about 50 feet above some trees before it crashed. Aircraft hit the ground in an upright position which caused fuselage to break immediately forward of rear seat, transmission to fall forward and through cabin top, and tail boom and tail rotor drive shaft to break just aft of tail boom attaching point. 8161

**Class E mishaps** ☐ (A series) Pilot noticed airspeed indicator at zero during takeoff. Insect was found in pitot static tube. ☐ (A series) Aircraft would not shut down when throttle was closed. Fuel valve handle was pulled off and engine shut down after about 30 seconds. Caused by malfunction of fuel control. ☐ (A series) Unusual noise was heard during takeoff. Bleed air line had broken away from elbow assembly at 1 o-clock position on diffuser. ☐ (A series) When pilot looked up to see if blade was turning during engine start, his finger slipped off starter button. He tried to reengage starter and missed. He then closed throttle and saw TOT at top of scale. ☐ (C series) Transmission oil light came on during hover. Caused by moisture on pressure switch.

**u8** **Class E mishap** ☐ (F series) When power was reduced to cruise after climb to 4,000 feet, No. 1 engine failed. Proper emergency procedures were followed and confirmed with checklist. Aircraft was landed at airfield.

**t42** **Class E mishap** ☐ As pilot taxied onto runway, right engine stopped. After some difficulty in restarting engine, aircraft was taxied back toward ramp. When crew noticed two mechanics approaching aircraft with a fire extinguisher, both engines were shut down and crew exited aircraft. Fire had started under right wing aft of exhaust stacks while aircraft was being lined up for takeoff. Apparent cause of fire was ignition of oil residue which had collected on underside of wing.

**u21** **Class E mishaps** ☐ No. 2 engine $N_1$, torque, and fuel flow fluctuated during approach. Fuel was leaking between fuel control and fuel pump. Caused by failure of fuel pump shaft seal. ☐ (A series) Pilot's communications and intercom became inoperable, and smoke was seen coming from audio control panel. Caused by burned-out capacitor.

**c12** **Class C mishap** ☐ (A series) Lightning flashed on right wing tip. Two to three minutes later, pilot's outer windshield began to crack. After aircraft was landed, small hole was found in trailing edge of right wing and small area on left wing was burned. Lightning entered top of pilot's windshield and exited right and left wing tips.

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **5** |
| | June | 2 | 4 | June | **6** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | August | **6** | **3** |
| | September | 3 | 1 | 1-16 Sep | **0** | **0** |
| | Total for Year | 37 | 26 | Total to Date | **43** | **26** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

# Maintenance

**uh1** **Class C mishaps** ☐ (H series) Pilot heard loud grinding noise during engine runup. Tail rotor drive shaft was severed. Starter generator drain port was fitted with incorrect hardware, causing drive shaft tunnel to rub drive shaft. ☐ (H series) Aircraft was started to check for lateral vibration after adjustment of main rotor blade sweep. After about 20 seconds at flight idle, loud noise was heard and aircraft was shut down. Blade alignment scope had been left on top of main rotor blade. Scope hit blade, causing hole in leading edge, and was thrown into parked helicopter about 100 feet away, hitting side of transmission bulkhead.

**Class E mishaps** ☐ (H series) Master caution and chip detector lights came on. Frayed transmission chip detector wire caused system to ground out. ☐ (M series) Fire warning light came on, and running landing was made. Fire warning detector wiring lead harness was pinched between engine cowling and cowling frame. ☐ (H series) Copilot felt stiffness in collective during pitch changes. Cotter pin was bent straight and was binding against pivot bar on collective irreversible valve. *(continued on next page)*

# Mishap briefs

**ah1** **Class E mishap** ☐ (G series) Squealing noise was heard, followed by No. 1 hydraulic and master caution lights. Running landing was made. Caused by chafed hydraulic line.

**ov1** **Class E mishap** ☐ (RV-1D) No. 1 engine failed when reverse thrust was applied during landing roll. Self-locking nut backed off of shear bolt, allowing control rod free travel along serrated portion of sector assembly. When power levers were put into reverse, control rod was probably far enough out of rig to put fuel control in fuel cutoff position. Fuel control unit will be replaced.

## Messages received

- Safety-of-flight maintenance notice concerning AH-1 collective hub assembly bearing (AH-1-81-25, 011300Z Sep 81).

- Safety-of-flight maintenance notice concerning change in repair procedures for UH-1 landing gear skid shoes (UH-1-81-10, 031430Z Sep 81).

- Hq DA message concerning change of policy regarding designation of aircraft for emergency procedures training (312046Z Aug 81). Message rescinds DA policy to designate specific aircraft for conducting practice touchdown autorotations and simulated tail rotor failures.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# Fuel siphoning

Sixteen cases of fuel cap siphoning have been reported this fiscal year. Check the tightness of your fuel caps before each flight. ■

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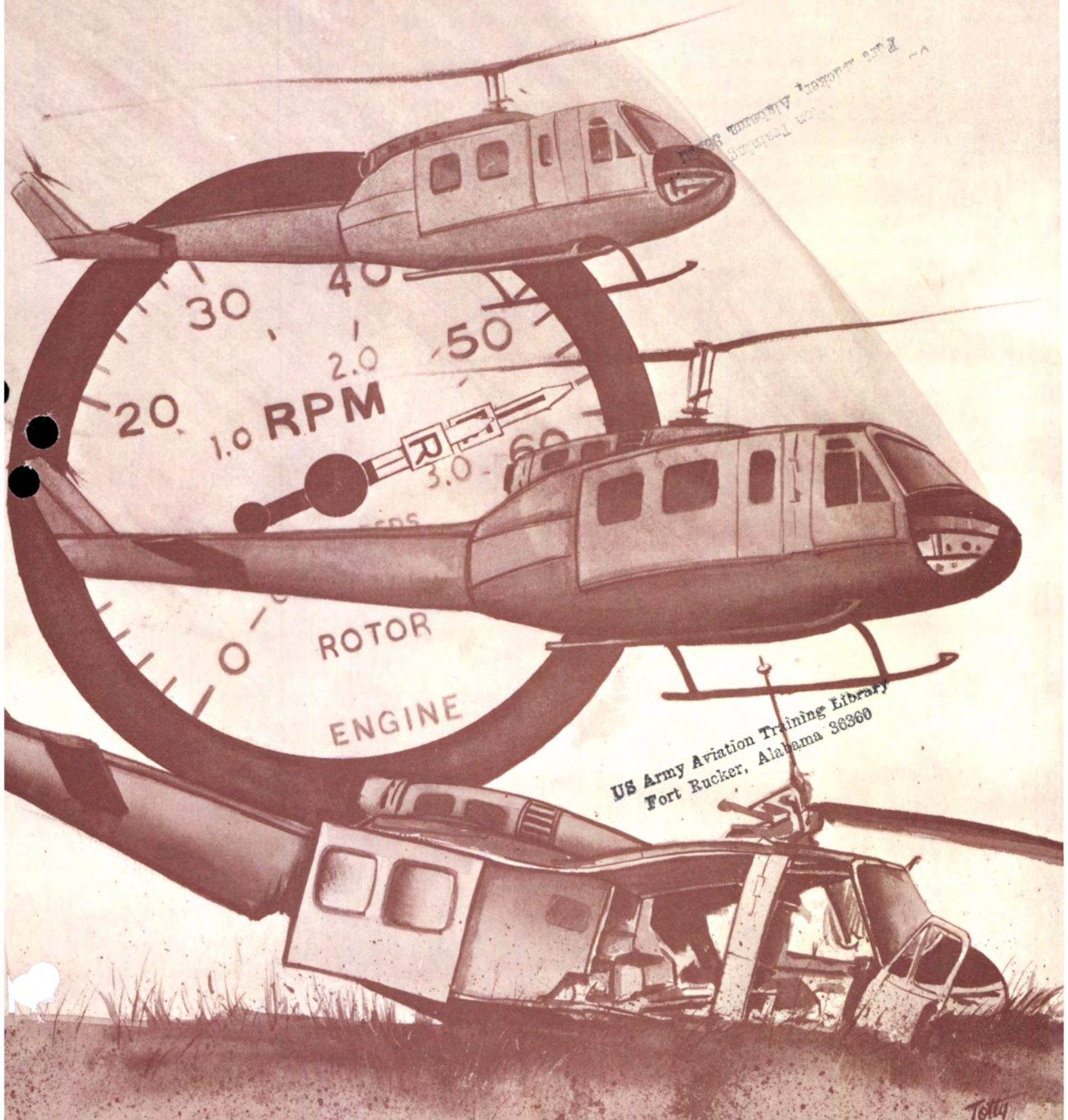


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# Technique . . . or lack of knowledge?

In the early morning haze the flight crew was going through its daily routine, getting ready to fly a support mission. The PIC arrived at the helicopter and told his crew that their mission would be a snap—an ash and trash resupply. Shortly after the crew completed the preflight, a truck drove up with the load they were to carry. The PIC looked at the load and said, "This looks like a three-load mission but if we stack the cases right, we can probably make it in two trips."

While the UH-1 was being loaded, the PIC left the flight line to have a last cigarette before the flight. On his return, he signaled the copilot to strap in and get ready for takeoff. During the engine start and runup procedures, he looked back to see if the crew chief was ready. The cases were all he could see.

With the runup completed, the pilot picked up to a hover. The rpm promptly bled to 5900 and the helicopter settled back to the ground. Again he picked it up, this time with a little more care. The rpm bled to 6000 and the Huey again settled to the ground. The copilot said, "Maybe we have too many cases aboard." The pilot smiled and replied, "Relax. This is where technique comes in. I've handled loads like this a hundred times!"

After several tries, the pilot finally repositioned the helicopter on the runway. On takeoff, the helicopter resembled a frog trying to make it back to the pond. The Huey skipped along the runway, became airborne, then settled back to the ground. Finally, just before reaching the end of the runway, with the low rotor audio sounding off, it lurched into the air.

The pilot adjusted cruise power and began to explain to the copilot the fine points of the maneuver he had just performed. "At first it's a little hairy, but it's easy once you learn the technique."

The en route portion of the trip was uneventful, though it took a very high power setting to maintain straight and level flight. Laughing and joking, the pilot navigated toward the LZ. The sun had

burned away the haze and the outside air temperature had increased from 26° to 30° C. It was becoming another hot day.

The pilot pointed to a small ridgeline. "That's the LZ down there at 10 o'clock." It was at the edge of what appeared to be remnants of an old worn-out mountain. Visibility was excellent and there was no sweat about dust. With these factors in his favor, the pilot briefed the copilot on the type of approach he would use to make the pad without overshooting or having to come to a hover and reposition.

Although the pilot planned and explained his approach, he failed to consider the problems he'd had during takeoff. The approach appeared to be a beautifully executed steep one. As he entered the final phase, the pilot flared and applied collective to slow his rate of descent. The helicopter began to shudder and vibrate. The pilot sensed an emergency and attempted to make a go-around. As he added a little more collective, the copilot cried, "We're losing rpm! It's down to 5800!" At this point, the pilot lost control and the helicopter crashed into the ridgeline, killing the crew chief and seriously injuring the pilot and copilot.

This is one example of many similar mishaps reported each year involving overgross conditions. Close analyses of mishaps initially attributed to main or tail rotor blade strikes reveal many of the blade strikes resulted from uncontrollable conditions caused by loss of rpm.

Pilots involved in mishaps of this type usually complain to maintenance that their engines gave them poor performance at the moment of truth. When maintenance personnel ask, "What was the percent $N_1$, OAT, egt, and torque?" the pilot usually answers, "I was too busy with the emergency to look."

A rotor system will produce only so much lift. Once the system attains this lift, any demand for additional lift will result instead in loss of lift.

The helicopter, like all other mechanical devices, obeys the laws of physics religiously. To maintain flight, a helicopter must maintain rpm. For instance, a decay of only 10 percent of rotor rpm will result in a 19 percent decrease in lift capability. Correspondingly, it can be said that the same can apply to the tail rotor. A reduction in tail rotor rpm would reduce the antitorque capability and/or the tail rotor effectiveness. Those who attempt to develop what they call "techniques" to cope with impossible situations are asking for trouble.

The best insurance against an overgross condition is to know the factors that affect rotary wing performance. They are load/weight, type aircraft, prevailing atmospheric conditions, and terrain. Once an aviator has a basic knowledge of his helicopter's performance, he can adequately plan the loads that he can carry in existing atmospheric conditions. There is no excuse for getting caught in a power deficiency range as a result of an overgross condition. But as long as we have aviators who try to accomplish their missions by substituting technique for available lift, statistics will continue to show a high number of overgross mishaps. Are **you** asking **your** helicopter to defy the laws of physics? ■

# Selected mishap briefs

**uh1** **Class C mishaps** ☐ (H series) As pilot was positioning aircraft to parking spot, tail rotor hit main rotor blade of parked UH-1. ☐ (H series) During adjustment of main rotor high rpm warning system, governor was placed in emergency position, and engine and main rotor exceeded 8000/450 rpm respectively. Pilot was not familiar with the procedures for adjusting main rotor rpm warning system.

**Class E mishaps** ☐ (H series) Shudder was felt through tail rotor pedals and airframe during flight. Postflight inspection revealed tail rotor cover was open and damaged. Crew chief had not secured cowling after preflight and PIC did not check cowling before flight. ☐ (H series) As aircraft was landing in LZ, simulator aggressor forces on the ground fired a flare at aircraft. Flare hit right side of aircraft.

**ah1** **Class E mishaps** ☐ (G series) SCAS began to motor left to right during flight. Caused by failure of transducer. ☐ (S series) Transmission oil bypass light came on during landing. Caused by loose wire to transmission bypass light. ☐ (S series) When pilot decelerated from NOE flight mode, he allowed aircraft to assume a tail-low attitude. Pilot increased collective. IP noticed rapid increase in torque and prevented further increase in collective. Overtorque of 58 psi for 1 second was observed. ☐ (S series) Transmission oil bypass light remained on during runup. Caused by failure of oil bypass switch.

**ch47** **Class E mishaps** ☐ (B series) When SAS was turned off during runup, aircraft rocked fore and aft. Caused by failure of servo cylinder. ☐ (B series) Cyclic was stiff when aircraft was picked up to a hover. Caused by failure of boost actuator. ☐ (B series) No. 2 engine $N_1$ fluctuated between 86 and 90 percent during hover/taxi. Caused by malfunction of control box and beep resistor. ☐ (C series) Bleed band on No. 1 engine began popping when aircraft was picked up to hover. Caused by failure of bleed band actuator. ☐ (C series) As aircraft was hovering for slingload hookup, crew saw ground personnel's raingear fly through the air. Rain jacket hit front rotor blade.

**oh58** **Class E mishaps** ☐ (A series) About 10 seconds after generator was turned on, amp gauge reading dropped to zero. Caused by sheared starter generator drive shaft. ☐ (A series) Low rpm audio and light activated during takeoff. Caused by malfunction of governor double check valve accumulators. ☐ (C series) Primary directional control jam and disengage lights came on during landing. Caused by short in wire. ☐ (C series) Fore and aft cyclic binding during flight was caused by magnetic brake failure.

**u21** **Class E mishap** ☐ (F series) Left bleed air fail light came on during flight. P3 line in left wing ruptured, causing polyflo line and outer covering of flap shaft actuator drive cover to melt.

**c12** **Class E mishap** ☐ (A series) Right engine fire warning light would not go out following preflight runup. Caused by failure of fire detection probe.

## FY 81 Fourth Quarter Countdown

| | | FY 80 | | | FY 81 | |
|---|---|---|---|---|---|---|
| | Month | Class A Mishaps | Fatalities | Month | Class A Mishaps | Fatalities |
| 1st Qtr | October | 4 | 2 | October | **2** | **2** |
| | November | 5 | 4 | November | **5** | **4** |
| | December | 0 | 0 | December | **1** | **1** |
| 2nd Qtr | January | 3 | 4 | January | **8** | **4** |
| | February | 3 | 7 | February | **4** | **3** |
| | March | 3 | 1 | March | **4** | **1** |
| 3rd Qtr | April | 2 | 1 | April | **1** | **0** |
| | May | 4 | 0 | May | **5** | **5** |
| | June | 2 | 4 | June | **6** | **3** |
| 4th Qtr | July | 2 | 1 | July | **1** | **0** |
| | August | 6 | 1 | August | **5** | **3** |
| | September | 3 | 1 | 1-23 Sep | **0** | **0** |
| | Total for Year | 37 | 26 | Total to Date | **42** | **26** |

**Is your safety record the result of detailed planning, preparation, and professional performance, or is it just a matter of luck?**

**c7** **Class E mishaps** ☐ Hydraulic pressure fluctuated and low pressure light came on after level-off. No-flap landing was made. Caused by ruptured hydraulic line in left wheel well. ☐ When landing gear was lowered, no transit light or right main gear light was noted. Visual check showed gear was down and locked. Caused by broken wire to microswitch.

# Maintenance

**uh1** **Class C mishap** ☐ (H series) Preflight inspection revealed feeler gauge in aft portion of tail rotor drive shaft tunnel. Front half of No. 4 drive shaft was scored.

**Class E mishaps** ☐ (H series) Several flight hours after installation of new style thick wall mast assembly, it was noted during inspection that main rotor hub split cones were not evenly spaced, indicating loss of torque on main rotor hub retaining nut. The split cones were respaced and main rotor hub retaining nut was retorqued. Several flight hours later, the same problem occurred again. The main rotor hub split cones were replaced. Several flight hours later, the problem recurred. Investigation revealed that the main rotor mast split cone grooves were machined too low on the mast splines, causing main rotor hub retaining nut to bottom out and tighten to the correct torque without putting any torque on main rotor hub and split cones. ☐ (H series) Gas producer hung at 35 percent during start, egt increased to 610 degrees, and battery voltage dropped to 16 volts. Start was aborted. Cleaning rag left in engine inlet had been ingested by engine.

**ah1** **Class E mishaps** ☐ (G series) Master caution and transmission oil bypass lights came on. Wire leading to transmission manifold switch was frayed. ☐ (S series) Maintenance test pilot landed aircraft next to POL refueling pad. Pilot ran aircraft to 150 pounds indicated fuel remaining to check for proper illumination of 10 percent fuel caution light. When light did not come on, pilot determined light was inoperative and tried to hover aircraft into POL point. During hover, engine flamed out because of fuel starvation. Fuel gauge was incorrectly calibrated, indicating 100 pounds more fuel than was available.

**ch47** **Class E mishap** ☐ (C series) Pitch inputs began when SAS was engaged during runup. Caused by incorrectly balanced SAS.

**c7** **Class E mishap** ☐ No. 1 engine rpm decreased as power was applied for takeoff. Propeller lever arm slipped off governor control. Bolt was safetied, but was only finger tight.

## Messages received

• Safety-of-flight message concerning one-time inspection of UH-60A electrical connector (UH-60A-81-25, 092000Z Sep 81). Summary: Pin "B" has been found loose on several connectors manufactured by Matrix. The faulty connectors have been limited to two lots of late December 1980 and early January 1981 manufacture. The purpose of this message is to require inspection of the connectors to verify that pin "B" is connected properly and to replace any faulty connectors. A loose pin could cause malfunction of the circuits. Contact: Ronald Branson, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight maintenance notice concerning revised MAOT for T73 engines and fuel controls on CH-54 aircraft (CH-54-81-05, 101300Z Sep 81).

• Safety-of-flight maintenance notice concerning removal of AH-1 main rotor head sand deflectors (AH-1-81-26, 111330Z Sep 81).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# Correction

FLIGHTFAX, Vol. 9, No. 46, 2 Sep 81, contained an article titled "Flight Operations Over Snow." The mishap brief at the top of page 4 referred to an AH-1. The aircraft involved in the mishap was actually an OH-58C. ■

# Use your TM

Recently, while the crew chief of a UH-60 was inflating the tire on the tail wheel of his aircraft, the wheel assembly exploded, shattering the wheel rim. Pieces of the rim struck the crew chief, causing a serious eye injury.

During the servicing operation, the crew chief used a nitrogen cylinder properly equipped with a pressure regulator. However, the chuck assembly connected to the air hose was of the hand-held type which is **not** authorized for servicing the high pressure tail wheel tires on UH-60 aircraft. Use of this chuck required the crew chief to place himself dangerously close to the tail wheel and expose himself to unnecessary risk in the event of wheel component failure—a failure that occurred.

As stated in TM 55-1520-237-23-5, proper servicing of the UH-60 tail wheel tire requires the use of a safety chuck pressure gauge (NSN 4920-00-781-8423). This chuck assembly is the screw-on type which permits servicing personnel to stand clear of the tail wheel area while the tire is being inflated to its specified pressure of 90 to 95 psi.

For safety, the TM stipulates that servicing personnel observe the following:

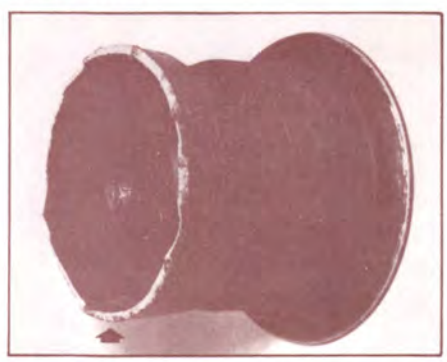
**WARNING**

- To prevent injury to personnel, or damage to equipment, do not inflate tire above its rated inflation pressure.
- To prevent injury to personnel, do not use a high pressure air source or an unregulated air pressure source.
- Never stand beside a tire being serviced. Stand forward or aft of tire.

The failed wheel assembly has been submitted as an EIR exhibit to determine the cause of its failure. But regardless of the cause, this accident clearly shows the need for personnel to observe all safety rules as well as all cautions and warnings stipulated in the various TMs when performing maintenance on any component.

To put it bluntly, for your own safety, **use your TM.** ■

**Unauthorized chuck and fragments of shattered wheel rim are clearly visible on ground following explosion of UH-60 tail wheel assembly.**



**Wheel minus one rim bears mute evidence of the explosive force of a high pressure tire.**

# Stacom

## Aug 80 -Aug 81—DITTO

A year ago STACOM discussed the increased number of Class A mishaps in the month of August.

This year's August record does not appear to show any improvement.

A year ago we stated that: "Inattention to standardization and performance planning were factors in too many of these mishaps. The Directorate of Evaluation and Standardization continues to advise extreme vigilance when operations are conducted in conditions requiring optimum performance. When aircraft gross weight approaches the maximum allowable under existing atmospheric conditions, it does not take much change in density altitude, temperature, wind, aircraft load, or aviator alertness to put the operation on the wrong side of the power curve."

This year: The "extreme vigilance when operations are conducted in conditions requiring optimum performance" was not apparent in an OH-58 mishap resulting from lack of tail rotor authority.

"Inattention to standardization" and total disregard for regulations, unit SOPs, and discipline were apparent in the helicopter mishap resulting from unauthorized high-speed, extremely low-level hotrodding.

These two examples suggest that we as operators and supervisors have not learned very much from lessons of the past. The first example indicates a need for more cogent instruction in a unique flight characteristic of the OH-58.

The second example is more difficult to define. Some might say that it is a breakdown of the mishap prevention program. However, it appears to be inappropriate to fault the mishap prevention program; rather we should say that supervision and discipline were nonexistent when they were most needed. ■

## U-21 oxygen system

Recent Aviation Resource Management Survey (ARMS) team visits have identified problems with the U-21 oxygen system when it is removed or unserviceable, or the aviator does not have an oxygen mask on board. This creates the following deficiencies/restrictions:

- Pilots cannot comply with all U-21 emergency procedures when oxygen is not available. The emergency procedures for fuselage fire (smoke, fumes, etc.) in the U-21 airplane require 100 percent oxygen for the crew. In the event of nicad battery runaway, the battery fumes enter the fuselage through the right lower vent located at mid-fuselage. Opening the pilot/copilot vent windows will not evacuate the fumes, and opening the airstair door in flight is really asking for trouble. The crew must have supplemental oxygen if they are to satisfactorily cope with the emergency.
- Restricts the aircraft's optimal operating altitude for terrain and weather avoidance.
- Restricts the aircraft from operating at higher altitudes in the interest of fuel conservation.

The U-21 oxygen system must be installed and serviceable in order to fully utilize the capabilities of the aircraft and to comply with prescribed emergency procedures. ■

## FAC 2 ATM tasks

Discussions with field units indicate difficulties and possible nonconcurrence with FAC 2 ATM tasks.

The difficulty associated with the accomplishment of mandatory ATM

(*continued on next page*)

tasks, especially those related to terrain flight, is recognized by all associated with aviation training. However, it is necessary for each Army aviator to possess the skills necessary to effectively operate as a member of the combined ARMS team. The tasks designated as mandatory will accomplish this goal while making maximum use of available training time. Aviation managers must develop solutions for balancing the mandatory training requirements outlined within each appropriate ATM. These tasks are the minimum necessary for the maintenance of flying skills considered basic to each Army aviator.

In accordance with paragraph 2-6a, TC 1-134, and paragraph 2-10, AR 95-1, the MACOM may waive the performance of ATM requirements on an individual basis. A blanket waiver of tasks is not authorized. The ATM was designed and developed to facilitate "individual" aviator training. Specifically, where waiver requests involve the accomplishments of FAC 2 tasks, approval of the requests should be granted only after all other possibilities have been exhausted. Adherence to the minimum tasks established in the ATMs is of vital importance to maintain Army aviation as a viable component of the combined ARMS team. ■

## DA Form 4507-1-R

Recurring discrepancies have been noted with the use of the DA Form 4507-1-R. Generally, the gradeslips are not being completed in accordance with chapter 8 of the ATM. All mandatory AAPART items are not being graded and items 52 through 56 are not being used to list specific maneuvers and procedures not listed on the gradeslip. The DA Form 4507-1-R must be properly completed, including all mandatory AAPART items, before the commander certifies the DA Form 4889. ■

Information contained herein generally precedes the formal staffing and distribution of Departmen of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

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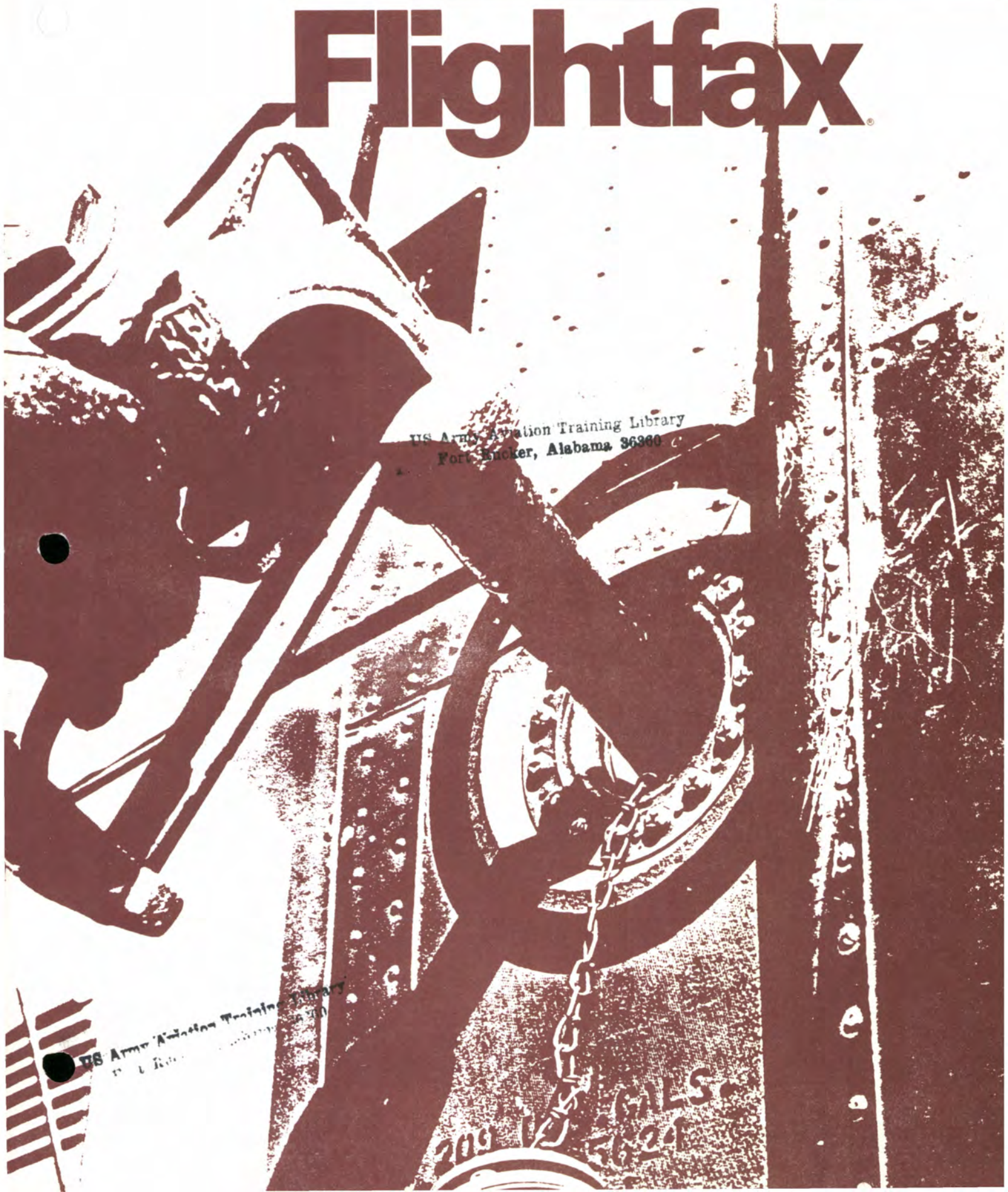

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# Sparking verboten

No, "sparking verboten" is sign posted in some public park, nor does it have anything to do with springtime and young lovers. In reality, these words allude to aviation turbine fuel—more specifically, to a recent fuel additive designed to reduce the possibility of electrostatically induced fires. And it does its job by helping prevent static sparking that could occur during refueling operations.

Until recently, we relied primarily on adequate grounding and bonding of both aircraft and servicing vehicles to prevent static sparks. In addition, we followed the prescribed practices related to safety during refueling operations, such as not servicing aircraft during electrical storms and making sure no radar equipment was being operated nearby.

These and all other safety procedures related to servicing operations must **still** be followed. The use of the conductivity additive in fuel in no way lessens the need to comply with all refueling safety requirements and policies currently in force. The additive simply gives additional protection—over and above that provided by following standard safety procedures.

## Sparks from aircraft

When aircraft are being refueled, static sparks can occur from either the aircraft or from the fuel itself. Even with its engine shut down, a parked aircraft can develop a static charge solely by the action of air flowing over its surfaces. This is the result of friction between two dissimilar materials. If the air happens to be filled with ice crystals, snow, or dust particles, a greater charge can be built up. This charge can be further increased by operating the engine which will speed up the airflow and increase friction. In flight, an aircraft will develop an even greater charge because of its speed. It may also acquire an induced charge by being flown near charged clouds. During the landing roll of a fixed wing aircraft or the ground taxiing of any aircraft, an electrical charge can build up from the friction between the tires and the pavement. But regardless of how a charge develops on the surface of an aircraft, its existence can produce a spark. If such a spark should occur in the presence of fuel vapors, fire and explosion can result.

## Sparks from fuel

Aircraft, however, don't have a monopoly on developing static charges. Aviation

fuels themselves can acquire or build up a charge of static electricity. The amount of charge that will build up within a fuel depends on a number of variables. These include the type of fuel being used, the amount and kind of impurities such as air and water present in it, and the rate of fuel flow. Since JP-4 has the ability to retain more impurities than AVGAS, it is more likely to build up and hold a static charge than AVGAS. As a result, it is more apt to discharge its electricity through a spark.

A static charge develops when fuel rubs against unlike materials as it does when it flows through pumps, filters, pipes, and hoses. During its flow through certain types of clay filters and microfilters, the charge may increase by 10 to 200 percent. If the fuel is shaken, poured, stirred, or splashed, its charge will further increase.

When the fill port of a fuel tank is located at the top of the tank, fuel will pour and splash as the tank is serviced. This falling stream will stir up the fuel already in the tank. If the tank is conductive, the charge will leak off the fuel surfaces that touch the tank. However, the charge on the top surface of the fuel will stay in place for a few minutes because it does not touch a conductor.

## Protection against static sparks

Prescribed grounding and bonding procedures are primarily relied on to protect people and equipment from the dangers posed by static sparks. These procedures include the grounding of both the aircraft and the refueling vehicles as well as the bonding of the fuel nozzle to the aircraft. While these procedures eliminate the external static charge hazard, they have no effect on any internal one that may exist between the space charge in the fuel and the countercharges on the tank walls.

If a high field strength causes a discharge with sufficient energy to be ignitable, and if the vapor-air mixture in the tank is within the explosive region, an explosion within the tank may occur. This condition results from poor fuel conductivity and cannot be influenced by external ground methods. Consequently, standard bonding and grounding procedures will not eliminate any internal static electricity problems. Additional safety measures are needed.

Today, we have one such measure in the form of a conductivity additive. Its presence in the fuel will help prevent electrostatic problems that may be generated as fuels pass through pumps, pipes, and filtration equipment. It does its job by decreasing the time required to bleed off any electrical charge accumulated in the fuel. Or, put another way, it increases the ability of the fuel to get rid of static electricity and, thereby, lessens the danger of fire and explosion from this cause.

The practical value of a conductivity fuel additive can best be seen by examining a recent mishap—one that occurred because the fuel did not contain such an additive.

In this instance, a CH-47 was landed on a pad for open port hot refueling. After all the other tanks had been serviced, the crew chief proceeded to fill the left auxiliary tank. He had serviced the tank for about 30 to 60 seconds, dispensing an estimated 5 to 20 gallons of fuel when he noted flames around the open fuel port. He immediately stopped refueling operations and, with the help of another crew chief, extinguished the flames, using a 15-pound $CO_2$ fire extinguisher. Inspection revealed no damage to the aircraft other than the need for minor IR paint touchup in the area surrounding the fuel cell opening.

Investigation revealed that correct refueling procedures had been followed and all safety requirements satisfied during the servicing operations. No equipment was found to be defective. Investigators concluded that no external ignition source caused the fire but that ignition occurred as a result of a static charge built up and discharged from the fuel itself. This charge was generated by JP-4 falling a distance of about 3 feet at a high fuel flow rate into an almost empty

(continued on next page)

# Sparking verboten

tank which contained JET A fuel. The charge traveled to the fuel port opening and ignited the fuel vapors.

The conditions that existed at the time of the mishap were ideal for the accumulation of a static charge in the fuel and for ignition of the fuel vapors. These included an OAT of 100 degrees F., a fuel temperature of 100 degrees F., wind velocity of 2 knots, and relative humidity of 22 percent. Had a conductivity additive been incorported in the JP-4 fuel, the static spark and resultant fire would most likely have been prevented.

The specification MIL-T-5624L, turbine fuel, aviation, now requires the addition of this product into JP-4 fuel. Responsibility for the inclusion of the additive in the proper concentration of about .75 to 1.0 part per million rests with the fuel terminal. The additive will not be added at the installation level.

Delivery of JP-4 fuel containing the conductivity additive to CONUS Army activities began in August 1980. However, some installations were not slated to receive it until October or later. So your unit is either using it now or soon will be.

All this gives rise to one all-important question: If the conductivity additive is to be included in all future JP-4 fuel shipments, and if it is going to be added at the terminal and not at the installation or unit level, then why all the fuss about the "antistatic" fuel? That is precisely the main point. It goes back to the old saying that a little knowledge can be a dangerous thing. The common reference to this additive is "antistatic." Obviously the use of this term could be misleading as it might give the impression that fuel which contains the additive has suddenly become resistant to static charges and, consequently, is safe. Nothing could be further from the truth. Such an interpretation could result in personnel becoming lax in following the required grounding and bonding procedures during servicing operations. The end result could be serious fire mishaps and injuries.

The fact is that the additive is not antistatic in the sense that it cannot build up or accept a static charge. It is a conductive agent that does its job by providing a low resistance path for excess electrons to bleed off the fuel to the aircraft surfaces and to ground. If it is to do its work efficiently, it is more important than ever that aircraft and servicing equipment be properly grounded and bonded during all refueling operations.

Research has developed the additive, and other personnel are doing the work of insuring that it gets into fuel in the proper proportions. You, in turn, receive the benefit of increased safety without having to put out any more effort. All you have to do is continue to follow the procedures stipulated in the manuals when you service your aircraft—just as you have been doing. This is no time to become careless.

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Point of contact at the Safety Center is Milan Buchan, AUTOVON 558-3901/4198, commercial 205-255-3901/4198. ■

# Mishap review

## Synopsis

The crew of a UH-1H on a service mission requested an IFR clearance to climb to VFR on top. While in IMC, the pilot became disoriented. The pilot-in-command (PIC), sitting in the left seat, took control but could not recover. The aircraft crashed on a frozen lake.

## History of flight

The mission called for the Huey to transport two passengers from one location to another, drop them off, and then return to the takeoff point. After planning the mission and checking the weather, the pilot and PIC preflighted the aircraft.

Weather at the takeoff point was 500 feet overcast and 3 miles visibility. Destination weather was clear. En route weather to the northwest after clearing the control zone was VFR.

The PIC was seated in the left seat performing copilot duties, and the pilot was in the right seat. The PIC had been told that the pilot did not have a current instrument rating.

After the passengers were briefed, the PIC requested and received a special VFR clearance to depart the control zone to the southwest toward forecast IMC. The aircraft took off and the flight was uneventful for the first 6 to 7 minutes.

Because of rising terrain and patchy fog, the PIC requested a climb through the overcast to VFR on top. Clearance was granted, and the aircraft ascended into the overcast. Some time during the climb, the pilot experienced vertigo and asked the PIC to take the controls. As the PIC took the controls, airspeed was slowing below 40 knots, and the Huey was in a right, descending turn. The PIC tried to regain airspeed and stop the descent, but the aircraft was still in a right descending turn when it broke out of the overcast.

The aircraft continued to descend and cut through the tops of two trees, crashing on a frozen lake. The pilot was trapped, unconscious, in the aircraft. He was removed by fire department rescue personnel and carried to the hospital, where he later died. The PIC, in the left seat, and the passenger in the right jumpseat, although seriously injured, were able to exit unassisted. The passenger in the left jumpseat was trapped in the cargo compartment. His seatbelt was apparently very loose or unhooked and he was found lying across the floor with his feet to the right side and his head towards the left side of the aircraft. His legs were trapped in the wreckage and he had to be removed by rescue personnel. He sustained major injuries.

## Crewmember experience

The 32-year-old pilot had more than 2,000 rotary wing hours. Almost 300 hours were in UH-1Hs. He had not flown instruments during the 10 months before the mishap and did not have a current rotary wing instrument rating.

The 39-year-old PIC had more than 3,400 rotary wing hours, with more than 300 in UH-1Hs. He was instrument qualified and current but had flown only 1 hour of hood time in the past 3 ½ months.

## Commentary

The pilot attempted flight in IMC because of the decision made by the PIC. The PIC, who was directly responsible for assuring the safety of the mission, permitted the non-instrument-qualified pilot to fly into IMC.

The pilot may have been overconfident in the ability of the PIC to help him if he had any difficulty.

The unit SOP stated that whenever weather conditions were such that IMC might be encountered during flight the unit commander would not permit the mission to be performed under VFR unless the aviators were instrument qualified. The operations officer was not aware of this policy and authorized the mission. ■

# The case of the nut that wasn't missing

There is nothing unusual about an aircraft problem that develops because of missing hardware. But when a piece of hardware causes a problem because it is **not** missing, that's news. Actually, it happens all too often. We call it FOD.

In this instance, mechanics inspected a T53 engine to determine why it was subject to frequent compressor stalls. They found the variable inlet guide vanes (VIGV) to be incorrectly rigged; so they proceeded to adjust the linkage until the rigging marks were properly aligned.

They then discovered, to their dismay, that instead of correcting the problem, this action caused engine performance to further deteriorate. At a loss to diagnose the cause, they removed the engine for teardown and analysis.

An external check of the engine and inspection of the VIGV actuator showed the actuator piston to the guide vane rod was out of rig by approximately five-sixteenths of an inch. With the rigging marks aligned, the inlet guide vanes were approximately 15 degrees **past** the open position.

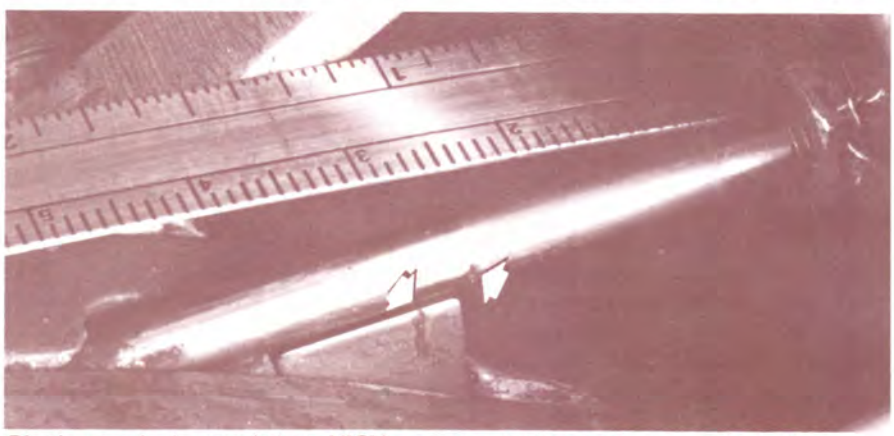
To determine why the inlet guide vanes could not be properly adjusted, personnel removed the actuator bearing cup. Inside they found a 5/16-inch steel self-locking nut lodged between the cylinder housing and the piston rod bearing attaching cup.

The nut had damaged the cylinder housing and broken the cup. Further, its presence restricted the travel of the actuator piston rod sufficiently to make proper rigging impossible. Disassembly inspection of the engine revealed no internal defects.

Simply put, this is just another case of FOD, and another good reason for the following reminder: If you drop or lose some item of hardware, a tool, shop towel, or whatever while performing maintenance, **don't leave the aircraft without it.** If you can't find the item, get help and report the matter to your supervisor. Such dropped or lost items must be located. As shown by this example, they can work themselves into the most restricted places. And not only can they produce costly damage but threaten the safety of aircrews and passengers as well.

If a piece of hardware or object doesn't belong on an aircraft, make sure it stays off.

**Thanks to the Analytical Investigation Branch, CCAD, for this information.** ■



**Rigging marks (arrows) show VIGV actuator piston travel was restricted approximately five-sixteenths of an inch.**

**Removal of actuator bearing cup reveals nut (a) and damage it caused to cylinder (b) and cup (c).**

# Selected mishap briefs

**uh1** **Class C mishaps** □ (H series) During ground slide after autorotation, left and right aft attaching points of transmission failed, causing white main rotor blade to flex down and hit No. 5 tail rotor drive shaft and cover. Severe vibration caused FM antenna to flex into red tail rotor blade. Possible fatigue failure of transmission case. □ (H series) As aircraft was approaching LZ, bird hit and broke left chin bubble. □ (H series) Main rotor blade hit top limb of tree during takeoff, tearing blade skin. □ (H series) During terrain flight, aircraft flew over hill and surprised flock of birds on the ground. Birds took off and flew toward aircraft. One bird hit and cracked right chin bubble.

**Class E mishaps** □ (H series) Master caution and transmission chip detector lights came on during runup. Caused by failure of transmission. □ (H series) As aircraft was being hovered to parking area, pilot noticed right yaw, increase in engine/rotor rpm, and increase in engine noise. IP increased collective while simultaneously reducing throttle to take manual throttle control. Rpm continued to increase, and aircraft was landed. Caused by failure of overspeed governor. □ (H series) Master caution and engine chip detector lights came on during hover. Oil analysis indicated engine was high in iron content. □ (H series) Right cargo door vibrated excessively during flight. Antichafing strip at bottom of cargo door slot had deteriorated. □ (H series) Egt fluctuated between 100° and 600° C. during flight. Internal corrosion prevented full coupling of connector plug. □ (H series) Crew smelled smoke and landed. Troubleshooting failed to reproduce problem. Aircraft was flown to airfield, and grinding noise was heard on shutdown. Caused by disintegrated hanger bearing.

**ah1** **Class C mishap** □ (S series) Tail stinger hit runway during deceleration. Aircraft pitched forward and landed hard, damaging aft cross tube, VHF antenna, UHF antenna mount, and bulkhead.

**Class E mishaps** □ (TH-1G) No. 2 hydraulic light came on. Caused by failure of hydraulic pressure switch. □ (S series) Crew smelled smoke during runup. Caused by failure of alternator.

**ch47** **Class E mishaps** □ (C series) $N_1$ tachometer failed during runup. Caused by failure of tachometer generator. □ (C series) No. 2 engine failed during test flight. Fire lights came on, fire was extinguished, and running landing was made. Inspection revealed inlet guide vanes were ingested into compressor section.

**oh6** **Class C mishap** □ Crew heard loud noise during cruise flight. Bird had hit and broken chin bubble.

**oh58** **Class C mishap** □ (C series) Main rotor blade hit top of tree during takeoff from hover.

**Class E mishaps** □ (A series) Fuel boost pump light came on during runup. Caused by failure of pressure switch. □ (A series) Grinding noise was heard during shutdown. Caused by failure of oil cooler bearing. Operation in volcanic ash environment, coupled with early morning condensation, had allowed significant amount of ash to build up on vanes of oil cooler fan. This condition caused an out-of-balance condition that substantially shortened the life of the bearing. □ (A series) Transmission oil pressure light came on during takeoff. Caused by broken wire at transmission oil pressure switch. □ (C series) Master caution and instrument inverter lights came on during landing. Caused by failure of instrument inverter.

**ov1** **Class E mishap** □ (D series) When landing gear was lowered, position indicator showed right gear in transit. Landing gear handle warning light came on. IP recycled gear several times but continued to get unsafe gear indications. Aircraft was landed without incident. Caused by faulty down lock switch.

*(continued on next page)*

# Mishap briefs

**u8** **Class E mishap** ☐ (F series) No. 2 engine was shut down for feathering check as part of maintenance test flight. Aircraft is not equipped with accumulators, would not come out of feathered position, and could not be restarted in flight.

**u21** **Class E mishaps** ☐ (G series) Fuel was seen coming from upper right nacelle plate on No. 2 engine. Pilot shut down engine and landed. Fuel tank transmitter unit failed to shut off transfer pump, causing fuel cell to overflow. ☐ (RU-21H) Heater failed during cruise flight. Pilot aborted mission because of extreme cold in cockpit. Caused by failure of spark plug. ☐ (RU-21H) No. 1 inverter failed during climbout, causing power fluctuation which, in turn, caused inertial navigation system to dump.

## Messages received

- Safety-of-flight maintenance notice for UH-60A main rotor hub assembly damper rod end (UH-60A-80-36, 101505Z Oct 80). Summary: The rod end of the damper has been contacting the spindle bracket (damper rod outboard attachment lugs) and wearing a hole in the boot, damaging the bearing and wearing the spindle bracket shoulder bushings. SOF message lists things to look for to determine serviceability of the damper rod end. Contact: Frank J. Hunleth, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

- Maintenance notice concerning AH-1S voltage regulator adjustment (AH-1-80-21, 101505Z Oct 80).

- Maintenance notice concerning removal of OH-58A jet assembly bleed valve (OH-58-80-09, 141515Z Oct 80).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## More on FAA regulations

Units with account numbers for DOD FLIP and related products should provide their requirements for FAA publications (including FAR Part 91) to the appropriate activity listed in Appendix A, AR 95-14.

Do not request FAA publications from the FAA Aeronautical Center in Oklahoma City. ■

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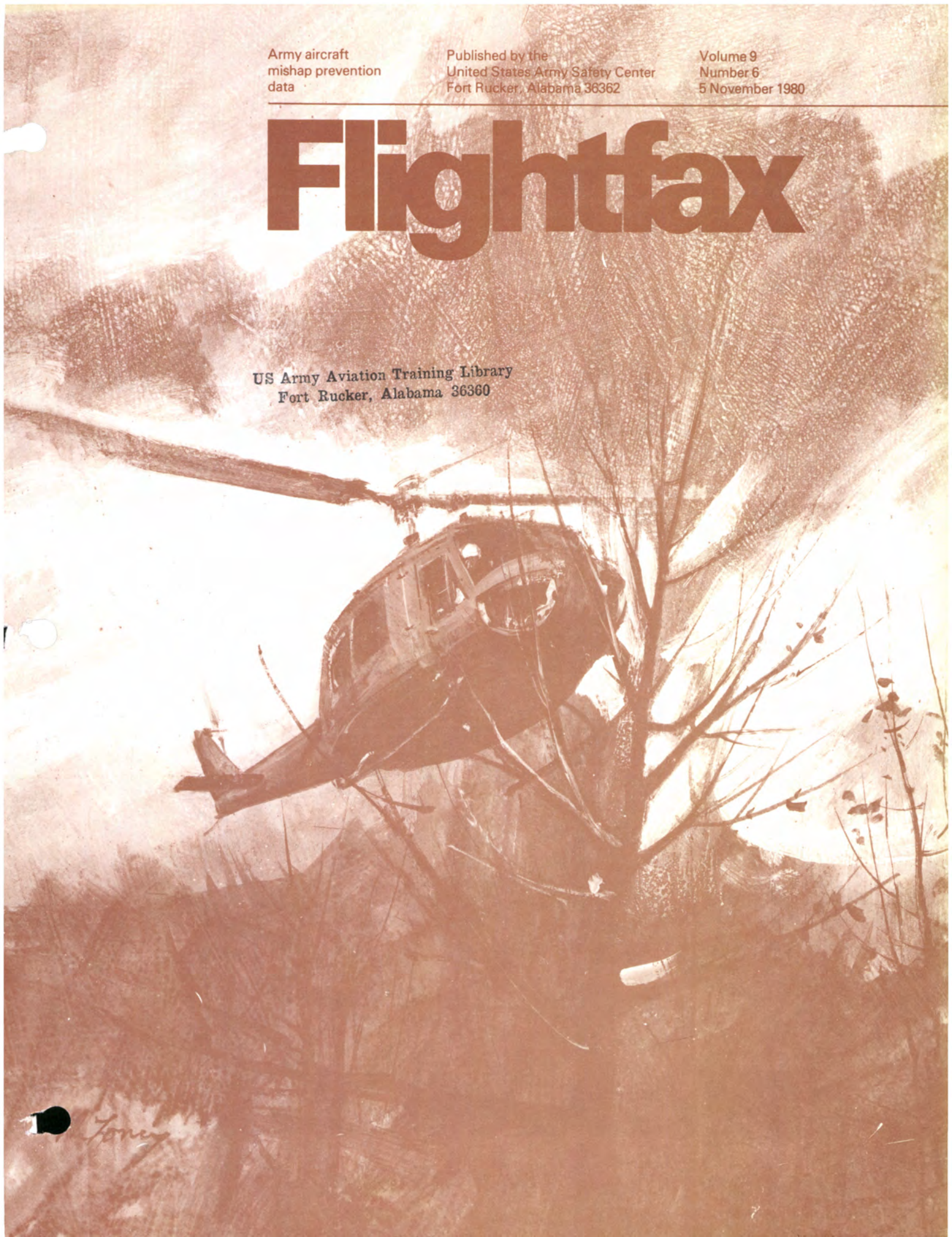


# Mishap review

## Synopsis

During a maintenance test flight, rpm decreased to 6200 as the pilot was recovering from an autorotation. The pilot channelized his attention inside the cockpit, and the UH-1H descended and hit a wire which severed a pitch control tube. The aircraft then flew uncontrolled until it crashed into trees and was consumed by a postcrash fire.

## History of flight

The mission was a functional test flight to determine whether the airframe, powerplant, accessories, and other equipment were functioning properly. The pilot was scheduled to test fly two aircraft that day so they could be returned to their units before the holiday weekend. The crew consisted of a maintenance test pilot, crew chief, and powerplant mechanic.

The pilot did not fill out a takeoff and landing data (TOLD) card, and he did not compute a weight and balance form. Time en route was estimated at 2 hours.

During the preflight, the pilot measured the throttle cushion, determined the throttle had 12 degrees of cushion on the high and low side instead of the 5 $\pm$ 2 degrees in accordance with TM 55-1500-219-MTF, and noted it would have to be adjusted when they returned.

The pilot did not take the time to check out a survival radio or brief the other crewmembers on their duties in case of an emergency.

During the engine runup, maximum engine rpm that could be obtained at full increase of the governor increase-decrease switch was 6600 instead of 6700 $\pm$ 50 as required by the operators manual and MTF manual. The pilot left the switch in the "full increase" position during the flight.

Hover checks were made, and the UH-1 took off. En route to the test flight area, the pilot performed normal test flight procedures. Arriving over a sod strip, he entered autorotation to check rotor rpm and control rigging. After power recovery, the pilot climbed to 5,000 feet to make a turbine engine analysis check. After completing the check, the pilot started a descent and by the time he reached 4,500 feet was established in full autorotation to recheck the rotor rpm which was reading high in the first autorotation. The pilot made a 270-degree turn to the right during the autorotation and turned away from his forced landing area on a heading of 090 degrees to fly back to the airfield.

About 500 feet agl, the pilot began joining the $N_2$ and rotor needles and, at 200 feet agl, applied collective pitch to begin a power recovery. According to the pilot, rpm bled off to 6200 when collective was applied.

The aircraft continued to lose altitude and descended below treetop level over a small lake, hitting a wire at one end of the lake. A main rotor pitch control tube was severed. The aircraft became uncontrollable, gained enough altitude to clear the trees at the end of the lake, and settled inverted into a swampy area about 300 meters from where it hit the wire.

The mechanic exited the aircraft and then helped the pilot, who had a fractured leg, get out. The crew chief was killed on impact. The engine continued to run for about 2½ minutes. Hot engine exhaust gases started a postcrash fire which consumed the main fuselage.

## Crewmember experience

The 34-year-old maintenance test pilot had almost 2,300 rotary wing hours, with more than 1,600 hours in UH-1Hs.

## Commentary

During recovery from the autorotation, the pilot descended to 200 feet before applying collective pitch to complete the power recovery. TM 55-1500-219-MTF requires recovery from autorotations to be completed at or above 500 feet agl. When partial power failure occurred as collective pitch was applied, the pilot channelized his attention inside the cockpit to check engine instruments. He allowed the aircraft to descend below treetop level before looking outside. Before he could react, the Huey hit a wire.

The pilot had not briefed the crew on emergency procedures and did not tell them of the emergency. Therefore, they did not advise him of his altitude or a possible forced landing area.

Before recovering from the autorotation, the pilot turned to a heading which put the aircraft over terrain unsuitable for a forced landing. The pilot had just completed various engine checks and found the engine to be operating properly. Thus, he did not anticipate the possibility of engine failure and the need for a forced landing area. He was in a hurry to get back to the airfield and test fly another aircraft before the end of the day.

Even though the aircraft had an unsafe condition of 12 degrees of throttle cushion instead of 5 $\pm$ 2 degrees, the pilot was confident he could handle the throttle discrepancy with no problem. Possibly as a result of the excess cushion, the throttle was not fully open during power recovery. As collective pitch was applied, rpm decreased. The pilot rolled the throttle on, off, and on again before lowering the collective. The disturbed airflow and improper fuel-to-air ratio resulted in thermal damage to the engine.

ATM procedures for power recovery do not specify that the aircraft should be in the full open position before application of collective to prevent the possibility of power loss.

There was no unit organizational structure to insure the aviators were aware of or complying with aviation directives. Proper guidance and supervision probably would have prevented the pilot's violation of established aviation procedures. ■

# Followups

## Additional information on mishap briefs previously published

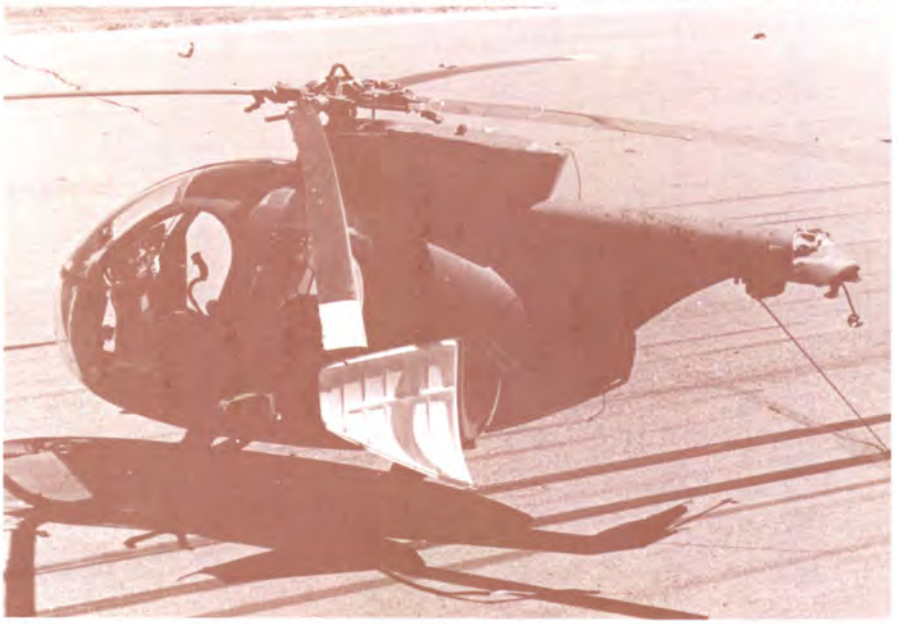
**ah1** **Class B mishap** in 28 May 80 issue (8039) ☐ During simulated firing run, IP made left turn using 60-degree angle of bank, applied left pedal, and reduced airspeed to about 20 knots. On rollout, aircraft lost lift due to excessive sideslip and slight tailwind. Power was insufficient to halt rate of descent, and aircraft hit tops of trees. IP then flew to nearest open area and landed.

**Class A mishap** in 4 Jun 80 issue (8041) ☐ Aircraft was on training flight. After placing aircraft in a descending maneuver from about 120 feet agl, copilot, flying from the front seat, misjudged rate of closure and point in maneuver beyond which he would be unable to fully arrest the aircraft's rate of descent before hitting the ground. After ground impact, aircraft slid forward about 185 feet and came to rest almost inverted.

**ch47** **Class A mishap** in 11 Jun 80 issue (8042) ☐ Pilot did not compute performance planning card before the flight and was not aware of power required or available for the mission. During takeoff, pilot exceeded power available, rotor rpm bled off, and torque on No. 1 engine decreased. Copilot misread torque gauge and tried to increase power to No. 2 engine. Pilot delayed landing even though rotor rpm was decreasing and aircraft was descending. A suitable landing area was overflown while the copilot was trying to regain power. Pilot was forced to land among trees. Aircraft hit two trees and came to rest on its right side.

8042

**oh6** **Class A mishap** in 9 Jul 80 issue (8047) ☐ Pilot, making standard autorotation with turn, initiated steep deceleration flare about 100 feet agl in attempt to reduce excessive ground slide he had experienced on previous autorotations. Pilot prematurely applied collective pitch, resulting in rotor rpm bleed-off, and failed to level aircraft at touchdown. Aircraft landed hard on heel of skids and main rotor blades flexed down and severed tail boom. IP did not closely monitor control inputs because of high confidence in the ability of the pilot.



8047

**oh58** **Class B mishap** in 2 Apr 80 issue (8033)
☐ Pilot and observer were on training flight. Pilot completed turn to downwind condition at 30 knots IAS and 100 feet agl while flying toward rising terrain and looking out left side of aircraft to observe tactical situation. When pilot looked forward again, he became spatially disoriented and thought aircraft was descending. Although $N_1$, airspeed, and engine torque were normal, pilot decided to make forced landing. Landing on 9-degree snow-covered slope was successful, but aircraft started sliding toward tree line. Pilot bottomed collective and rolled throttle to flight idle in an attempt to stop slide. Aircraft turned left and continued to slide into trees. Proper written procedures on crew coordination in unit SOP, adequate individual training in terrain flight techniques, and a more realistic crew configuration to accomplish the mission probably would have prevented the mishap.

**Class A mishap** in 14 May 80 issue (8036) ☐ Witnesses saw aircraft descend from low cloud base at high vertical rate of descent and crash. Several factors led to the crash. Pilot continued flight into deteriorating weather conditions, requested an IFR clearance to enter IMC in an aircraft restricted to VFR flight only, accepted an IFR clearance including an ILS approach in an aircraft not ILS equipped, and entered IMC without an instrument-qualified copilot aboard.

**Class B mishap** in 11 Jun 80 issue (8043)
☐ Pilot initiating go-around maneuver at night did not apply enough antitorque control to counter the power setting. Aircraft entered uncontrolled right turn and crashed. Pilot's actions were influenced by the lack of recent experience and inadequate unit training.

**Class A mishap** in 16 Jul 80 issue (8049)

**8043**

☐ Partial power loss occurred during flight at 200 feet agl, and pilot initiated approach to open field. During approach, $N_2$ decreased further and pilot failed to detect rotor rpm decaying below a level that would maintain flight. Aircraft fell through from about 60 feet agl with extremely low rotor rpm and crashed. Factors which may have affected the pilot's ability to correctly diagnose a powerplant malfunction and detect decaying rotor rpm included limited overall experience, failure to recheck instruments during approach, and inadequate training and instructions in the operators manual regarding partial power failure.

**Class B mishap** in 16 Jul 80 issue (8050)
☐ Engine lost power during landing. Pilot used collective to cushion touchdown, but aircraft landed hard. Teardown analysis revealed internal binding in power turbine governor caused by defective annular bearing. ■

# Selected mishap briefs

**uh1** **Class C mishap** □ (H series) Loud snap was heard and aircraft leaned to right front during landing following simulated antitorque maneuver. Forward cross tube had broken at support bracket. Metal fatigue occurred in area of forward support rivet holes. □ (H series) Aircraft hit wire stretched across canyon, damaging link assemblies.

**Class E mishaps** □ (H series) Crew smelled fuel fumes during climbout. Fuel tank vent valve was stuck open. □ (M series) Crew heard grinding noise and master caution light came on during NOE flight. Caused by failure of main inverter. □ (H series) During hovering autorotation, crew could not get a needle split between engine and rotor tachometer. Standard autorotation was made, and $N_2$ would not decrease below 5800 rpm. Caused by failure of main drive shaft quill assembly. □ (H series) Rotor rpm was lost during landing. Caused by failure of rotor tachometer generator. □ (H series) Aircraft was on training NBC dispersing mission, using talc in M5 dispenser. Three passes had been made. During the fourth pass, outlet hose burst where it connects to unit, filling aircraft with talc. Copilot, flying from right seat with dark visor down, initiated climb and displaced antitorque pedals to give aircraft out-of-trim, left yaw condition. Dispenser was mounted on left side of aircraft, and aircraft was being flown with doors open. Pilot in left seat had clear visor up and was wearing prescription sunglasses. When pilot looked at cabin compartment to check condition of dispensing device and operator, he was unable to see either because everything was heavily coated with talc. Pilot's visibility was reduced by 50 percent because of the amount of powder on his glasses. Protective masks were not used. Aircraft was flown to airfield and landed.

**uh60** **Class E mishap** □ Postflight inspection revealed yellow main rotor blade spindle was thrown outboard.

**ah1** **Class C mishaps** □ (G series) Main rotor blades hit tree during NOE flight, damaging both blades. □ (S series) Postlanding inspection revealed damage to both main rotor blades. Copilot heard unusual noise about 1 hour into flight. Pilot did not hear anything or have any unusual input in flight controls.

**ch47** **Class E mishaps** □ (A series) Engine chip detector light came on. Caused by failure of engine torque measuring system. □ (C series) Loud bang was heard and aircraft vibrated. About 1 minute later, transmission oil pressure light came on. Caused by failure of combining transmission. □ (C series) Crew chief smelled burning odor during hover with external load. Load was set down and aircraft returned to PZ. On final to PZ, No. 1 flight boost hydraulic light came on. Complete loss of hydraulic fluid was caused by cracked line. □ (B series) Crew chief saw hydraulic fluid in aft transmission compartment during flight. Caused by ruptured hydraulic oil cooler.

**ch54** **Class E mishap** □ (A series) Vertical vibrations occurred as aircraft was being accelerated from 65 to 100 knots. Caused by malfunction in AFSC pitch channel.

**oh6** **Class E mishap** □ Engine quit during flight at 1,000 feet and 80 knots. Aircraft was autorotated between two sets of wires to landing on bike path along beach. Engine is undergoing teardown analysis.

**oh58** **Class C mishap** □ (A series) Forward air controller left smoke grenade on top of instrument panel. As pilot was making right turn, smoke grenade fell off instrument panel and went through pilot's chin bubble.

**Class E mishaps** □ (A series) Pilot noticed oil spot on parking pad after aircraft was picked up to hover. Caused by failure of aft seal in freewheeling assembly. □ (C series) $N_2$ dropped to 98 percent as aircraft was picked up to hover. Caused by failure of overspeed governor.

**th55** **Class C mishap** ☐ Student pilot was on supervised solo flight. After turn on base leg, IP in tower noticed aircraft was in slight nose-high attitude and descending. Aircraft continued descent and hit the ground hard. Mishap is under investigation.

**c12** **Class E mishap** ☐ (A series) During missed approach, pilot was able to obtain only 80 percent power on No. 2 engine without exceeding TGT limits. Caused by failure of high pressure bleed valve.

**ov1** **Class E mishaps** ☐ (RV-1D) Gear and flap indicator gave unsafe gear-down condition. Gear was lowered with hydraulic pressure and emergency blowdown system was used. Caused by failure of microswitch on landing gear. ☐ (D series) Left prop would not unfeather prior to taxi. Caused by defective auxiliary feathering motor.

**t28** **Class E mishap** ☐ Aircraft developed airframe vibrations during flight. Caused by cracked horizontal stabilizer struts.

**u8** **Class E mishaps** ☐ (F series) Aircraft would not gain airspeed after takeoff. Check of landing gear indicator showed gear was stuck in transit position. Emergency gear extension was used and aircraft was landed. Landing gear actuator motor splined shaft failed, causing drive gear of gearbox to strip teeth. ☐ (F series) Grinding noise was heard as gear extended. Gear handle lights and gear indicators showed unsafe condition on all three gears. Tower personnel said gear appeared to be down. Landing was uneventful. Landing gear motor and gear spur drive of box assembly had sheared teeth.

**u21** **Class E mishap** ☐ (RU-21H) Right prop tachometer generator failed during takeoff.

## Maintenance

**uh1** **Class E mishaps** ☐ (H series) Crew chief discovered hydraulic leak through sight glass in transmission area during flight. Caused by leaking hose assembly. Fitting was loose. ☐ (H series) Crew smelled electrical fumes during takeoff. Electrical wiring leading to landing light was chafing on airframe.

**ah1** **Class E mishaps** ☐ (S series) Transmission oil pressure dropped and caution light came on. Caused by improperly installed oil filter O-ring. ☐ (S series) No. 1 hydraulic and master caution lights came on, followed by stiffness in antitorque pedals. Overtorque of fitting caused line to separate, causing hydraulic system module to empty.

**ch47** **Class E mishap** ☐ (C series) As aircraft was taxiing, pilot on ground told crew fuel was venting from left main fuel cell. Fuel line inside left main fuel cell was not connected.

**oh58** **Ground mishap** ☐ (A series) When mechanic positioned tracking flag, he thought it would be too short to make blade contact so he lifted flag off the ground about 2 feet. Pilot saw what was happening but

*(continued on next page)*

# Mishap briefs

was unable to get mechanic's attention or raise rotor plane enough to prevent steel shaft of tracking flag from hitting main rotor blades.

**Class E mishap** ☐ (C series) Master caution and engine oil bypass lights came on, and engine oil pressue went to high red line. Postlanding inspection revealed about 1 quart of engine oil had been lost through engine oil reservoir cap because of pinched O-ring on cap.

**c12** **Class E mishap** ☐ (A series) Lights on landing gear handle would not come on during preflight. Caused by loose wire.

**u8** **Class E mishap** ☐ (F series) Left main gear would not indicate down. Gear was recycled three times with no change. Tower personnel said gear appeared to be down and locked. Upon touchdown, left gear indicated down. Slide bolt in downlock mechanism of right main gear was too tight and would not allow downlock mechanism to lock in place.

## Messages received

• Safety-of-flight operational message concerning M5 dispersing system (GEN 80-26, 211530Z Oct 80). Summary: Pending results of investigation, all operations using M5 dispersing system are suspended. Contact: Ray Boland, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight technical message concerning inspection and treatment of all OH-6 and OH-58A/C governors and fuel controls used on T63-A-5A, T63-A-700, and T63-A-720 gas turbine engines. Summary: A recent OH-58A aircraft failure was attributed to a galvanic corrosion condition in the power turbine governor used on the T63A-700 engine. This condition resulted in the loss of available engine power and can contribute to an accident in all situations where engine power is needed to sustain flight. This message requires a one-time inspection and corrosion treatment of all P3 air ports and fittings on the power turbine governor and fuel control housings. This action is necessary to assure no galvanic corrosion conditions exist and to apply the necessary corrosion preventative to stop any galvanic corrosion from forming. Contact: David Giratos, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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IPs are invaluable but not infallible

# The problem with IPs

No one can argue about the importance of the IP's role in Army aviation. Without this individual, the most sophisticated and well maintained aircraft would be nothing more than expensive ornaments to be viewed like paintings in an art gallery.

It is little wonder, then, that the IP is held in such high esteem. Not only is he knowledgeable, experienced, and proficient in matters related to flight, but he is also skilled in imparting this knowledge to others. And he didn't gain this knowledge and experience overnight. It required both time and effort. Yet, once he has made the grade, the bulk of the responsibility for safe and efficient training of other pilots seems to be dumped right into his lap. In the process, it is sometimes forgotten that instructing pilots is vastly different from other teaching assignments.

A student in college, for example, may fail every exam and eventually "wash out" of the course—and the college. But he doesn't take the classroom or the building in which it is located with him when he leaves. Nor does his departure have any physical effect upon the instructor or the remaining students. This is not the case with flight training. One small student error at an inopportune moment in flight can literally "wash out" the aircraft along with the student, the IP, and any other occupants who may happen to be on board.

Similarly, a college professor may inadvertently make an error while solving some mathematical problem and no real harm is done. He simply locates the error and makes corrections. The IP, however, cannot enjoy the same kind of luxury. Any error on his part can produce results that might range from mild to catastrophic. Yet, the IP is just as human and just as prone to making an inadvertent error as is the college professor. So the problem is not really a problem **with** IPs, but rather a problem **of** IPs—one that concerns them and with which they must contend.

Basically, the issue is how can the IP prevent an emergency situation—and a possible mishap—from developing as a result of a student error, and how can he avoid making mistakes of his own? For the answers, the problem areas must first be identified. A look at some past mishaps can help do just that.

## IP overconfidence

• In one instance, a UH-1 with pilot and IP on board made a low pass over an 11,300-foot mountain peak. The IP applied power to clear the peak, but rotor rpm began to bleed off. The end result was a forced landing on the mountain. Fortunately, this mishap produced no injuries and resulted in only minor damage to the aircraft.

A major cause factor in this mishap was the IP's overconfidence in his ability to safely perform the attempted maneuver. However, the important question lies with motivation. Specifically, what induced the IP to deviate from established regulations and policy and try to conduct an unauthorized flight? Investigation revealed the IP's actions represented a courtesy gesture to a unit pilot on his final training flight. And it could have been just that.

• In another instance, the pilot of a UH-1 applied excessive cushioning pitch during termination of a practice autorotation

with turn. The aircraft landed on the heels of the skids with low main rotor rpm, rocked forward, and slid approximately 109 feet. During the final portion of the slide, the pilot abruptly applied aft cyclic, causing one main rotor blade to flex down and sever the tail boom. Although no injuries resulted, damage costs exceeded $20,000.

The pilot's overreactions were substantially the result of his inadequate composure. He was under considerable pressure in that he was attempting a maneuver he considered extremely difficult and one which he had not done in about 4 months. Also, he was attempting this maneuver on what he believed to be his final checkride to obtain operational unit pilot status. To add to his concern, the IP had indicated that the checkride was progressing less than satisfactorily.

The IP failed to react sooner because of excessive confidence in his own ability to safely counteract or compensate for any mistakes the pilot might make. Consequently, he delayed corrective action beyond the point of safe recovery.

• In a third instance, the IP of a UH-1 was demonstrating an autorotation with turn under high density altitude conditions. While still in the landing slide, the main rotor blades struck and severed the tail boom.

Investigation revealed the IP failed to properly coordinate the flight controls to safely terminate a standard autorotation with turn under the existing atmospheric conditions. Poor judgment and lack of proficiency teamed up to produce this mishap.

The IP had not performed a standard autorotation with turn for about 6 months and had not performed one on his last IP standardization ride. Further, demonstration of this maneuver was not required. Yet, the IP elected to perform it under such existing high density altitude conditions that local SIPs would have refrained from attempting the maneuver. Overconfidence in his abilities resulted in actions that produced damage costs of more than $20,000.

• A fourth mishap occurred during a combat skills training mission. With two student pilots aboard a UH-1, the IP proceeded to demonstrate recovery from a tail rotor failure at a hover, with the aircraft rotating to the left. The aircraft drifted right, struck the ground with the right skid, and rolled over on its right side. The crew exited unassisted through the pilot's greenhouse window which had shattered during the crash. All crewmembers escaped injury, but the aircraft was destroyed.

In this instance, the IP lost control of the aircraft while demonstrating an unauthorized maneuver. However, several factors induced him to attempt this demonstration. First of all, it was a combat skills training mission, and the students had been inquiring about procedures to be used under different emergency situations. One had asked specifically about this situation. So the IP felt he should demonstrate the maneuver—and certainly had confidence in his ability to perform it.

Although such factors as misdirected motivation and delayed corrective action appear in the mishaps described, the underlying factor in each was overconfidence on the part of the IP involved. Each IP was convinced he could handle the situation. But just as excessive self-confidence on the part of an IP can lead to mishaps, so can an IP's overconfidence in the performance of his student.

## Overconfidence in SPs

• While performing an NOE quick stop in a UH-1H, the pilot applied insufficient collective and excessive cyclic, causing the tail rotor to strike the ground.

Inadequate supervision by the IP, who was conducting an annual aviator proficiency test, prevented him from taking corrective action in time to prevent the mishap. The IP had excessive confidence in the pilot because he knew the pilot was experienced and had been an IP. This gave him such confidence in the pilot that he placed him at a 5-foot skid height, downwind, before having him attempt the maneuver. In addition, the IP failed to closely monitor cyclic control movement.

• A similar mishap involved another UH-1 and occurred under almost identical conditions. While trying an NOE quick stop, the pilot applied excessive aft cyclic without appropriate collective increase. The tail rotor struck the ground and separated. The aircraft then hit the ground, turned right, hit on the left skid, rolled over on its left side and was destroyed.

Again, overconfidence in the pilot's ability to perform the maneuver set the stage for this mishap. The IP knew the pilot had

*(continued on next page)*

# The problem with IPs

been NOE qualified 2 years previously. This induced him to have the pilot perform an NOE quick stop at an altitude that did not afford time for corrective action.

Such overconfidence in another's ability has caused many an IP to relax his guard and permit a situation to develop beyond his ability to control it. However, delayed corrective action on the part of an IP is not always caused by overconfidence. In some instances the IP is not aware that a hazard exists. This is sometimes true even when the IP is at the controls.

## Failure to recognize hazards

• One such example involved an IP who was demonstrating a standard autorotation in an AH-1S. The maneuver was normal in all respects until initial pull about 15 feet above the runway. At that point, the IP applied excessive collective pitch, and the aircraft landed hard, damaging the landing gear and the transmission mount.

The IP did not appreciate the effects of higher gross weights on rotor rpm bleed-off during collective pitch application in autorotation. He erroneously believed rotor rpm decay to be a function of rotor blade design differences between AH-1S models equipped with Kaman 747 blades and those with standard Bell 540 blades. Consequently, he expected his helicopter to have the same degree of rotor rpm decay as the lighter AH-1G model since his aircraft was equipped with the same type of blades (Bell 540).

More often, however, failure to be aware of some existing hazard is the result of the IP's failure to observe the SP's actions or to insure that communications between the two of them are clear. In one mishap, both of these conditions prevailed.

• The SP was to make a takeoff in a UH-1 under minimum power/torque limitations to simulate a maximum load by using only hover power. However, the SP did not understand the IP's instructions that if more power was needed for safe operation it was available and would be used. As a result, the SP removed his left hand from the collective and rested it on the center console, thinking the IP was controlling the collective to hover power setting. The IP, in turn, did not see the SP's action.

While the aircraft was moving forward for the takeoff, rpm deteriorated. The aircraft yawed left, hit the ground with the toe of the right skid, and pitched up. The IP assumed control and abruptly lowered the collective to full down. The cross tubes rolled aft and the skids separated from the aircraft.

Misunderstanding on the part of the SP coupled with the IP's failure to observe the SP's actions led to a delay in the application of corrective measures.

## Late corrective action

As can be seen in most of the examples described, late corrective action by the IP is almost always an accompanying factor when mishaps occur because of some improper action on the part of the SP. However, in the majority of these instances, the delays resulted from other factors such as overconfidence in the SP's abilities and failure to recognize some existing hazard. In these cases, IPs were relaxed and not staying close to the

aircraft controls. Therefore, these mishaps can be categorized as preventable.

But what about those mishaps that occur when the IP is "on top" of the controls and closely monitoring the SP, yet is not able to take corrective measures in time to prevent a mishap? Is the IP blamed or is the mishap classified as being unavoidable? Before we try to answer this, let's take a brief look at a couple of examples.

• One mishap occurred when an SP rotated the nose of a UH-1 too high during an NOE quick stop maneuver. The tail rotor hit the ground, causing the 90-degree gearbox to separate from the aircraft. The IP failed to fully anticipate the SP's actions and was unable to take timely corrective action.

• Another mishap occurred during a practice autorotation. The SP increased collective pitch, then suddenly reduced it, causing a rapid increase in sink rate from about 50 feet agl. The IP attempted a power recovery but was too late to prevent the mishap.

Obviously, pointing an accusing finger in instances such as these can only be done on an individual basis, and then only after a thorough investigation has been completed. The dividing line that separates the preventable mishaps from the unavoidable ones is so thin in these types of mishaps as to be virtually nonexistent. All depends on the IP's judgment. To accomplish his job, the IP must allow the SP to go as far into a particular maneuver as possible before assuming control of the aircraft. If he takes over too early, the student fails to gain the necessary experience. If he waits too long, a mishap results. Add to this any sudden, unpredictable control inputs an SP might make at some critical point in a maneuver, and the possibility of the IP preventing a mishap further decreases. What, then, can be done to reduce the risk of training mishaps?

## The commander's responsibility

First, commanders should insure each IP is properly qualified and proficient in the area of training in which he is to engage. Then, commanders should make certain IPs are in good health both physically and emotionally. Next, insist that during transition training the IP demonstrate a maneuver before having the SP attempt it—regardless of the experience level of the SP.

Make sure aircraft are properly serviced and maintained so that no mechanical problems are added to the IP's concern. Finally, provide the best supervision possible to help insure regulations and SOPs are followed and to discourage the performance of any unauthorized maneuvers. From this point, responsibility for the safe conduct of training flights rests primarily with the IPs themselves.

## The IP's responsibility

It is the IP's responsibility to insure he is proficient in his area of training responsibility, and that he is physically and emotionally capable of performing his duties. After all, no one is better qualified to provide this information than the IP himself. And while he must be confident in his abilities, he must guard against any tendency towards overconfidence. Simply stated, the IP must remain aware of his capabilities and not exceed them.

Similarly, the IP must guard against developing excessive confidence in the abilities of a student pilot undergoing training. On the contrary, he should expect the unexpected and be prepared to take corrective action.

Further, the IP should make sure he is aware of any potential hazards that may exist and remain observant for any additional ones that might possibly arise during flight. He must constantly monitor the SP and remain close to the controls when the SP is performing any critical maneuvers. And it goes without saying that he should not allow himself to be swayed into demonstrating any unauthorized maneuver. In a nutshell, he is to obey all regulations and SOPs related to his mission.

Finally, he must rely on his best judgment as to when he should assume control of the aircraft. This is one area of operation that cannot be dictated or covered by rules. The IP must depend on his knowledge, training, and experience to guide him as to when he must make the decision to "take over."

Yes, the IP is an important member of the Army aviation team. As a matter of fact, he is invaluable—indispensable. But he is also human. As such, he is not infallible. Commanders must never treat him as if he were by demanding more of him than can be reasonably expected. And what is even more important, the IP must always remain aware of his fallibility. Knowing that he can make mistakes is his best defense against making them. ■

# Selected mishap briefs

**uh1** **Class C mishaps** □ (H series) IP was intending to give pilot instruction on emergency governor operations. Instead of rolling throttle to 6400 rpm, IP decreased linear actuator. When governor was placed in emergency position engine accelerated and surged. Governor was then placed in automatic position and engine was shut down. IP said he wasn't thinking when he reduced rpm with linear actuator instead of throttle. With throttle still in full open position, placing governor in emergency position caused overspeed condition plus rapid surging. □ (H series) Aircraft was flown for more than 2 hours on night training flight. Postflight inspection revealed damage to vertical fin drive shaft cover and tail boom. Aircraft had been preflighted during daylight hours, and vertical fin drive shaft cover was left unsecured.

**Class E mishaps** □ (H series) Fuel pressure fluctuated from 22 to 17 psi in flight. Caused by cycling of anti-ice valve. □ (H series) During landing, crew noticed fumes and liquid in vicinity of battery vent and liquid on chin bubble. Caused by thermal runaway of battery. □ (H series) Shortly after takeoff, pilot felt one-to-one vibration and heard popping noise from main rotor. Caused by skin separation on main rotor blade.

**Aviation-related mishap** □ (H series) Aircraft was being moved into hangar to be parked between two other aircraft. As aircraft entered hangar, tug driver was told he was driving too fast and was about to hit another aircraft. Driver did not respond to warning and left synchronized elevator hit right cabin door of parked aircraft.

**uh60** **Class C mishaps** □ Aircraft landed on engineer stake in confined area, damaging copilot's step fairing and door. □ Stabilator was bent when it hit ground during landing.

**ah1** **Class A mishap** □ (S series) Crew of second aircraft in flight of two saw lead aircraft descend and turn to left about 2 miles from destination airfield. Rate of descent appeared to increase and aircraft crashed and burned. Pilot and copilot were killed. 8104

**Class B mishap** □ (S series) As aircraft turned downwind after takeoff during NVG training flight, severe vibration was felt throughout airframe. IP took control, reduced power, and began approach. About 50 to 70 feet agl, nose of aircraft began to rotate to right. Application of tail rotor pedal was ineffective. As nose continued to rotate, IP began rolling throttle off. Aircraft made two revolutions, touched down slightly nose low in a sandy area, and came to rest upright. Preliminary indications are failure of No. 2 tail rotor hanger bearing assembly. 8105

**Class E mishaps** □ (S series) Engine oil pressure light came on during landing. Caused by failure of pressure switch.

□ (TH-1G) Transmission oil temperature fluctuated between 70 and 100 degrees during flight. Caused by failure of temperature gauge.

**Aviation-related mishap** □ (S series) As aircraft was being towed to hangar, tug bogged down. Tug operator added gas, causing tug to jump forward. Vertical fin of aircraft being towed hit vertical fin of parked aircraft. Parking pad was 4 inches lower than taxiway, causing aircraft to be towed over a hump.

**ch47** **Class E mishaps** □ (C series) Flight engineer saw fuel flowing from No. 1 engine fuel drain during runup. Caused by failure of fuel pressure valve. □ (B series) During takeoff, flight engineer told pilots thick black smoke and oil were coming from No. 2 engine area. Postlanding inspection revealed ruptured O-ring caused oil to pour out of No. 2 engine oil filter and be ingested by engine.

**oh6** **Class E mishap** □ Loud bang was heard and engine quit. Aircraft yawed left and nose tucked under. Aircraft was autorotated to ground with no damage. Yellow compressor liner (less than 450 hours) probably broke loose and was digested through compressor blades. Reminder: TM 2840-231-24, change 8, established an overhaul interval of 450 hours for compressors with yellow plastic liners.

**oh58** **Class C mishap** □ (A series) Damage to engine oil cooler fairing assembly was noticed during hover/taxi to parking area after flight. Fairing assembly was probably not secured prior to flight and was torn from aircraft.

**Class E mishaps** □ (C series) VHF communications were lost in flight. After aircraft was landed, loose VHF antenna wire was found hanging from tail rotor gearbox area. Wire appeared to be too

long and had worked loose by flapping during flight. ☐ (A series) Generator and master caution lights came on. Caused by burned out generator brushes.

**th55** **Class C mishap** ☐ Student pilot was trying to ground taxi aircraft to a heading into the wind before taking off to a hover. This required a 180-degree turn. SP decided to turn to the right. A Hobart tractor was parked to the left side of the aircraft about 26 feet away. Aircraft had completed about 80 degrees of the turn when tail rotor hit side of tractor. Aircraft came to a stop 180 degrees from the direction in which the maneuver began.

**c12** **Class E mishap** ☐ (A series) As aircraft was climbing from 12,000 to 14,000 feet, left half of pilot's windshield began cracking in vertical direction. Cracking continued in all directions and soon covered all areas of windshield. Windshield heat was not on and there was no ice present.

**ov1** **Class E mishap** ☐ (C series) Pilot smelled fumes after turning instrument lights on. Lights were turned off but fumes continued. Caused by short in light-dimming rheostat.

**t42** **Class E mishaps** ☐ Props went out of sync during cruise flight. No. 2 propeller could be advanced to 2625 rpm, but when lever was retarded, propeller would only reduce to 2500 rpm. Both props were set at 2500 rpm. Postlanding inspection revealed failure of right propeller lever cable. ☐ Electrical failure occurred during takeoff. Gear was in half-up position. After emergency procedures were completed, landing gear was lowered manually and aircraft landed 24 minutes later at airfield. No. 2 cell strap had come loose on battery.

**u21** **Class E mishaps** ☐ (A series) Left main landing gear down light did not illuminate during approach. Emergency procedures were followed, and aircraft was landed. Caused by broken wire on down and locked microswitch on left main landing gear. ☐ (A series) Left engine was shut down with fuel control lever during training flight. When restart procedure was initiated, left ignitor circuit breaker popped. Circuit breaker was reset and popped again. Single-engine landing was made at airfield. Caused by failure of ignitor plug.

# Maintenance

**uh1** **Class C mishap** ☐ (H series) Aircraft was at hover before takeoff for maintenance test flight when pilot saw engine oil temperature at 145° C. Crew chief had been told to cap bleed air line for deice system during previous maintenance operation to correct for high egt. Crew chief had instead disconnected bleed air line for engine oil cooler. Oil cooler was inoperative because of interruption of bleed air drive. Engine was replaced.

**Class E mishaps.** ☐ (H series) Hydraulic system failed during landing. Two hydraulic hose assemblies from irreversible valve were chafed against each other. ☐ (H series) Stiffness was felt in controls during final approach. On shutdown, leak was found in left cyclic servo. Caused by pinched O-ring between irreversible valve and servo actuator.

**c12** **Class E mishap** ☐ (A series) During cruise flight, pilot noticed left upper forward cowling had elevated from aft seam about one-half inch. Maintenance personnel had not properly secured cowling after completing inspection.

## Messages received

- Maintenance notice concerning conservation of T55 and T53 engines for UH-1, AH-1, OV-1, and CH-47 series aircraft (UH-1-80-15, AH-1-80-23, OV-1-80-11, and CH-47-80-12, 291610Z Oct 80).

- Safety-of-flight message concerning change to SOF technical message, OH-6-80-06 and OH-58-80-10, dated 232200Z Oct 80, concerning inspection and treatment of OH-6 and OH-58A/C governors and fuel controls used on T63-A-5A, T63-A-700, and T63-A-720 gas turbine engines (292200Z Oct 80). Paragraphs 2A and 7A(2) of original message have been changed. Contact: David Giratos, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

- Safety-of-flight maintenance notice concerning temperature sensing element installed on T53 engine fuel controls on UH-1, AH-1, and OV-1 aircraft (UH-1-80-14, AH-1-80-22, and OV-1-80-10, 312015Z Oct 80). Summary: A recent accident was caused by a faulty temperature sensing element in the fuel control. This message underscores the importance of keeping the temperature sensing element with its fuel control and the importance of proper installation. Contact: Robert Lawyer, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

# More on new reporting requirements

Reference FLIGHTFAX dated 6 February 1980 and 1 October 1980, containing information on accident reporting and the new AR 385-40. The Safety Center sent a message, dated 311435Z Oct 80, to the field with the following subject: Clarification of DA Form 2397 Series Reporting Requirements for New Mishap Classifications (USASC GEN 80-4). We are quoting the message here for the benefit of those of you who may not have gotten a copy.

A. AR 385-40, 1 Sep 80.

B. AR 95-5, 1 Jul 75, with two changes.

1. Reference A, par. 5-5, established new classification criteria for Army aircraft mishaps effective 1 Oct 80. Reference B, chapter 14, provides elements of DA Form 2397 series required for mishap reporting and detailed instructions on how to complete these forms. The forms may still be used to report aircraft mishaps IAW reference A pending revision of reference B.

2. Clarification instructions for use of current DA Form 2397 series by aircraft mishap investigation boards in consonance with reference A and B follow:

a. For Class A, B, and C mishaps, DA Forms 2397, 2397-1, 2397-2, and 2397-3 should be prepared IAW instruction for completion contained in chapter 14, reference B. Other DA forms in 2397 series should be prepared whenever they meet criteria set forth in chapter 14, reference B.

b. When filling in block 1, DA Form 2397-1, type in after word "classification," class category; e.g., A or B or C. All other entries in that block may be disregarded.

c. When filling in block 10, DA Form 2397-1, type in "injury cost" and "total cost." Injury cost will be computed IAW table E-1, appendix E, reference A. Total cost will include sum of injuries, fatalities, occupational illnesses, Army property damage, and non-Army property damage IAW par. 5-4, reference A.

d. When completing DA Form 2397-11, the degree of injury as outlined at table E-1, reference A, should be identified in block 15. This will assist in correlating the "injury cost" entry on DA Form 2397-1.

3. Questions or comments pertaining to DA Form 2397 series should be referred to office of the commander, USASC, AUTOVON 558-6385/6510. ■

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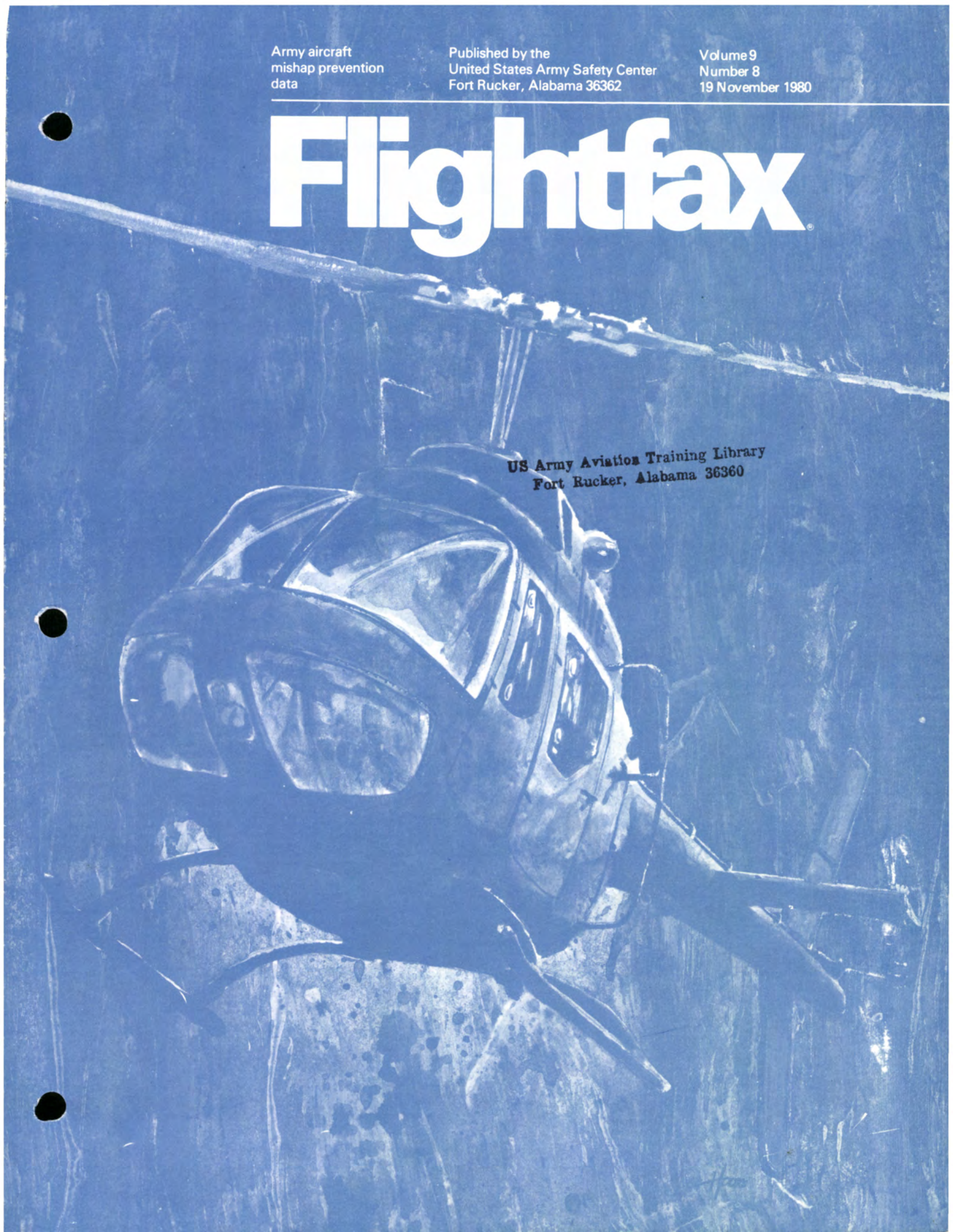

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# Mishap review

## Synopsis

An OH-58C on a night training flight entered an uncontrolled right turn about 30 to 40 feet agl during an attempted go-around from an unimproved landing area. The turn was stopped by closing the throttle, but the aircraft landed hard.

## History of flight

The mission was a night VFR instrument training flight. A pilot-in-command (PIC), pilot, and crew chief were aboard the OH-58. Takeoff was made in the late afternoon, and the first three legs of the flight were uneventful. Nearing the end of the fourth leg, the crew entered a military reservation and initiated an unplanned visual approach to a ridgeline adjacent to an active tank gunnery range. The intended touchdown area was a gently rising slope, sparsely vegetated with sagebrush and trees about 20 feet tall.

As the aircraft approached the selected landing site, the PIC asked the pilot, who was flying the aircraft, if he wanted the landing light turned on. The pilot said he did not need it. Considerable illumination was provided by a full moon and some flares. As the aircraft approached 30 to 40 feet agl, at or slightly above effective translational lift, the pilot decided to make

a go-around and applied collective to begin a straight climb. The pilot did not tell the PIC he was going to make a go-around.

The aircraft accelerated and yawed to the right because adequate left pedal was not applied. The pilot reduced collective and neutralized his pedal settings to try to fly out of and correct his adverse yaw and turn. The reduction in power resulted in an unplanned descent. During the descent, the OH-58 was subjected to a tailwind which caused the nose to pitch down, further increasing the rate of descent. The pilot applied collective pitch in an attempt to stop the descent. This caused the aircraft to accelerate, the nose to pitch further down, the angle of bank to increase to 30 to 35 degrees, and the yaw and rate turn to further increase.

During the entire sequence of events, the pilot tried to follow the turn with right cyclic. Neither the pilot nor the PIC tried to arrest the condition by full application of left antitorque control. As the aircraft completed a turn of about 270 degrees, a crash seemed inevitable to the PIC.

Without telling the pilot, he rapidly reduced the throttle to the flight idle position. After the throttle reduction, the turn and yaw stopped. At about 20 feet, with the rotor rpm decaying, the PIC pulled maximum collective pitch to try to cushion the landing.

The aircraft hit the ground with load forces of about 20 g's. The landing gear collapsed, the tail boom was bent, the transmission drag pin attaching point failed, and forward rocking of the transmission distorted the cabin and airframe structure.

The crew chief sustained back injuries, and the PIC sustained whiplash neck injuries. There were no survival radios on board the aircraft. The pilot walked to the nearby tank gunnery range to report the mishap and get medical aid.

## Crewmember experience

The 22-year-old PIC had more than 260 rotary wing hours, with almost 150 in OH-58s. The 27-year-old pilot had more than 300 rotary wing hours, with more than 100 in OH-58s.

## Commentary

The pilot's excessive application of power during the go-around produced more torque to the main rotor than the tail rotor antitorque setting was capable of counteracting. The pilot's actions were influenced by a lack of recent experience and inadequate unit training. The ATM iterations required by the unit commander did not include night tactical approaches, a maneuver which would be expected of a scout pilot. Also, the pilot had not completed his night orientation in accordance with the unit SOP, which required a reservation boundary orientation.

Both pilots were unit PICs, of equal rank, and at about the same aviation experience level. Their platoon leader considered them equally qualified. These factors resulted in the PIC being reluctant to take control of the aircraft even though he was the designated PIC of the mission. Closing the throttle and applying collective pitch were the minimum actions his sense of self-preservation would permit.

Both the mission scheduling board, considered directive in nature, and the verbal instructions of the platoon leader specified a VFR instrument training mission with a specific termination time. At the time of the mishap, the aircraft had exceeded the down time by more than 4 hours. The PIC was very anxious to complete his night ATM requirements even though he had 60 days remaining in which to complete them. He would have completed a substantial part of the requirements during the flight if the mishap had not terminated the flight. ■

# Selected mishap briefs

**uh1** **Class A mishap** □ (H series) During hovering autorotation, student pilot applied excessive collective. IP attempted power recovery but was unsuccessful. Aircraft fell about 20 feet, resulting in damage to entire airframe. Tail boom was fractured, cabin roof distorted, chin bubbles and greenhouse broken, skids collapsed, and underside of aircraft damaged. 8106

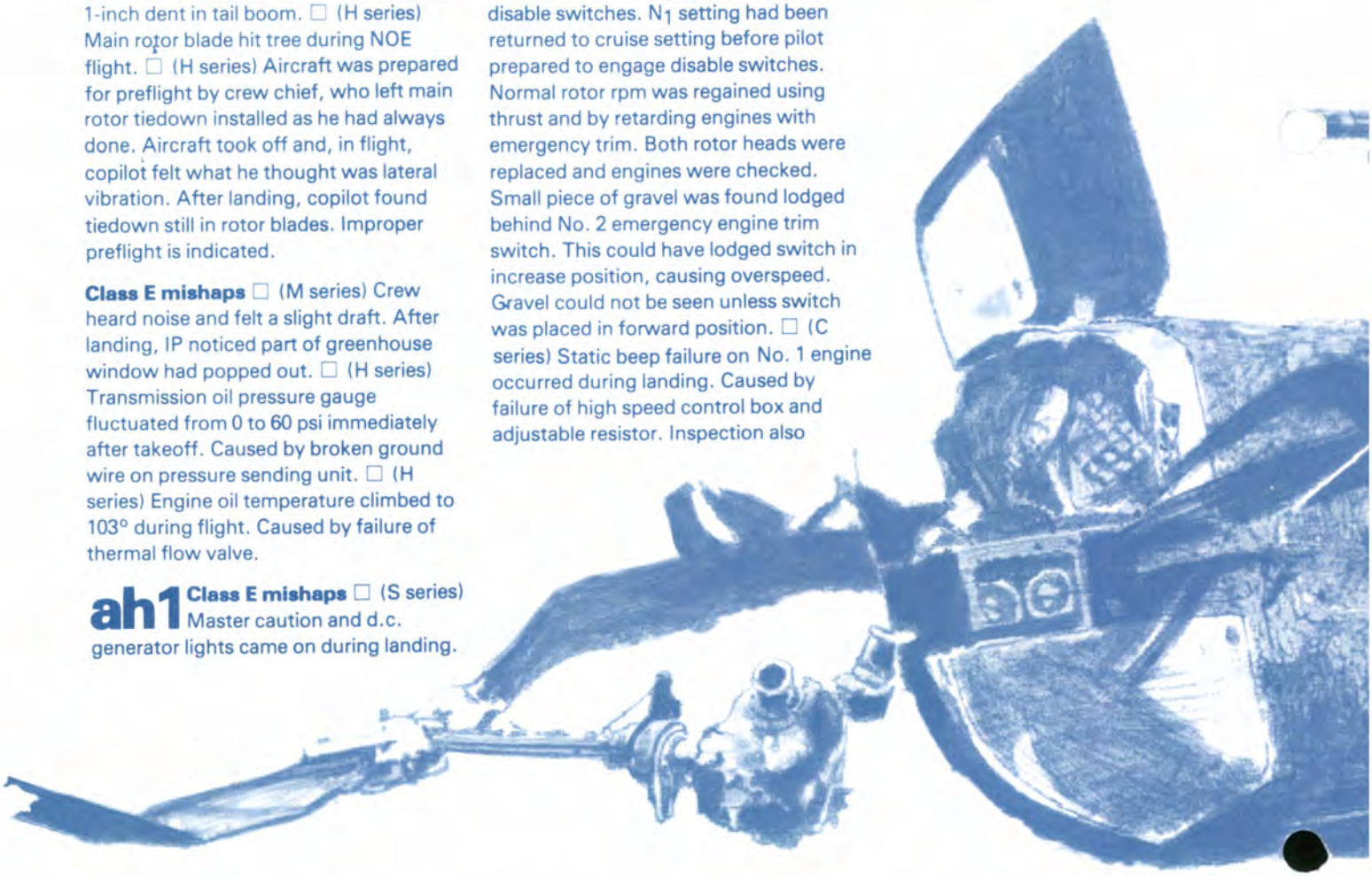
**Class C mishaps** □ (M series) Aircraft was started with aft tiedown hanging on main rotor blade. Tiedown hit tail rotor, causing 3-inch tear in tail rotor blade and 1-inch dent in tail boom. □ (H series) Main rotor blade hit tree during NOE flight. □ (H series) Aircraft was prepared for preflight by crew chief, who left main rotor tiedown installed as he had always done. Aircraft took off and, in flight, copilot felt what he thought was lateral vibration. After landing, copilot found tiedown still in rotor blades. Improper preflight is indicated.

**Class E mishaps** □ (M series) Crew heard noise and felt a slight draft. After landing, IP noticed part of greenhouse window had popped out. □ (H series) Transmission oil pressure gauge fluctuated from 0 to 60 psi immediately after takeoff. Caused by broken ground wire on pressure sending unit. □ (H series) Engine oil temperature climbed to 103° during flight. Caused by failure of thermal flow valve.

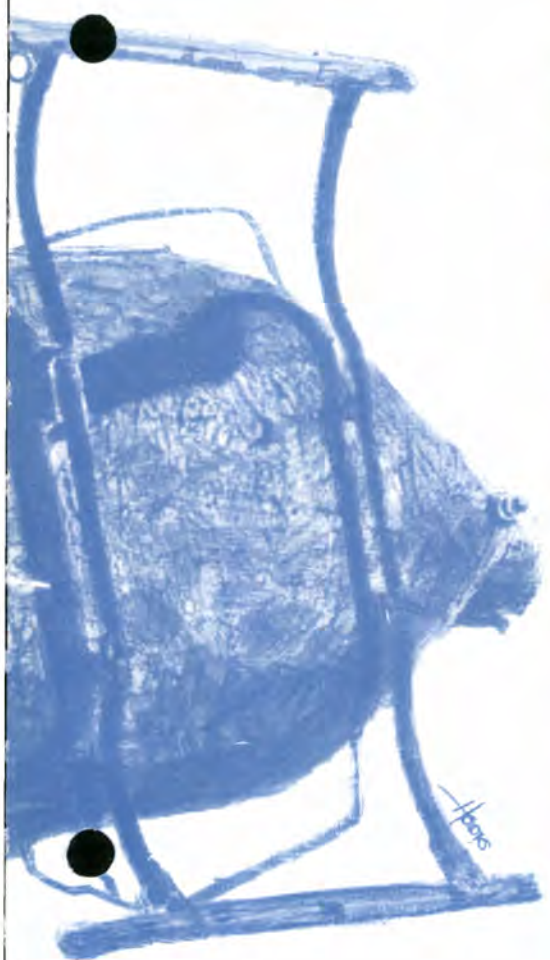
**ah1** **Class E mishaps** □ (S series) Master caution and d.c. generator lights came on during landing. Caused by failure of starter generator shaft. □ (S series) Transmission oil pressure went to 90 psi during hover. Caused by failure of pressure switch.

**ch47** **Class E mishaps** □ (C series) Hydraulic fluid began to spray from SAS extensible link in flight control closet. Caused by failure of extensible link seal. □ (C series) Normal engine trim was disengaged for autorotational rpm check. After rpm check, rotor rpm reached 275 and No. 2 engine went to 98% $N_1$ as pilot was prepared to reengage normal engine trim disable switches. $N_1$ setting had been returned to cruise setting before pilot prepared to engage disable switches. Normal rotor rpm was regained using thrust and by retarding engines with emergency trim. Both rotor heads were replaced and engines were checked. Small piece of gravel was found lodged behind No. 2 emergency engine trim switch. This could have lodged switch in increase position, causing overspeed. Gravel could not be seen unless switch was placed in forward position. □ (C series) Static beep failure on No. 1 engine occurred during landing. Caused by failure of high speed control box and adjustable resistor. Inspection also revealed malfunction of No. 1 engine actuator. □ (B series) Cyclic could not be moved laterally as aircraft was picked up to hover. Caused by failure of lateral magnetic brake.

**oh58** **Class A mishap** □ (A series) Aircraft lost power during approach to field site, landed hard, and rolled on right side. Tail boom and main rotor system separated. Preliminary teardown analysis indicates failure of compressor. 8107



**Class E mishaps** □ (A series) Pilot was making performance checks before starting mission. Rpm bled down to 96% $N_2$ during left pedal turn at 4-foot hover. Pilot stabilized aircraft at 4-foot hover into the wind and took off to return to airfield. At 50 feet agl, pilot heard rpm audio and power was lost. Just before aircraft was landed, $N_2$ rpm was noted at 93%. Caused by malfunction of double check valve assembly. □ (C series) Pilot encountered unforecast weather at 300 feet agl. As pilot executed 180-degree turn, he discovered weather had closed in behind him. At this point, pilot entered IMC, requiring him to execute emergency IMC procedures. With radar assistance pilot landed at home base. **Well done to the pilot.** □ (A series) Master caution light came on during flight. Caused by moisture in light circuit. □ (A series) Aircraft started to roll to right during takeoff from slope. Application of left cyclic did not help. Collective was lowered and pilot thought spike knock had occurred. Inspection revealed no damage. Caused by improper slope takeoff technique. □ (A series) After dropping passengers at field location, pilot tried to fly to airfield but was unable to make it because of bad weather. Numerous steep bank turns were required to avoid flying into low ceilings or ground fog. Transmission oil cover apparently vibrated loose, allowing oil to splash over entire transmission area and right side of aircraft. Oil had been added to transmission. Although crew chief said he replaced oil cap securely and cap was in place during preflight, it is possible cap was not securely fastened.



**u21** **Class E mishaps** □ (RU-21H) Engine air start was attempted during single-engine training flight. When auto-ignition switch was turned on, segment panel light did not come on and bus overload relay circuit breaker popped. All electrical power was lost. Electrical equipment was turned off. When battery was turned on and No. 2 generator reset, second battery start was made. Bus overload relay circuit breaker popped again and start was aborted. Single-engine landing was made. Postflight inspection revealed two in-line diodes had crystalized. □ (A series) Fuel pressure fluctuation on No. 1 engine was followed by failure of electric fuel boost pump. Flight was continued using fuel crossfeed to boost fuel pressure, and aircraft was landed at destination 15 minutes later. □ (A series) Right fuel boost and crossfeed lights came on. Caused by failure of right boost pump.

# Maintenance

**uh1** **Class E mishaps** □ (H series) Fire warning light came on during flight. Caused by chafed wire. □ (H series) Hydraulic light would not go out during runup. Leak was discovered at tee fitting on hydraulic line connected to tail rotor servo. Nut to tee fitting was four turns loose.

**oh58** **Class C mishap** □ (A series) Tracking flag hit main rotor tip cap during tracking operation, damaging cap.

**u21** **Class E mishap** □ (A series) Left main landing gear light did not illuminate when gear was lowered. Gear was recycled twice with unsafe indication and then manually pumped down. Caused by out-of-adjustment down-lock switch.

## Messages received

• Safety-of-flight message concerning one-time inspection for UH-60A APU/engine fuel shutoff valve (UH-60A-80-37, 031500Z Nov 80). Summary: APU/engine fuel shutoff/prime valves may operate intermittently due to a hydraulic lock caused by an extra O-ring installed in valves with serial numbers 1 through 75. Contact: Dennis Schumacher, AUTOVON 693-1661, commercial 314-263-1661. *(continued on next page)*

# Mishap briefs

• AVRADCOM message concerning special inspection requirements for the UH-60A in TM 55-1520-237-23-4 (051515Z Nov 80). Message notifies personnel of the deletions and modifications being made to inspections so unnecessary man-hours expended on these inspections can be eliminated.

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

## From National Transportation Safety Board

On January 10, 1980, a Piper Arrow aircraft crashed into a mountain after departing the Kalispell City Airport, Kalispell, Montana. All three persons aboard were killed.

The Safety Board's investigation disclosed that the pilot had been issued, before takeoff, an IFR clearance to the Calgary Airport via direct to the Kalispell VOR, direct to the Calgary VOR. The clearance, issued by the Salt Lake City Air Route Traffic Control Center, included a climb to 14,000 feet and a transponder code. After acknowledging the clearance, the pilot asked, "Are we going to get vectors northbound?" The controller replied, "I could vector you to the Canadian border; after that I'm not sure if Canada can." The pilot answered, "We'll be receiving Lethbridge by that point."

As the aircraft reached the Kalispell VOR, the controller said "radar contact" and requested the aircraft's altitude. After the pilot reported leaving "five point five," the controller made the following transmission: "Three niner mike roger Lethbridge (unintelligible) bearing (unintelligible) five report reaching one four thousand." About 1 minute later, the pilot asked the center " . . .to let us know coming up on some high terrain if you would." The controller replied, ". . . are you in the clouds now?" The pilot said that they were. There were no more transmissions from the aircraft.

The Kalispell Airport has no published instrument approach procedures and , thus, no published IFR departure procedures. An approach by visual reference to the terrain is the only means of access to this airport. However, there are no procedures which prohibit a pilot from filing an IFR flight plan and receiving an IFR clearance for departure from this airport or other airports not having published instrument departure procedures. Normally, a pilot files a route that may include a published Minimum En Route Altitude (MEA), a Standard Instrument Departure (SID), a Standard Arrival Route (STAR), a published IFR Departure Procedure for small airports, or a published Instrument Approach Procedure, all of which provide sufficient altitude obstruction clearance. However, a departure clearance from an airport, such as the Kalispell Municipal, does not provide obstruction clearance. In fact, paragraph (5)(c), Instrument Departures, Obstruction Clearance During Departure, of the Airman's Information Manual states.

". . .At airports where instrument approach procedures have not been published, hence no published departure procedure, determine what action will be necessary and take such action that will assure a safe departure."

Thus, in IFR conditions, such departures involve a hazard because the pilot does not have available any published procedures for instrument flight. Furthermore, he cannot get radar vectors until the aircraft climbs to the minimum vectoring altitude (MVA). The ATC issuance of an IFR clearance for the portion of a flight before it reaches "protected airspace," or airspace that insures terrain avoidance, gives the pilot implied permission to fly under actual IFR conditions via the IFR flight plan in an area where the flight can only be accomplished safely under VFR. The Safety Board believes that, in order to assure terrain clearance, a departure of this nature must be conducted visually, and that the controller-issued IFR clearance should begin only at a point that provides separation from the terrain.

During its investigation, the Safety Board interviewed pilots who said that they expect the controller to be able to issue radar vectors after saying "radar contact." The ATC handbook prohibits vectoring aircraft below the MVA. Pilots have no access to MVA information because it is contained in documents in individual ATC facilities. These are not given general distribution. During the investigation, the controller stated that the MVA for the flight was 12,500 feet, that radar contact was established as the aircraft left 5,500 feet, that the target was non-mode C, and that the bearing to Lethbridge was an "information only" item.

The Safety Board believes that, in this accident, based on the controller's transmission, the pilot expected radar vectors and was not aware that the controller had no terrain information and therefore was unable to issue vectors until the aircraft was above the MVA. Because this misconception apparently is shared by many pilots, we believe a change in procedure is warranted. ■

# Stacom

## Cold weather operations

It's that time of year again. Cold weather is coming fast or is already upon us depending on the location.

Preflights on cold mornings with stiff wind chill factors are more and more common. Skids will be frozen to the ground and the danger of whiteouts during landing and takeoff will be very real. What is the proper procedure when confronted by these and other hazards such as ice, snow, and frost? Following is a list of publications and safety-related articles on the subject of cold weather operations that should be of interest to a good standardization and safety program:

TC 1-12, Cold Weather Flying Sense
TC 1-20, Aeromedical Training for Flight Personnel
TC 21-3, Soldier's Handbook for Individual Operations and Survival in Cold Weather Areas
Dash 10, chapter 5, Special Operating Limitations
Dash 10, chapter 8, Winter Preflight and Flight Operating Instructions
STACOM 34, 1 Nov 78, Rotor-induced Whiteout
FLIGHTFAX, 27 Sep 78, Snow Warnings in September
FLIGHTFAX, 11 Oct 78, The Cold Facts
FLIGHTFAX, 10 Oct 79, Blowing Snow Whiteouts
FLIGHTFAX, 14 Nov 79, Helicopter In-flight Icing
FLIGHTFAX, 30 Jan 80, Correct OH-58 Ice Removal Important
FLIGHTFAX, 10 Sep 80, Cold Weather Alert
AR 95-1, par. 4-4d, Flight into icing conditions
Unit SOPs and reading files ■

## Hot starts

The UH-60 starting system is automatic and normally requires no pilot action once the starting sequence is initiated. The engines are not, however, free of the potential for hot starts resulting in engine overtemperature. Following is a list of conditions that can result in overtemperatures:

- Moving the power control lever to idle with tgt above 275° C.
- Starter drop-out prior to reaching starter cut-out speed 52-65% NG.
- Popping or rumbling noise during start, indicating possible engine stall.
- Loud bang or noise during flight, indicating possible engine stall.
- Ingestion of foreign object into engine inlet which could cause compressor damage with possible stall.
- Operation in ECU lock-out mode with manual control of engine and deactivation of TGT limiter.

Action must be taken by all UH-60 users as soon as possible to place added emphasis on recognition of hot start characteristics and "hands-on" abort start procedure training. ■

## Questions and Answers

**Question**: Is there a difference between a "thin" and a "partial" obscuration? It appears that the terms are interchangeable.

**Answer**: The terms are not interchangeable. Your problem, which is not uncommon among aviators, is the error in interpretation of the symbol "-" used in aviation weather reports. This symbol has three uses: two as prefixes and one as a suffix.

1. - Thin, when prefixed to the sky cover contractions SCT (scattered), BKN (broken), and OVC (overcast).
2. - X Partly Obscured, when prefixed to the symbol "X." It means that 0.1 to less than 1.0 sky is hidden by precipitation or obstruction to vision from an observer on the ground. An obscuration is either total or partial, never thin.
3. - Light, when suffixed to a "weather and obstruction to vision" symbol, i.e., R- light rain.

**Question**: If piston engines generate less power when subjected to high concentrations of water vapor, why is their performance improved when liquid water is added to the fuel air mixture?

**Answer**: The presence of water vapor in the air causes a loss of power due to the diminished volume of combustible air, some of which has been replaced by water vapor. This causes an overly rich mixture and a "drowning" effect, further reducing engine effectiveness.

On the other hand, the introduction of liquid water directly into the engine absorbs a great amount of heat as it evaporates and mixes with the fuel charge. This heat absorption protects against pre-ignition due to overheating and the engine is able to deliver "wet" full power which is about 7 percent above full power without water injection.

Water vapor, because it is evaporated before being introduced, provides no cooling to the engine as does water in a liquid state. ■

Information contained herein generally precedes the formal staffing and distribution of Department of the Army official policy. Subject information is provided to all commanders to enhance aviation operations and training support. Call AUTOVON 558-7174 during duty hours; 558-6487 after duty hours.

# Shortfax

## When do you add Prist?

There is some confusion among UH-1 operators concerning when it is appropriate to add Prist to commercial jet fuels. Table 2-1 of TM 55-1520-210-10 states that Prist provides anti-icing protection and also functions as a biocide to kill microbial growths in helicopter fuel systems. Therefore, Prist must be added to commercial fuel not containing an icing inhibitor, regardless of ambient temperatures. See table 2-1, page 2-42, of the UH-1 Operators Manual for details. ■

## New film released

"Profile of an Accident—and Then There Were Two" (TF 46-6119) was released 2 October 1980. This 10-minute film stresses the importance of supervision, maintenance, and command guidance in the safe operation of aircraft.

The film is now available at your local Training and Audiovisual Support Center. ■

## Birds or aviators

Each year the autumn migration of waterfowl makes hunters and tax collectors happy, but a few pilots very sad. A 25-pound sandhill crane does not belong in a cockpit, engine, or anywhere near an aircraft. However, each year, several close and actual encounters make true believers out of both the cranes and the flight crews.

It's an absolute fact that very few migratory birds study operators manuals or hold extensive preflight briefings. On the other hand, the smart aviator not only knows the migratory routes, but plans the route and altitude to minimize the possibility of a bird strike. Results of the next few months, as the birds head south (and again north in the spring), should clearly show who is smarter—birds or aviators! ■

**—from APPROACH**

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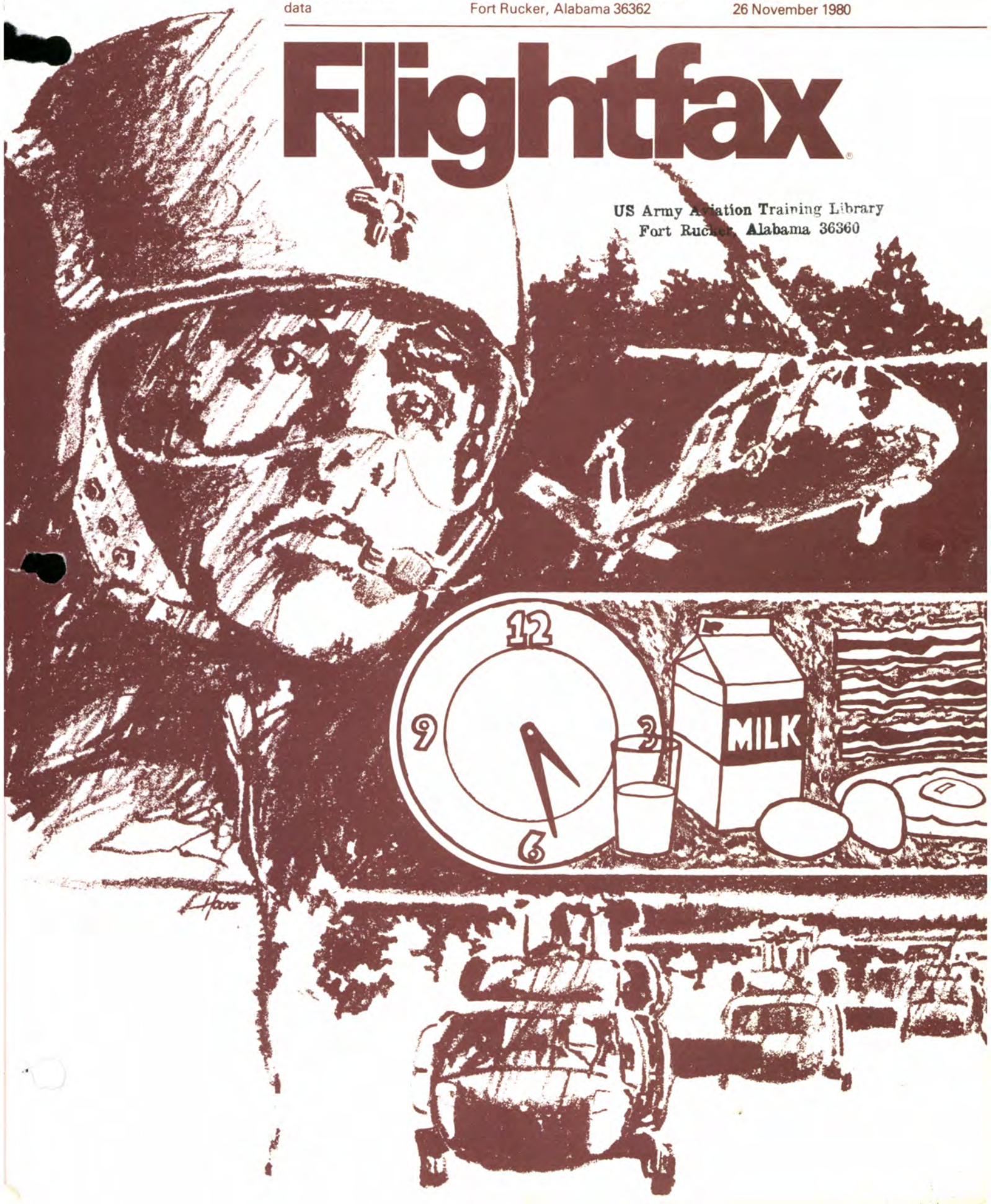


# Food for thought

Are you one of the estimated three out of four people who skipped breakfast this morning? If you did, you could be a candidate for an accident according to Dr. J.E. Monagle of the Department of National Health and Welfare, Canada.

He points out that your blood sugar after an overnight fast may be at a reduced level when you wake up. This condition, known as hypoglycemia, may cause morning headache, irritability, irrational emotional responses, grogginess, and confusion.

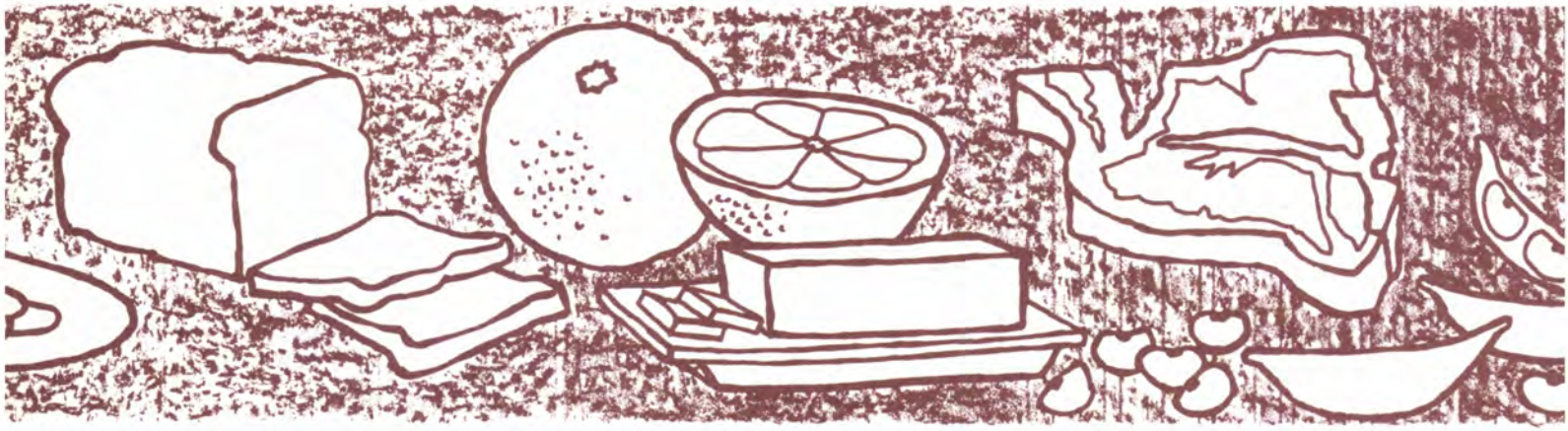
Add to these the effect of sudden stress or emotional reaction, such as a last minute glitch in our trusty crew transport. This stimulates a sudden release of adrenalin, which raises blood sugar, and causes other disturbing symptoms such as fear, anxiety, headache, shakiness, weakness, dizziness, shortness of breath, and palpitations of the heart. The preoccupation and distraction from these symptoms may increase your chances of an accident. The anxiety may cause hyperventilation, producing additional disconcerting symptoms such as numbness, tingling, warmth, and dizziness, with or without respiratory symptoms. Dr. Monagle cautions that when you're in this state, it's unwise to do things requiring alertness, concentration, mental and physical responses.

Studies at a university add to these facts. Students who didn't have breakfast showed markedly poorer classroom performance. In London, police have noted that traffic accidents happening around 10 or 11 a.m. frequently involve persons who have not eaten, or at least not properly. Certain people, especially those with emotional problems, will develop hypoglycemic symptoms 2 to 3 hours after ingesting a meal rich in carbohydrates.

While we have no definitive statistics on accidents to nonbreakfasted pilots, the points made here apply also to pilots. To be mentally and physically alert, the breakfast should contain some protein—an egg, glass of milk, or even a sausage or some bacon **before** flight planning.

Many individuals routinely skip breakfast. However, aircrews should not deviate from their usual dietary habits when flying—that includes lunch. Lunch at the candy machine is rapidly overshadowing the Fighter Pilot's Breakfast on the list of aircrew favorites. By the time supper comes around we could eat a horse—washed down with some "Colorado Cool Aide," of course. That's one hell of a way to treat the most sophisticated piece of data management in your airplane.

A typical scenario for the hypoglycemia incident would go something like this. Remember, the most likely person to experience this would be someone subjected to severe psychological stress in the form of anxiety.



0430 Awoke and ate toast and coffee
0505 Arrived at squadron
0515-0540 Preflight planning
0545-0630 IP briefing
0630-0710 Aircraft preflight
0710 Taxi takeoff

This was the student's first flight in advanced instruments, and it had been one month since he had last flown instruments. Ten minutes into the instrument portion of the mission, he began to come unglued. He began to overcorrect, and when the IP noticed that the aircraft was climbing after a rollout from a turn, he queried the student who reported symptoms of dizziness, tingling and generalized warmth.

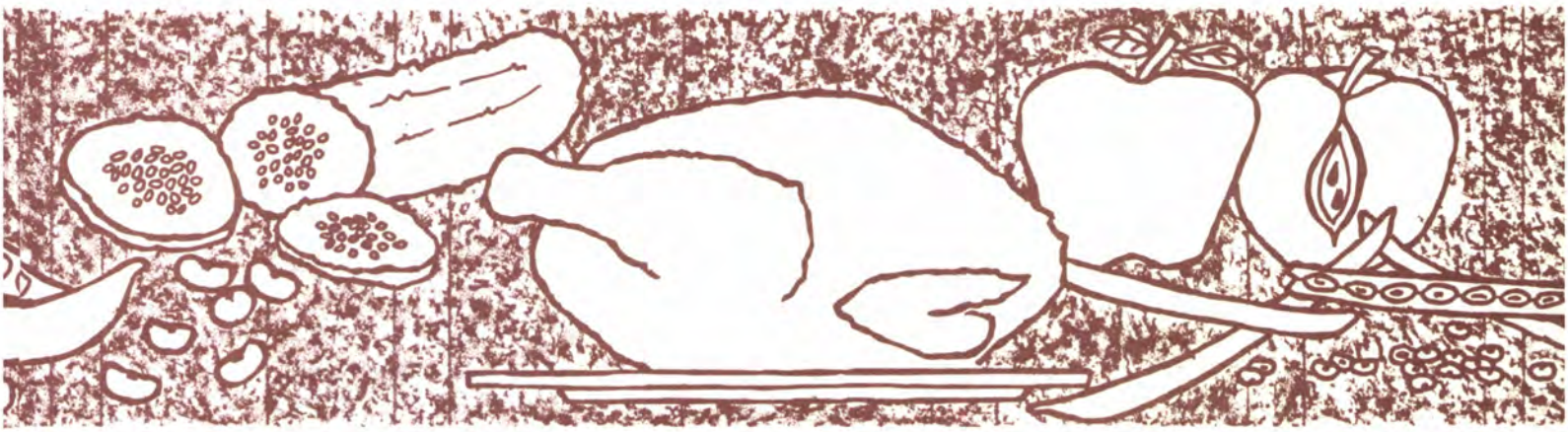
Dizziness gradually cleared during the descent and the student reported he was "completely normal at the time of landing." The student never reported heavy breathing and the IP did not recall the student pilot breathing heavily, but because the symptoms are compatible with hyperventilation, that was considered to be the most likely possibility.

But, is it the only factor to be considered? Could the hyperventilation symptoms have been produced by the anxiety of adrenalin released in response to lowered blood sugar? Let's put the pieces together in a logical manner.

The student had become accustomed, through the years, to a diet of heavy meals at regular intervals. But after the customary evening meal the night before, breakfast on the day in question consisted of toast and coffee, and that at a much earlier hour than normal. As in any normal individual, the amount of sugar in his blood is controlled by the type of food consumed and by two body chemicals, insulin, which lowers the blood sugar level, and adrenalin, which raises it by "squeezing" sugar from the liver and muscles (where it is stored as glycogen).

pancreas and within two or three hours the level is back to normal limits. The level of sugar in the blood is a critical factor in the functioning of brain cells, since they use sugar almost exclusively as their source of energy.

In this particular case, the student "fasted" from 1900 the night before until the time of his reaction (about 0730). This is a fast of more than 12 hours, broken only by coffee and toast. It is entirely possible that the toast and coffee triggered the insulin mechanism and brought his blood sugar down to a borderline level. At this point, three hours before eating, he was subjected to severe psychological stress in the form of anxiety. Under these conditions, adrenalin (or epinephrine) is released into the bloodstream. Adrenalin can cause the



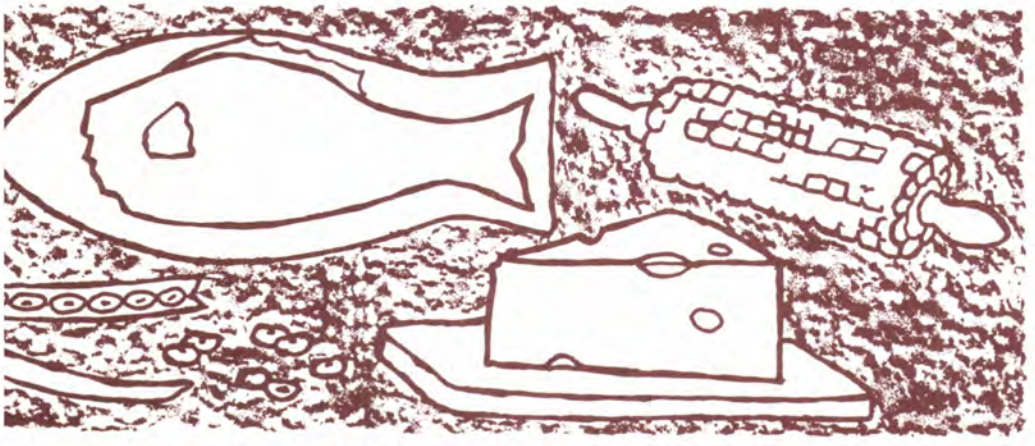
However, if prolonged fasting has reduced the usual body stores of glycogen, the elevation of blood sugar may be minimal, whereas the unpleasant effects of adrenalin may be maximal. Normally, the amount of sugar in the blood rises rapidly after eating. This triggers the secretion of insulin by the

symptoms of dizziness, weakness, and sweating, and produce the anxiety which leads to hyperventilation, as in this student. *(continued on next page)*

# Food for thought

When the IP takes over, declares an emergency, and begins a descent, the student's emergency is over. He can relax, so the level of adrenalin rapidly diminishes. His symptoms disappear by the time the IP lands the aircraft.

A blood test taken postflight revealed that his blood sugar level was still in a "borderline" status. The real culprit here is hypoglycemia and every crewmember must realize his own vulnerability under similar conditions. You may get away with lapses and omissions occasionally, but as long as the laws of probability are valid, you can expect to have a reaction at some unspecified time and under conditions which may be more dangerous than this student's. Try speculating on what might have been the outcome had he been solo.



Let's run this by again and see what our student should have consumed prior to his mission. We do not need a gourmet's delight in every meal we eat; what we do need is a balanced diet. All the food groups should be represented including:

1. Breads, enriched or whole grain; cereal or potatoes.

2. Citrus fruits, other fruits and vegetables.

3. Dark green or deep yellow vegetables.

4. Fats: butter, margarine, and other fat spreads.

5. Meat: fish, poultry; cheese or eggs.

6. Milk.

That's right. We all need some fats in our diet and, would you believe, carbohydrates as well. I'm not proposing that we live on Big Macs and fries. What I do suggest, though, is have a good look at the meals you are now eating and see if you are doing your body justice. Try to spread the daily intake into three balanced meals.

Remember also that crash diets have no place in the life of the aircrewmember. If you are finding it difficult to make those weigh-ins, check with the flight surgeon first. He will advise you what your ideal body weight should be and how best to maintain it. Crash dieting may result in some immediate weight loss, but you don't get the nutrition required for proper health. As well as loss in the fatty tissues, you will lose needed protein and muscle tissue. What's more, the body will quickly regain those lost pounds when the crash diet is terminated—quite often the dieter ends up heavier than when he started. Some diets are dangerous. For example, the liquid protein fad has been associated with a number of sudden deaths attributed to severe chemical imbalances.

Back to our student. There is no requirement for a fancy breakfast of pancakes and all the trimmings—a glass of orange juice, milk and cereal, perhaps with toast and butter or jelly will provide many of the food groups he needs. As aircrewmembers, it behooves us to realize that we have some control over those early morning butterflies. As supervisors and IPs we should be cognizant of the stressful environment the trainee pilot is forced into—part of our supervisory role obviously involves the man of the man/machine system. Let's insure that the man has the opportunity to take in those well-earned vitamins. That includes time out for an adequate lunch (at least a sandwich) instead of a trip to the candy machine.

Footnote: For those fortunate enough to be a crewmember of multiplace aircraft, don't forget some commands lay down additional guidelines on **when** we can eat those in-flight delights. ■

**—from AEROSPACE SAFETY**

# Judgment, maintenance, and the PIC

As a pilot-in-command, do you always use sound judgment in everyday aircraft maintenance procedures? Doing so not only makes you a better pilot but also sets the right example for those who fly with you.

Do you always follow the checklist? Besides being required by AR 95-1, it is just sound judgment (and good sense) on the part of the PIC to always use the checklist. Have you ever made a **quick look** preflight and found something wrong? I'm sure that the feeling of "Did I miss anything else?" crept in. Sound judgment and the checklist could replace that uneasy feeling with one of confidence.

Using sound judgment in aircraft maintenance procedures doesn't end with the checklist. As a PIC you must use sound judgment in determining if the checklist items meet the established maintenance criteria. Have you ever found what some people call a little red X? Using your sound judgment, you write up the fault and try to get it corrected as soon as possible. Right?

All too many times, judgment bends to the pressures of the peacetime training mission. You know "it really isn't much," but what about your new copilot? Does he or she get the benefit of your sound judgment and see how things should be done? No! You are teaching your copilot that rules and sound judgment only count sometimes. Using sound judgment in getting this "small" matter fixed before you fly shows your copilot and your peers that you deserve the title pilot-in-command.

Do you use sound judgment in dealing with maintenance problems? All of us have read the operators manual. In fact, to become a PIC, we are tested and retested on its content. I have yet to find in any operators manual where the PIC is authorized or encouraged to conduct the "minitest flight" when maintenance problems occur. I'm sure you know what I mean. The controls are binding just a little. Your flight is taking off in just 2 minutes. What to do, what to do? Using sound judgment may mean you get the maintenance officer to take a look at it, even though you may miss the flight's takeoff. Sometimes, though, we see a PIC check the stops and announce that everything's A-OK. Is it? Does he really know what he's doing? Is he using sound judgment?

A small maintenance problem may be a warning of a bigger one to come. Sound judgment demands that we land when we first experience maintenance problems in flight. Let someone trained in maintenance handle the problem. Don't let your ego take over and make you believe this is something you should handle. Using sound judgment in this case means that you write up clearly the fault or suspected fault so maintenance personnel can find and fix the problem. A clearly stated writeup makes the problem much easier to solve than sifting through wreckage at a crash site.

The use of sound judgment in everyday maintenance procedures is what people look for in a pilot-in-command. From preflight to precautionary landing, sound judgment in everyday maintenance procedures is a must. Although pressures from others may try to make you bend from what you know is right, sound judgment is the cornerstone of aviation safety. Moreover, sound judgment is one of the best tools a PIC can use to teach a new copilot the right way to handle everyday maintenance problems safely.

I'm sure you can cite many more examples of how sound judgment on the part of PICs has paid off quite well. On the other hand, all you have to do is read FLIGHTFAX to learn about all the PICs who failed, maybe just once, to use their sound judgment in everyday maintenance procedures. ■

**CW3 Richard G. Amodt**
**USASC ASO Class 81-1**

# Selected mishap briefs

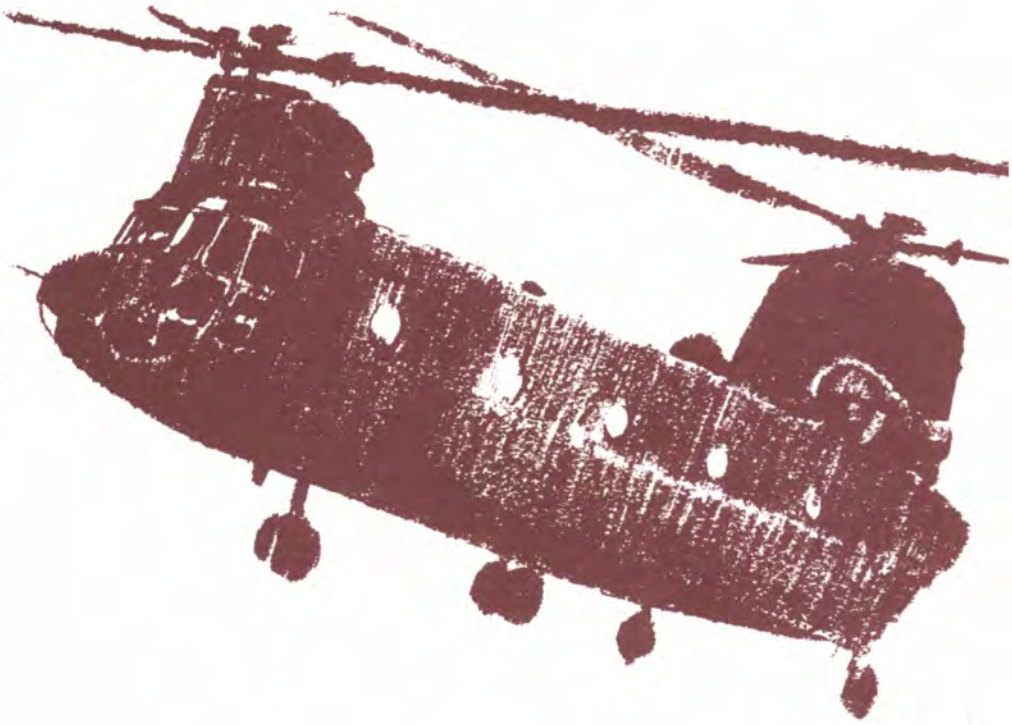
**uh1** **Class A mishaps** □ (H series) Aircraft No. 1 took off from lane 1. Aircraft No. 2 took off from a pad located about 1,500 feet to the right rear of the takeoff point of aircraft No. 1. During the crosswind part of the flight, red main rotor blade of aircraft No. 1 hit tail rotor assembly of aircraft No. 2, causing tail rotor assembly and 90-degree gearbox to separate. IP of aircraft No. 1 took control and landed straight ahead to an open field without further damage. IP of aircraft No. 2 took control of aircraft, which was in a nose-low attitude spiraling to the right. IP tried to level aircraft and cushion it into some trees. Aircraft settled into trees and came to rest on left side. 8108 □ (H series) Aircraft crashed during departure from LZ. Pilot, copilot, and crew chief were killed. Low ceiling and ground fog were probable at crash site. 8109

**Class C mishaps** □ (M series) Low rpm light and audio activated at 800 feet agl. Rotor rpm was stabilized at 295-300. Altitude prohibited applying emergency procedures for suspected low-side governor failure. Rpm was sacrificed to clear hilltop, resulting in hard touchdown. Terrain was steeply sloped, and there were few level or open forced landing areas. Fuel control or governor failure is indicated. □ (H series) Tail rotor blade hit tree limbs during hover for takeoff. □ (H series) Aircraft took off with fire suppression water bucket as sling load. About 200 feet agl, cargo hook opened and load fell. Water bucket was destroyed.

**Class E mishaps** □ (H series) Engine oil pressure fluctuated and then went to zero during landing. Caused by failure of oil pressure gauge. □ (H series) Copilot's windshield began to fog over. After initiating descent for approach, crew smelled odor. Landing light was turned on and loadmeter registered maximum amperage. Caused by failure of battery. □ (H series) Fuel fumes were detected in cockpit during flight. Caused by seeping left forward sump drain. □ (H series) On engine shutdown, egt increased when throttle was closed and main fuel switch turned off. IP motored starter and egt decreased to 550 degrees. When starter was released, egt increased again. Shutdown was eventually completed by disconnecting main fuel quick disconnect. Caused by failure of engine fuel control.

**ah1** **Class E mishaps** □ (G series) Egt began fluctuating between 350 and 400 degrees on both gauges. Caused by corrosion on cannon plug connecting harness to egt system. □ (S series) Crew smelled smoke during engine runup. Caused by failure of alternator. □ (G series) Transmission oil pressure was lost during flight. Caused by cracked elbow fitting. □ (S series) Engine oil pressure light came on after takeoff. Caused by failure of pressure switch.

**ch47** **Class E mishaps** □ (B series) During flight, with $N_1$ above 70 percent, No. 2 engine oil pressure remained below 40 psi. Caused by failure of engine oil pump. □ (C series) Both fore and aft longitudinal speed trims went into full retract position during flight at 130 knots airspeed and 1,500 feet agl.



Airspeed exceeded VNE with speed trims retracted. When aircraft was slowed to 100 knots, speed trims returned to proper position. Caused by electrical malfunction in speed trim amplifier box. ☐ (C series) No. 1 engine oil pressure dropped below red line during flight. Caused by failure of oil pressure transmitter.

**oh58** **Class E mishaps** ☐ (A series) Pilot saw sparks in lower right corner of instrument panel during landing. Console and instrument lights were then lost. Instrument panel light circuit breaker popped and could not be reset. Failure of panel lights was caused by shorted-out attitude indicator light. ☐ (A series) Preflight inspection revealed shallow dents on tail rotor blade. Pilot flew mission and did not detect any high frequency vibration. Damage was evaluated by tech inspector after return to airfield. Dents were determined to exceed allowable limits on one tail rotor blade. Two-inch-long separation between blade cap and skin was detected by magnifying glass. Damage was probably caused by flying debris. **Aircraft damage should only be evaluated by qualified maintenance personnel.**

**th55** **Class C mishap** ☐ SP was on first supervised solo flight. During third approach, SP lost control as antioverspeed device activated. Aircraft yawed 180 degrees to right, then stabilized momentarily. SP attempted hovering autorotation and main rotor blade hit ground.

**c12** **Class E mishap** ☐ (A series) As aircraft was passing flight level 090, cabin altitude started increasing at 2,000 fpm. At flight level 160, aircraft was leveled off with cabin altitude indicating 10,000 feet. Aircraft was landed and airstair door seal replaced.

**u3** **Class E mishap** ☐ (A series) Fuel was seen venting from left auxiliary fuel tank during flight. Caused by cracked gasket.

**u21** **Class E mishap** ☐ (RU-21H) No. 1 power lever would not reduce below 600 pounds torque. Engine was shut down and aircraft landed. Temperature at flight altitude was -30° C. After 10 minutes on the ground, with temperature at 0° C., power lever unfroze. Moisture probably entered cable housing and froze.

# Maintenance

**uh1** **Class E mishaps** ☐ (H series) Master caution light came on and controls stiffened. Postlanding inspection revealed crimped O-ring below pressure switch. ☐ (H series) Pilot smelled fumes from battery vent after takeoff and turned off battery switch. Voltage regulator was set too high, causing battery to overcharge. ☐ (H series) Controls stiffened and master caution and hydraulic lights came on. Postflight inspection revealed hydraulic line tube assembly was chafed against another hydraulic line. ☐ (H series) Pilot heard loud whining noise from rear of aircraft during takeoff, and hydraulic light came on. Upper preformed packing was not installed on irreversible valve.

**ch47** **Class E mishap** ☐ (A series) Daily inspection revealed damage to left forward work platform. Forward latches of platform had not been secured, and platform was bent out during flight, causing cracks in fiberglass skin and internal rib. Damage was not discovered during postflight inspection because of darkness.

*(continued on back page)*

# Mishap briefs

**ch54** **Class E mishap** □ (A series) Hydraulic fluid was seen running out of hoist well during hover. Caused by loose hydraulic line on hoist well at bottom of flow regulator.

**oh6** **Class E mishap** □ Engine power was lost, and aircraft was autorotated to landing. Caused by loose bleed air line at tee fitting on governor.

**oh58** **Class D mishap** □ (A series) Crew chief began postflight inspection during shutdown. While standing on right side of aircraft near No. 3 tail rotor drive shaft hanger bearing, crew chief thought he saw hole through drive shaft. Rotor was turning 20 to 30 rpm. As crew chief touched his right index finger to drive shaft, glove rotated with drive shaft. Crew chief jumped back, ripping glove and amputating finger. The hole the crew chief thought he saw through drive shaft was an inspection hole. Caused by failure to follow accepted procedures.

**Class E mishap** □ (A series) Engine oil pressure fluctuated during flight. Aircraft had a history of fluctuating engine oil pressure. Organizational maintenance could not correct problem, so aircraft was sent to field maintenance, where it was decided to change engine. After engine was removed, engine oil tank was removed. As tank was being removed, oil sump bottle was found in tank. Bottle apparently restricted flow of oil from tank.

**ov1** **Class E mishaps** □ (D series) Power levers were placed in reverse thrust position during landing rollout. No. 1 propeller did not reverse, causing aircraft to veer right off runway. Pilot maintained control and continued along side of runway for some distance, then brought aircraft back onto runway. Microswitch wiring to No. 1 power lever was not properly routed. When gust lock was set, pin at bottom of gust lock lever would catch wire bundle and pull bundle up to gust lock bracket, which eventually caused wires to break. □ (D series) When gear handle was placed in up position after takeoff, gear only partially retracted and would not give safe indication. Gear was recycled with same results, and aircraft was landed. Caused by overinflated struts.

## Messages received

- Maintenance notice advising CH-47 users of additional calendar time inspections (CH-47-80-13, 132010Z Nov 80).

**For more information on selected mishap briefs, call AUTOVON 558-4202/4198.**

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