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mishap prevention
data

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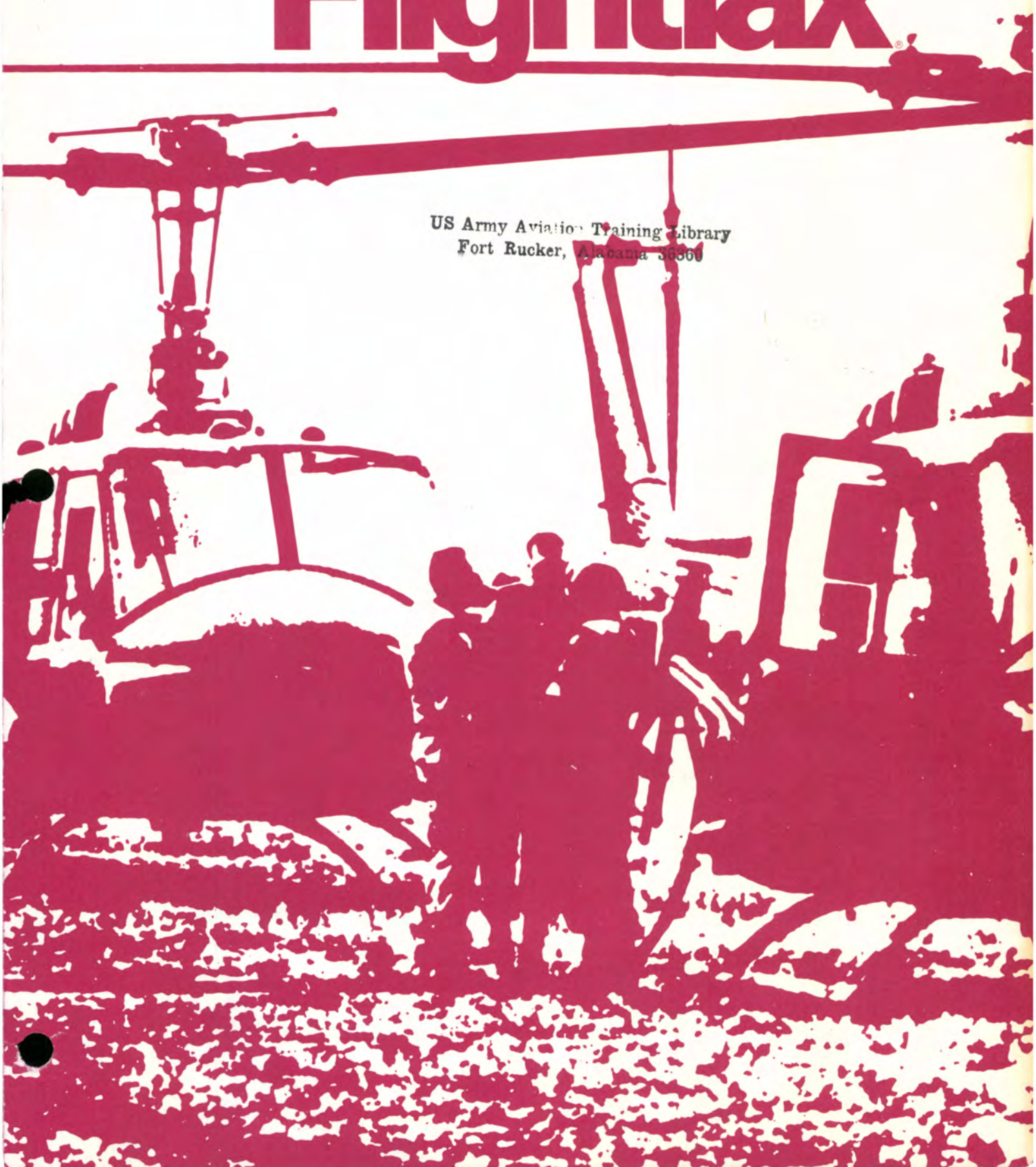

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Accident review

Synopsis

An AH-1G pilot and copilot were on a maintenance test flight. Witnesses saw the main rotor separate and the fuselage spiral to the right, nose low, until it went out of sight behind a ridge line. Shortly afterwards, an explosion was heard. The Cobra was destroyed in the crash and the two crewmembers were killed.

History of flight

The flight was made to determine airworthiness following removal and reinstallation of the tail rotor silent chain. The pilot and crew chief preflighted the aircraft, but the pilot delayed the flight for more than an hour because he was dissatisfied with the entries on the weight and balance form. About noon, the pilot was ready to go. Another aviator agreed to fly with him.

The aircraft was flown in a test flight area for about 10 to 15 minutes. An autorotation with power recovery and a low approach were then made at the unit airfield. The pilot signaled his maintenance personnel that the test flight was complete and the aircraft was satisfactory. After completing the low approach, the pilot broke left and proceeded eastward. It is not known why the pilot continued the flight after the approach.

A short while later, witnesses saw the main rotor separate. The aircraft then pitched down in a right turn and exploded and burned on impact. The tail rotor and 90° gearbox were found 312 feet from the main wreckage and the main rotor assembly was found about 1,800 feet from the wreckage. Several aircraft parts were scattered between the main rotor and the wreckage.

Crewmember experience

The pilot had more than 2,000 hours rotary wing flight time, and the copilot had more than 200 hours rotary wing time.

Witness accounts

The pilot was considered to be a sincerely dedicated maintenance officer and a very meticulous pilot. He rarely took a day off and also worked on weekends. Some of the aviators in the unit described the pilot as being depressed for 3 or 4 months before the accident. There were indications that he was an excessive drinker. Twice he had been asked to leave the officers club for disruptive behavior. However, his drinking appeared to be under control for about a month before the accident.

Aviators who had served with the pilot before said that his personality had changed. He now seemed self-centered and at times showed little regard or consideration for others.

No one reported seeing the pilot "cowboy" an aircraft, but allegations were made about incidents in which serious breaches of flight discipline occurred.

Additional information

It is possible that the pilot ingested methaqualone, a sedative and hypnotic drug, during or just before the flight. Methaqualone may produce headache, fatigue, dizziness, sluggishness, and momentary tingling of the extremities. Drowsiness can occur 10 to 20 minutes after taking the drug. Pilots should be medically grounded while taking methaqualone, which is to be taken only when prescribed by the flight surgeon. It is unknown whether the methaqualone found in the pilot's stomach affected his performance because the hypnotic and sedative effects would occur only if the drug were present in the blood.

Commentary

This accident involved mast separation. Several hypotheses, concerning engine failure, materiel failure of the mast assembly, and failure of the main transmission, among other things, were pursued to try to determine why the mast separated. Teardown analysis of components revealed no conclusive evidence of any defect or malfunction which would have caused or contributed to any type of failure with resultant mast bumping.

One plausible but nonconclusive hypothesis is intentional or unintentional flight near or below zero g. At moderate to high airspeeds, it becomes increasingly easier to approach zero or negative

load factors by abrupt forward cyclic input. The AH-1G will roll to the right simultaneously with the forward cyclic input. This characteristic occurs throughout the normal operating airspeed range and increases at progressively lower load factors. Left lateral cyclic will not effect recovery from a well developed right roll during flight at less than 1 g, and it can induce severe main rotor flapping, causing resultant mast bumping and subsequent separation of the main rotor.

It cannot be concluded that intentional or unintentional flight outside the design envelope occurred.

Areas involving lack of proper supervision kept cropping up during the accident investigation. To begin with, the unit commander should have taken positive action concerning the pilot's very apparent state of emotional/behavior instability. This is not to say that the commander should have tried to solve the pilot's problems himself. We have flight surgeons, chaplains, and other professional people to take care of this. Commanders, with the help of their staff, must continually monitor their personnel, particularly those on flight status, to detect any changes in behavior or problems that might affect performance. When these behavior changes or problems do surface, commanders should use their referral authority to insure the individual is given needed care. Prompt action is essential to prevent these individuals from becoming a hazard to themselves and others.

Other supervisory factors included lack of documentation of flight training, inadequate monitoring of the weight and balance program, and inadequate screening of maintenance forms. No one in the unit knew the purpose, planned duration, or content of the second portion of the flight, which was undertaken without proper approval. This breach of flight discipline indicates a lack of effective operational control of unit resources.

A large number of Army aircraft accidents occur when flight discipline is violated and an unplanned maneuver is conducted, usually without the knowledge or approval of the pilot's supervisor. Without effective command and control a unit will have accidents. If the pilot unloaded the rotor system by some unnecessary maneuver and caused the aircraft to roll to the right, usual for the Cobra in a negative g condition, and then incorrectly reacted by trying to level the aircraft with left cyclic (instead of loading the rotor system by applying aft cyclic **before** he attempted to level the aircaft), this could have caused the main rotor to sever the mast where the static stops hit it.

Mast bumping: causes and prevention

Analysis shows that mast bumping is directly related to the pilot's handling of the aircraft. A Safety Center film "Helicopter Mast Bumping: Causes and Prevention," shows what causes mast bumping in the Huey and Cobra and the in-flight conditions which lead to mast bumping, and stresses what pilots must do to avoid it. The film should be shown as many times as necessary to insure that every helicopter pilot understands what causes mast bumping and what to do to avoid it.

"Helicopter Mast Bumping: Causes and Prevention," catalog number TF 46-6077, is available at your local Training and Audiovisual Support Center. ■

CH-47 lag damper

CH-47C rotor damper attachment failure was discovered after shutdown. It is suspected failure occurred during flight.

As a result of a recent rotor damper attachment failure on a CH-47, some questions have been raised concerning the effect of such a failure.

According to Boeing Vertol Company, all helicopters with articulated rotors are subject to a form of mechanical instability commonly referred to as ground resonance. In the ground resonance situation, the lead-lag pattern of the rotor blades is disturbed at approximately one-third of the one-per-rev frequency in such a manner that the combined center of gravity of all the blades is no longer at the center of the rotor shaft.

This offset center of gravity produces an unbalanced force that causes the helicopter to oscilliate on the landing gear at approximately two-thirds the one-per-rev frequency. If the natural frequency on the landing gear coincides with the frequency of these oscillations, the amplitude of the oscillation can become sufficient to damage the aircraft.

Lag dampers on the rotor blades and dampers incorporated into the landing gear are one means for prevention of instability. The landing gear and blade dampers act together so that the loss of a single lag damper reduces the total damping by less than one-sixth. A second approach is to locate the natural frequency of the helicopter on the landing gear so that it does not coincide with the unstable frequency.

The CH-47 employs a combination of these methods. In addition to damping, the natural frequency is located to eliminate possible instability over the major portion of the operating range from zero percent lift to full airborne.

Analysis indicates that loss of a single lag damper does not lead to an unstable situation. There are a number of recorded instances of lag damper failures in flight, including damper attachment failure, where the aircraft have made uneventful landings. While the flight crews may have noticed a change in the low frequency vibration, they have generally been unaware of the nature of the failure. In the case of a complete attachment failure, difficulty will be experienced during shutdown since the lag stops are incorporated in the damper. Due to the rotor shaft tilt and collective position at shutdown, the lag pin is not perpendicular to the ground. Therefore, as the rotor speed decreases, a point is reached (about 10 rpm) where the centrifugal force can no longer support the weight of the blade, and the blade rotates downward about the lag pin, eventually striking the ground or crown on the fuselage.

Although such an occurrence is obviously undesirable, there will be no hazard during flight rpm conditions as a result of a damper attachment failure.■

Caution: OH-58C engine overtorque

While OH-58A pilots have grown accustomed to keeping a sharp eye on the TOT gauge when pulling power during operation in hot, humid weather and when aircraft are at near maximum gross weight, they have not given the same attention to the possibility of exceeding engine torque limits. And the reason is simple: The T63-A-700 engine lacks sufficient vim to make overtorque a problem. But times have changed. With the advent of the T63-A-720 engine, it's a whole new ballgame.

OH-58C pilots can readily exceed engine torque limits when operating under certain conditions such as high OAT and DA, especially when aircraft are at maximum or near maximum gross weight. As a matter of fact, four instances of engine overtorque involving OH-58C aircraft were reported within the past month. Such overtorque can produce engine and transmission damage and is more likely to occur during NOE flight when aircraft are being hovered out of ground effect and maneuvers such as unmasking are performed. Further, this type of operation poses a double threat in that overtorque can occur and go unnoticed by the pilot who may be preoccupied with conditions outside the aircraft. The end result could be incipient damage that can cause failure and a mishap at some later date.

The solution involves completion of a Performance Planning Card in accordance with chapter 7, TM 15-1520-235-10, so the pilot can know how much power should be available under the prevailing conditions; making certain the copilot or observer monitors the instruments to note any overtorque should one occur; and writing up overtorque occurrences (amount and duration) so proper maintenance action can be accomplished.

At present, if torque exceeds 117% for more than 10 seconds, the engine must be removed for overhaul. (This is in accordance with instructions contained in TSARCOM message 171930Z Aug 79, subject: T63-720 Overtorque.) Anytime engine torque exceeds 100%, the transmission must be inspected. Torque in excess of 115% requires removal and overhaul of the transmission (reference TM 55-1520-228-23, section IV, Inspection Requirement, page 1-43). Of course, before an engine or transmission is removed, maintenance should insure the overtorque indication was not the result of a faulty gauge.

Current technical manuals will be changed in the near future to provide more specific data. Meanwhile, the above inspection and maintenance guidelines are to be followed. Should you have any questions, contact Mr. Al Bayliss, TSARCOM, AUTOVON 693-0611, commercial 314-263-0611.■

Selected mishap briefs

uh1 **Incident** ☐ Aircraft landed hard during practice hovering autorotation to sod. Incident damage to landing gear and attaching points.

Forced landing ☐ Hot refueling had just been completed, and aircraft was climbing to hover. Rpm dropped to 5800 and aircraft was landed. Caused by failure of fuel control.

Precautionary landings ☐ Hydraulic caution light came on and feedback was felt in contols. Popping sound was heard and running landing was made. Caused by failure of irreversible valve. ☐ Crew smelled fumes and copilot saw fluid leaking from lower chin bubble. Caused by failure of capacitator.

Aviation-related ☐ As aircraft was being moved in hangar, main rotor blade hit overhead support of hangar ceiling. Tip of blade was damaged. ☐ Crew chief saw helicopter hovering nearby and unlocked the wheels of his maintenance stand to move it. A paper towel blew off stand and crew chief ran to retrieve it. Stand, left unsecured, was blown into a parked UH-1. ☐ As aircraft was being unloaded from C-141, attachment chains secured to aircraft broke, causing aircraft to slide off ramp. Both skid tubes were damaged. Chains were improperly secured to aircraft. ☐ Tug, being used as workstand, was parked 2 ½ feet from aircraft. When mechanic tried to move tug, nothing happened when gear was placed in reverse. After lever was recycled three times to reverse position, tug jerked forward, hitting left side of aircraft. Transmission linkage of tug was out of adjustment.

ah1 **Precautionary landings** ☐ Aircraft was being recovered from shallow dive. When pitch cone coupling became effective, pilot did not reduce power to compensate and aircraft was overtorqued. ☐ Shortly after takeoff, pilot was told items were falling from his aircraft. Right ammo bay door was open. Postflight inspection revealed forward latch of door would stick in partially closed position. Vibration probably caused door to open. Pilot did not notice sticking latch on preflight inspection.

ch47 **Precautionary landings** ☐ Master caution and No. 2 engine transmission oil pressure lights came on. Caused by failure of No. 2 engine oil pressure transducer. ☐ No. 1 engine low oil light came on. Caused by shorted-out cannon plug.

Aviation-related ☐ Aft rotor blade had been removed and was being lowered by crane. Ropes had been connected at blade cuff and in receptacle at blade tip. About 15 feet off the ground, blade tip rope came out of receptacle. Blade was not balanced in cradle, slid to one side, and fell out. ☐ Drive arm assembly was being removed from aft swashplate. When bolt which connects upper and lower halves of drive arm were removed,swashplate rotated because of weight of blades. Rotation of swashplate caused pitch-change links to gouge swashplate and three pitch varying housings beyond allowable limits. Required maintenance manual was not being used. ☐ Individual had parked his truck near an aircraft. When he was ready to leave, he backed up to turn around. As he was moving forward, he heard a loud noise and felt truck jerk. Getting out and looking behind truck, individual found a rope with a large knot in the end had become caught in rear bumper. Other end of rope was attached to main rotor blade of CH-47. Blade was twisted and buckled beyond repair.

ch54 **Precautionary Landing** ☐ Loud bang was heard and master caution light and second-stage hydraulics caution capsule came on. Postflight inspection revealed No. 1 engine had large holes forward of power turbine section. Numerous metal particles were found in engine exhaust section.

oh6 **Precautionary landing** ☐ Fuel low light came on and aircraft was landed. Fuel quantity indicating system was fully operational. Crew did not visually check fuel level before flight.

oh58 **Precautionary landings** ☐ Pilot was making right descending pedal turn. When turn was stopped, torque went to 108% for 2 seconds. Aircraft was landed and maintenance inspection revealed no damage. ☐ Main rotor blade hit tree top during NOE flight. Damage was found after shutdown. ☐ Winds were 30° at 8 to 10 knots and gusting. Aircraft was in forward flight at 10 knots airspeed, 150 feet agl, heading 180°. As pilot made shallow right turn to downwind flight condition, aircraft began to rotate uncontrollably to right. As two revolutions were completed, pilot reduced throttle to engine idle. Aircraft made two more revolutions and stabilized. Pilot regained power and recovered before touchdown. Suspect gusting winds adversely affected tail rotor thrust capability.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐After refueling at night, pilot lifted aircraft to hover and moved toward a nearby tiedown, using the aircraft searchlight to maintain ground reference in the poorly illuminated area. Dust on the surface of the taxi strip was lifted into the rotorwash, resulting in IMC. With the searchlight still on and reflecting from the dust cloud, pilot tried an instrument takeoff. Aircraft hit ground in nose-low attitude, bounced, and went into right turn with rotor hitting ground at 45° angle.

th55 **Precautionary landing** ☐ During preflight inspection, IP noticed crack at tail rotor blade cap-to-spar filler. Blades were removed and crack was found to be a paint crack.

c12 **Precautionary landings** ☐ (A series) Aircraft was parked with engines running. As crew chief approached aircraft and was reaching up to open door, individual on inside opened door and pressure which had built up inside cabin forced door open, striking crew chief on head. High resistance ground on safety pressure valve prevented valve from returning to normally open position after system was tested, allowing aircraft to pressurize. ☐ (C series) Right bleed air warning light came on during landing. Inspection of bleed air system revealed small hole in tubing of right wheel well. ☐ (A series) No. 2 engine produced only 62% torque on takeoff roll. Caused by failure of high pressure bleed valve.

u21 **Precautionary landing** ☐ (A series) Landing gear would not extend and gear-up landing was made with minimum damage. Machine screw in 2 o'clock position of heater spark plug access panel worked loose and fell on and lodged between nose gear chain and middle sprocket, jamming entire landing gear system.

Maintenance

uh1 **Forced landing** ☐ Aircraft was being hovered to hangar. Dull thud was heard and rotor rpm decreased as aircraft was in right pedal turn. Hovering autorotation was made. Caused by failure of main drive shaft. Previously determined unserviceable drive shaft had been mistakenly installed on aircraft 1 ½ hours before mishap.

Precautionary landings ☐ Crew landed after smelling fuel fumes. Preformed packing was not installed in float switch of auxiliary fuel tank. ☐ Left cargo door came off during flight. Caused by worn cargo door slider tracks, which were not detected during scheduled inspection. ☐ Transmission oil pressure gauge fluctuated between 25 and 55 psi during descent for landing. Inspection revealed metal tube was chafed by electrical wire bundle. ☐ Smoke was seen coming from upper battery vent and loadmeter indicated above red line. Caused by defective battery.

UH-1 series elevator horn assembly

Currently the elevator horn assembly, NSN 1560-00-966-7515, P/N 205-001-914-25, is being issued with a special finish in the inside of the bore. This special finish is Super Korpon Epoxy Primer applied by Bell Helicopter Company. The purpose of this finish is to facilitate removal of the elevators from the horn assembly. The Super Korpon Epoxy Primer performs the same function as the Electro Film dry lubricant which is applied by CCAD.

(continued on back)

Mishap briefs

Information has been received that mechanics in the field are mistaking the Super Korpon Epoxy Primer for Zinc Chromate Primer. In accordance with information contained in TM 55-1520-210-23, paragraph 2-293, mechanics are attempting to remove what they think is Zinc Chromate Primer. The Super Korpon Epoxy Primer is not to be removed from the horn assembly. ■

— from USATSARCOM Information Bulletin

uh60 **Precautionary landing** ☐ Smoke and flames were seen coming from No. 1 engine during start. Main fire bottle was used. After shutdown, smoke continued, indicating further combustion of preservative. Suspect excessive preservative in combustion chamber. Check valve in APU drain was installed backwards.

ah1 **Precautionary landings** ☐ Loud whine was heard from transmission area. At termination of approach to hover, No. 1 hydraulic pressure light came on and pedals became stiff. Caused by failure of No. 1 hydraulic pressure line due to chafing. Line was improperly positioned. ☐ Aircraft was cranked and brought to flight idle. Before operating rpm was attained, pilot noticed object fly from rotor disc area and then saw pair of pliers lying on the ground. Pliers were left on rotor head after scheduled feather bearing check.

oh58 **Forced landing** ☐ Pilot heard loud noise from engine area and noticed turbine outlet temperature exceeded 1,000° C. Immediate power loss occurred. Successful autorotation was made. Engine failure was caused by separation of elbow assembly from diffuser scroll. Elbow assembly was not properly installed on diffuser scroll.

Precautionary landings ☐ About 2 minutes after takeoff, TOT was seen rising fast. During landing, passenger saw TOT at 1,000° C. One of the bleed air fittings on scroll popped out. Fitting was screwed in only one or two turns. ☐ Transmission light came on. Suspect bearing failure. OH-58C transmission was installed in OH-58A aircraft. Unit had been issued C model transmission instead of A model. **Although the C model transmission will work in the A model aircraft, there are only enough transmissions to support the C model retrofit program. If your unit is issued a C model transmission for an A model aircraft, check with TSARCOM, AUTOVON 693-2985, before installing it.**

Messages received

- Grease, NSN 9150-00-935-5851, lot WB-4717-17, from Mobil Oil Corporation, is to be placed in hold status pending laboratory tests (141845Z Sep 79).

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

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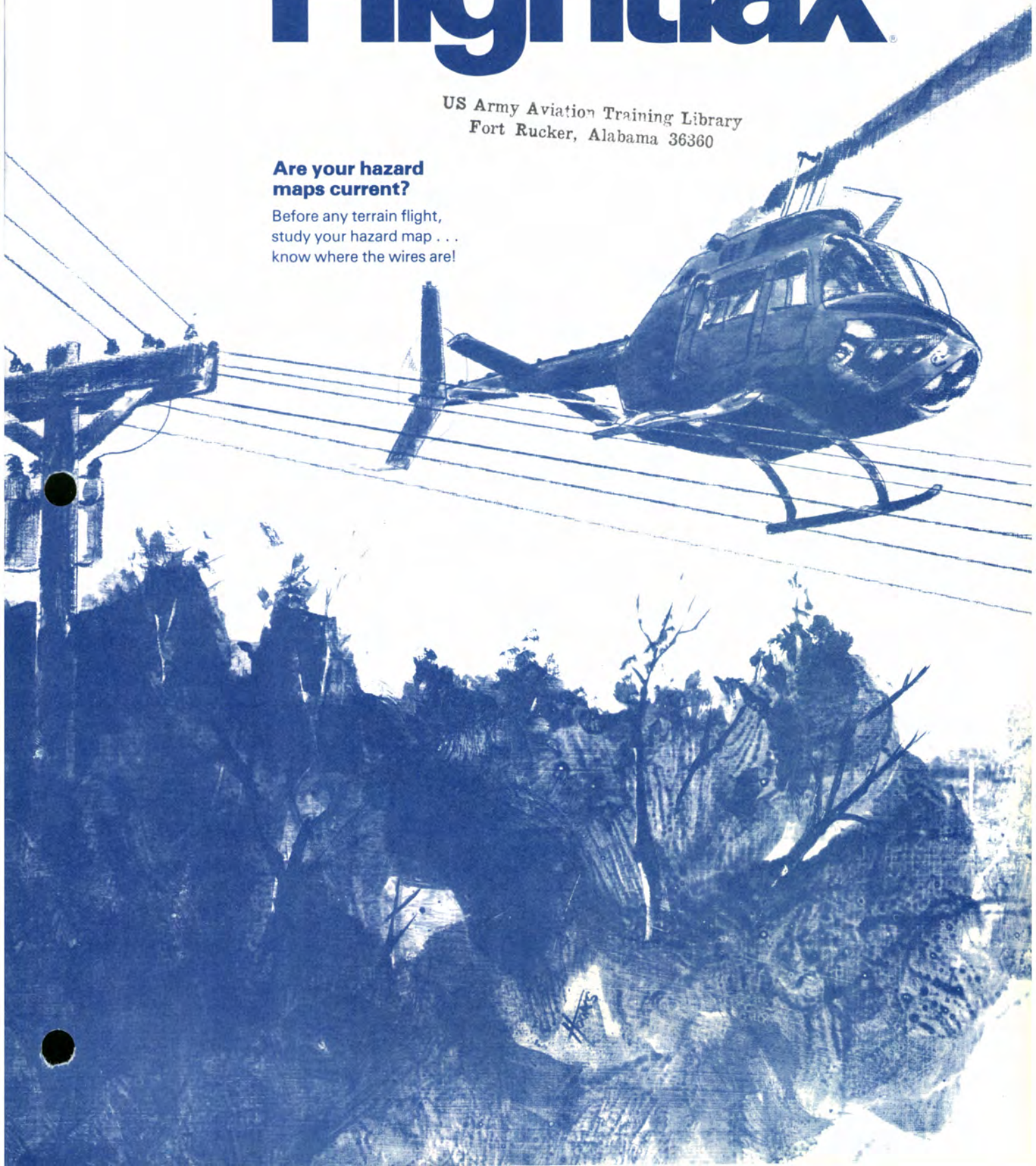
Are your hazard maps current?

Before any terrain flight, study your hazard map . . . know where the wires are!



Accident review

Synopsis

An OH-58 on an area surveillance mission during a field training exercise hit several telephone wires strung across a river. The copilot made an approach to a sandbar 1,100 feet downstream, with wires dragging from the right skid. Just before the aircraft was landed, the dragging wires caused the nose to tuck, and the aircraft crashed nose low. The pilot, copilot, and crew chief sustained major injuries.

History of flight

The aerial surveillance mission was delayed 2 hours due to poor visibility in the area. When the flight, consisting of an OH-58 and an AH-1G, was able to take off, visibility was estimated at 1 mile with no ceiling. Visibility improved during the mission to about 2 to 3 miles with haze and fog.

All three modes of terrain flight were used. The copilot was flying the OH-58, while the pilot performed navigation duties.

Near the end of the mission, the pilot told the copilot to cross a river on a diagonal course to check one more area. As they left the higher ground of the hills, the copilot started a descent to conform to contour flying techniques. Seconds later, the pilot saw wires in front of them just before the helicopter, flying at 50 knots and 70 feet above the river, hit the wires.

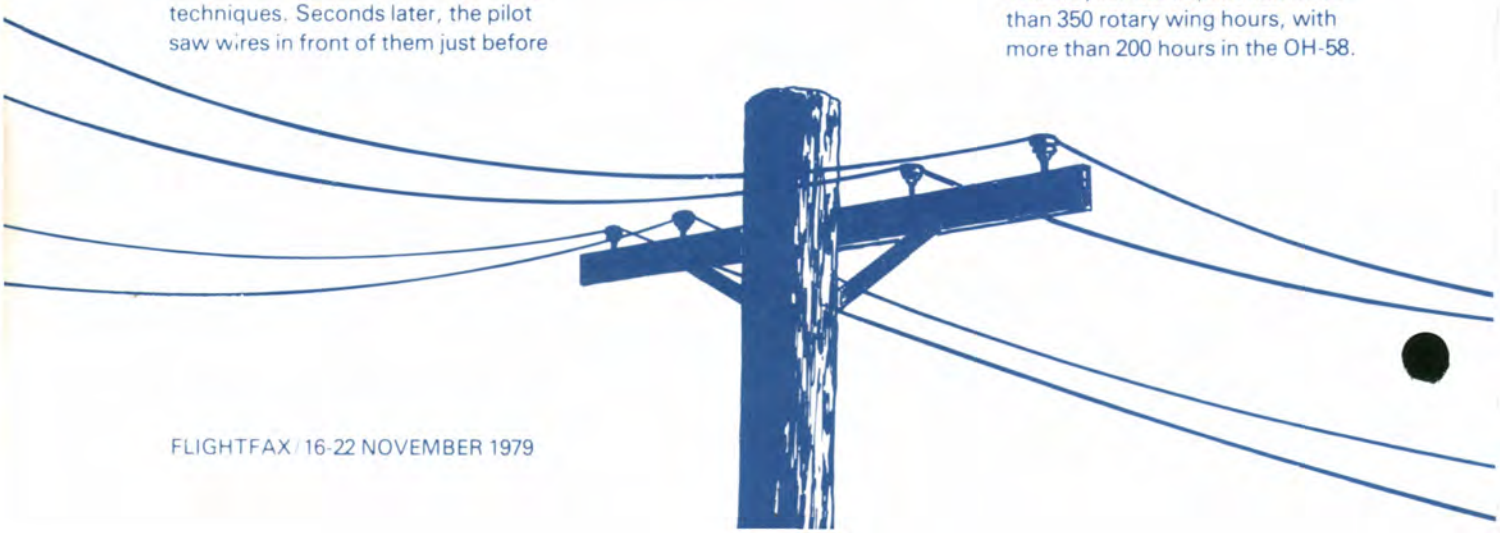
The copilot selected a sandbar in the river as his landing site and started an approach. Just before the aircraft was landed, wires dragging from the right skid caused the nose to tuck and the aircraft crashed. Both pilots were able to exit through an opening in the aircraft, but the crew chief, because of his injuries, remained in the aircraft until medevac personnel arrived.

The area was not the normal training area for the unit. Before the exercise, 1:50,000 tactical maps were issued to the aviators. Two units were assigned training missions in the area to locate and mark hazards and allow the aviators to become familiar with the area. Hazards were posted on one map. The map was made available to all aviators so they could post their maps. The hazards were also marked on a 1:100,000 map overlay maintained in operations during the field exercise. Both of the maps were incomplete. The wire struck by the OH-58 was not marked on either of the maps. In fact, when the mishap occurred, there were no hazards posted in the southern part of the exercise area. The unit had

another wire strike accident 7 days after this one, and the aviator involved still did not have the wire that was struck in the first accident marked on his map.

Crewmember experience

The 22-year-old pilot had almost 300 hours rotary wing flight time, with more than 100 hours in the OH-58. The 30-year-old copilot had more than 350 rotary wing hours, with more than 200 hours in the OH-58.



Commentary

The absence of a wire strike protection system was a factor in this accident. Wire strikes have been a problem since the early days of Army aviation. They will continue to be a problem until aircraft are equipped with a wire protection system. An OH-58 wire strike system will be fielded in Canada in January 1980. Watch FLIGHTFAX for more on this system.

In addition to this factor, there were three specific errors which would have resulted in the crew not knowing the location of the wire hazards along their flight route. Any one of these errors could have caused the accident.

The first error was failure to provide required information to the flight crew. FM 1-51 requires units to maintain hazard maps of the areas of operation. It also states that this responsibility should be assigned to a specific individual. There was confusion in the unit as to who was responsible for the hazard map. Since it could not be substantiated that the operations officer delegated this responsibility, it was concluded that the responsibility and the tasks involved remained with the operations officer.

The hazard map constructed by the unit was inadequate. There were no hazards marked on the map in the area assigned for the mission. The area had not been reconned for hazards. The operations officer was unaware of this deficiency until after the accident. The unit SOP did not include instructions which would insure aviators were provided hazards information in their area of operation before terrain flight missions.

The second error was inadequate flight planning. The pilot made no attempt to mark the hazards identified on the unit hazards map on his map. He understood this was a required task, but he omitted it. He thought he and the copilot could see the hazards.

The third error was a navigational error. The pilot thought he was on the eastern boundary of the assigned area instead of the western boundary. It is not known why this error was made. The pilot obviously had not been disoriented during the majority of the mission. He stated that he was keeping up with the navigational task and thought he knew where he was at the time of the accident.

The crew chief should not have been aboard the aircraft. Only mission-essential personnel are to be carried on tactical training flights. ■

Unsecured parachutes vs helicopters . . . and the winner is?

Scene 1: A USAF C-130 gracefully swoops down on the drop zone. Almost instantly, pallets loaded with 500-gallon collapsible drums of JP-4 drop from the rear of the C-130. They fall toward the ground; and then woosh, a G-11A 100-foot-diameter cargo parachute opens, guiding the pallets safely to the middle of the drop zone.

Scene 2: Off in the distance, a faint sound can be heard by the pathfinder on the ground at the drop zone. The sound is steadily increasing. Suddenly, the pathfinder's radio crackles, startling him. "Pathfinder Minder, this is Hook Chinook. Over."

Pathfinder Minder scrambles to his radio to respond. "Hook Chinook, this is Pathfinder Minder. Where are you guys? I can hear you, but I can't see you. Over."

"We're about 2 miles east of your location. ETA 2 minutes. Over."

"Roger, Hook Chinook. Winds are 240 at 3. Be advised there are numerous cargo chutes in the DZ. Clear to land at pilot's discretion. Over."

"Roger, Pathfinder Minder."

Scene 3: Hook Chinook spots drop zone to his left front. On board he has a parachute recovery team, two forward area refueling equipment (FARE) systems, and tents for the POL personnel to use while there. The drop zone looks like someone has spilled a bag of large cotton balls in a field. Crewmembers clear Hook Chinook to the ground and he lands. The parachute recovery team is let off. The POL officer on board Hook Chinook asks the PIC if it would be possible to relocate the two FARE systems at different points because the marshy terrain would make ground handling difficult. The PIC says, "No problem. Just tell me where you want them."

Scene 4: Hook Chinook relocates for the last time. But he has to back in so he can clear the cargo parachutes and pallets of JP-4 scattered about the DZ. The crewmembers in the back are clearing him. "Chief, I saw a parachute to our right rear. Are we clear?"

"Yes, sir. Should be no problem. It's at least 70 yards away."

"OK, I'm coming back."

"Roger, sir. You're clear straight back."

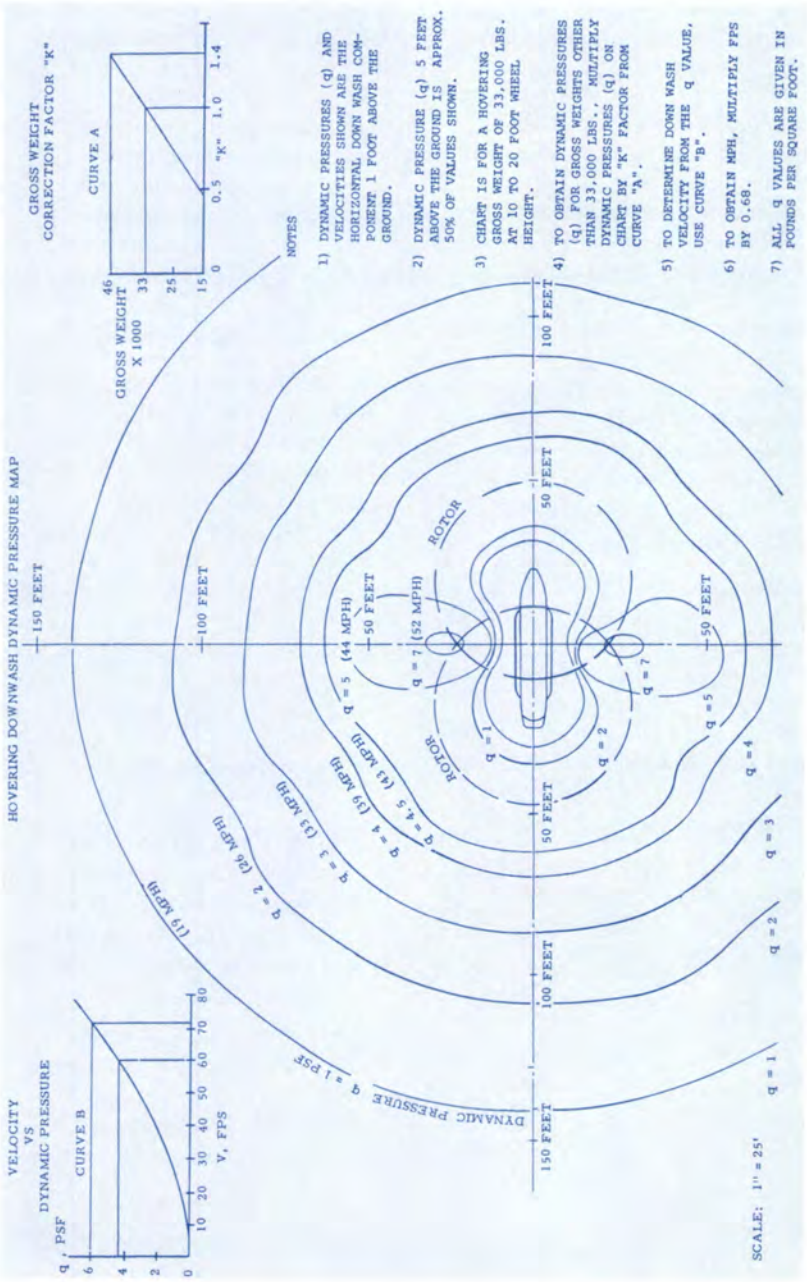
Hook Chinook cautiously moves straight back. No problems . . .so far.

"That's good, sir. They want the tents right here."

"OK, I'm coming down."

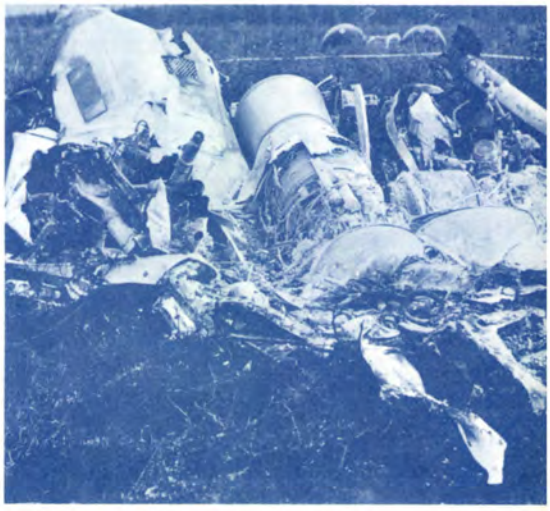
"You're clear down, sir."

The cargo ramp is lowered, and the tents and personal equipment of the POL people are being off-loaded. All of a sudden, there is a loud bang, and the aircraft begins to rock violently from side to side. The aft section of Hook Chinook is immediately engulfed in flames. The PIC tries desperately to reach the engine condition levers but is hampered by the violent shaking of Hook Chinook. He finally succeeds and shuts the engines down.



The crewmembers in the aft section exit the aircraft unharmed. After the rotor blades on the forward head stop turning, the pilots exit through the right jettisonable cockpit door that has fallen off because of the violent vibrations. Luckily, no one on Hook Chinook appears to be injured as they assemble far to the rear of the aircraft.

Scene 5: Hook Chinook is sitting helplessly in the middle of the DZ, rapidly being destroyed by the fire. One of the G-11A cargo parachutes lying unsecured on the ground was fully deployed by Hook Chinook's rotorwash and pulled into the aft rotor system. One of the aft rotor blades was severed when struck by the parachute, resulting in a rotor system unbalanced condition, which caused the forward blades to mesh with the two remaining aft rotor blades. *(continued on next page)*



A CH-47 was recently involved in a mishap similar to the one described here. The hovering downwash dynamic pressure map at left shows downwash velocity within a 150-foot radius of the helicopter.

Parachute vs helicopter

Scene 6: In the coffee break room back in the company, Hook Chinook's pilots are talking with members of the accident investigation board. "I have flown around unsecured obstacles before in a Chinook, and I've never had anything like this happen," the PIC says. "Seventy yards was always ample clearance in the past. I can't understand this at all."

"Well, we have researched many FMs, TMs, and ARs," the board president says. "There is no mention in any of them as to how much clearance should be maintained between an unsecured G-11A parachute and a helicopter in a DZ."

"Actually, there is no written guidance dealing with helicopters operating near parachutes and the extremely dangerous situation which is created," the other board member says. "A variety of opinions exists on how close a helicopter can operate near an unsecured parachute. Some people think helicopters shouldn't operate in drop zones at all," he adds.

A CH-47 was destroyed by fire in a recent mishap similar to the one above. Pilots and crewmembers should be aware that operating a helicopter near unsecured parachutes is very dangerous.

The following was extracted from Boeing Vertol Tandem Note No. 114-0515 (R-1).
Many times the aircraft will be directed from the ground while hovering. During hover, especially at the high gross weights, high downwash velocities are generated which can be hazardous to personnel and property. The hovering downwash dynamic pressure map (page 5) provides the downwash velocity within a 150-foot radius of the helicopter. Keep these velocities in mind when considering zones where hover work will be accomplished, and see that loose items that could be dangerous to personnel or the aircraft are secured.

Extreme caution should be exercised when maneuvering and hovering the helicopter in confined areas, close to obstacles and personnel. To prevent damage/injury to property/personnel or the helicopter, take the time to consider all the possibilities, and take the steps necessary for a safe operation.

POC at the Safety Center is SFC James J. Wheeler, AUTOVON 558-4202/4198, commercial 205-255-4202/4198. ■

Selected mishap briefs

uh1 **Precautionary landings** ☐ Loud squeal was heard from transmission area before takeoff. Caused by failure of irreversible valve. ☐ Crew heard loud bang about 4 minutes after takeoff. Postflight inspection revealed left greenhouse was cracked. Suspect turbulence caused crack. ☐ Unforecast ceiling and visibility below VFR caused pilot to divert back to home base.

Aviation-related ☐ Crew chief, assisted by other maintenance personnel, raised aircraft by using ground handling wheels. Tow bar was then pushed rearward under aircraft. Connecting piece of angle iron on tow bar hit and ruptured underside of aircraft. ☐ Rotorwash from hovering UH-1 blew over maintenance stand, which slid across taxiway and hit left chin bubble of parked UH-1. Wind was 18 knots gusting to 28 knots. Hovering aircraft and maintenance stand were upwind of damaged aircraft.

oh6 **Precautionary landing** ☐ Inboard bronze bushing separated from tail rotor pitch control assembly during hover, inducing severe high frequency vibration in tail rotor pedals.

oh58 **Precautionary landings** ☐ After entering IMC, pilot used vertical helicopter instrument recovery procedures and landed. ☐ N_2 rpm decreased to 101%, and aircraft was landed. Caused by malfunction of dual tachometer. ☐ Pilot noticed sudden increase in lateral vibration. Suspect corrosion of bonding aft of

main rotor spar between blade skin and tip, causing skin to separate from tip cap.

Aviation-related ☐ Crew chief was in passenger compartment with door closed but not latched. As UH-1 approached on ramp, propwash pulled unsecured door off its hinges.

th55 **Precautionary landings** ☐ Pilot noticed engine and airframe vibrations during takeoff. Caused by worn tail rotor swashplate and center frame engine mounting absorbers. ☐ Crew smelled smoke in flight. Caused by failure of fuel boost pump switch. ☐ Engine oil pressure exceeded upper limit. Caused by failure of sending unit.

ch47 **Precautionary landings** ☐ During cruise flight, crew chief found aft transmission filter button extended. Button would not stay in when reset. Caused by internal failure of aft transmission. ☐ No. 1 engine chip detector light came on. Caused by engine transmission failure. ☐ Tee hydraulic reducer to No. 1 filter ruptured, causing loss of hydraulic fluid in No. 1 system.

Aviation-related ☐ As individual was helping to load rotor blade boxes onto CH-47, one end of one box slipped. Individual's ring finger of left hand was caught between two boxes. Finger was severed at first knuckle.

c12 **Precautionary landings** ☐ (A series) Passenger noticed fluid seeping from No. 1 engine nacelle on right side in back of exhaust stack. Single-engine landing was made. Ruptured seal caused fuel leak. ☐ (A series) During cruise flight at -6° C. in light ice with windshield heat on normal, pilot's windshield, which was defrosting in uneven pattern, shattered.

u8 **Precautionary landing** ☐ (F series) Vibration was felt in throttles after takeoff, and No. 1 engine was seen trailing smoke. Single-engine landing was made. Generator armature of No. 1 engine generator disintegrated, creating vibration which caused vacuum pump mounting nuts to loosen and allow oil to leak into engine compartment and enter augmentor tubes.

u21 **Precautionary landings** ☐ (A series) Gear handle light would not extinguish after takeoff. Gear was recycled two times to get up indication. Caused by sticking toggle switch. ☐ (H series) No. 1 inverter failed during flight.

Maintenance

uh1 **Precautionary landing** ☐ Loud explosion was heard during engine start. Battery lid had been blown off. Loose cell terminal allowed internal arc, igniting gases generated by engine start.

ah1 **Precautionary landings** ☐ Pilot felt binding in collective during NOE flight. Caused by loose friction collet dust boot. ☐ Pedal motored during hover, and pilot determined he had SCAS yaw hardover. Postflight inspection revealed card was out of balance.

oh58 **Forced landing** ☐ Engine failed during approach. Fuel line came loose because of incorrect torque.

Precautionary landings
☐ Vibrations were felt in pedals and airframe during climbout. Caused by out-of-balance tail rotor. ☐ High frequency vibration was felt through tail rotor pedals, and pedals started to bind. Inspection revealed cannon plug from one of the radios was not secured properly and became lodged in control tubes, causing pedals to bind. ☐ Loud noises were heard from engine area during runup. Suspect compressor stall caused by sand and dust ingestion. Maintenance inspection revealed air cleaner box and engine inlet area were extremely dirty, compressor blades and liner were eroded, and bleed valve was stuck in closed position.

ch47 **Precautionary landing** ☐ No. 2 engine transmission oil pressure fluctuated 7 to 10 psi during flight. Caused by low fluid level in transmission.

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

The wire strike picture . . .

Since 1 October 1979, five wire strike accidents have resulted in three fatalities and three destroyed aircraft.

It's a fact . . .

Speed is the main killer in wire strikes.
When you go low, go slow.

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Last FLIGHTFAX this year

This is the last issue of FLIGHTFAX you will receive this year. The next issue will be dated 9 January 1980 and will include briefs for the period 30 November-27 December 1979. The personnel of the Army Safety Center wish you a Merry Christmas and a Safe and Happy New Year.

Back to basics

Two instructor pilots were flying from their home field to an auxiliary airfield on a training flight. The IP who was flying the aircraft from the left seat began an idle power descent to position himself on an inside downwind.

Lowering the landing gear just prior to beginning his final turn, he noted the flaps were up and told his right seater that he would make a no-flap, idle power descent and landing. He rolled out on final slightly long and high and decreased his pitch to adjust to a no-flap approach angle. As he reached the desired glidepath, he increased his pitch to establish the proper approach angle. He then felt the aircraft begin to sink and noticed the airspeed rapidly decreasing through his desired airspeed. To arrest the sink rate, he lowered 50 percent flaps and moved the power levers to 100 percent.

As he applied back pressure, he felt a buffet. He relaxed back pressure slightly in an attempt to fly the aircraft at or near the buffet to obtain maximum performance. When it became apparent that the aircraft would land short, he applied more back pressure and stalled the aircraft short of the runway. The crew got out safely, but the aircraft was destroyed.

Something that could happen to you? Never. Let's go over some of the events leading up to this mishap and look at it from your point of view.

• The instructor pilot flew an idle power descent and approach into an uncontrolled airfield.

Okay, sounds innocent enough. No need to ask why a "professional pilot" would elect to perform this maneuver, especially when there are no such training requirements. Perhaps he was preparing for his next stan/eval check. Besides, it was an uncontrolled airfield, and we all like to show our stuff when there is another IP to impress.

• Shortly after rolling out on final approach, the aircraft developed a sink rate in conjunction with a rapid loss of airspeed for undetermined reason(s). Most probably: (1) Increase in the angle of attack, in combination with idle power and extended speed brake; (2) Windshear; (3) A combination of both.

Should this pilot have been surprised at the decrease in airspeed when he raised the nose to increase the angle of attack? What should he have expected with an increase in the angle of attack without an increase in thrust? Everyone knows that you control the airspeed of a glider with the stick. Does a powered machine differ? Boy, wish I could remember all that aero class from a few years back.

Windshear—horrors! Everyone knows this can be a problem, especially during the critical phases of roundout and touchdown. The weather warnings "always" flash through my mind just prior to each takeoff and landing. (During the rollout on final approach? Well, I just make sure I have what I want while I recheck my configuration and runway alignment. Windshear is not too important this high on final.)

• The IP did not initiate a go-around.

This is not too difficult to deal with. Really no need to go around. The landing can still be made. After all, what would the pilot in the right seat think of such a poor display of airmanship. Much better to demonstrate how good I really am with this little bird.

• The first pilot failed to take action or provide assistance.

Now the troop in the right seat is really up for grabs. He has observed this "unusual" display of skill from the start without any comment. He has great confidence in the other IP flying the aircraft. He observes the flight path and observes that the airspeed is slightly . . . uh, 5 knots, no 10, no . . . uh, 30 knots below that airspeed recommended by the operators manual. He says nothing, believing that "old Joe" can hack it. I wonder how far he allows his students to go before taking corrective action.

• The IP lowered 50 percent flaps to arrest the sink rate.

What can we say here? Back to the aero classes. Yes, lowering flaps will decrease your stall speed. Yes, lowering flaps will decrease touchdown speed, decrease landing roll, require more thrust, etc. Will it increase your airborne distance? If so, why not use half flaps to fly cross-country? The answer should be obvious. Lowering flaps one-half or full will decrease glide distance.

Consider a no-power approach. What do you do if you are going to be long? Solution: lower flaps to increase drag. Looks like our friend may have his basic aero principles confused.

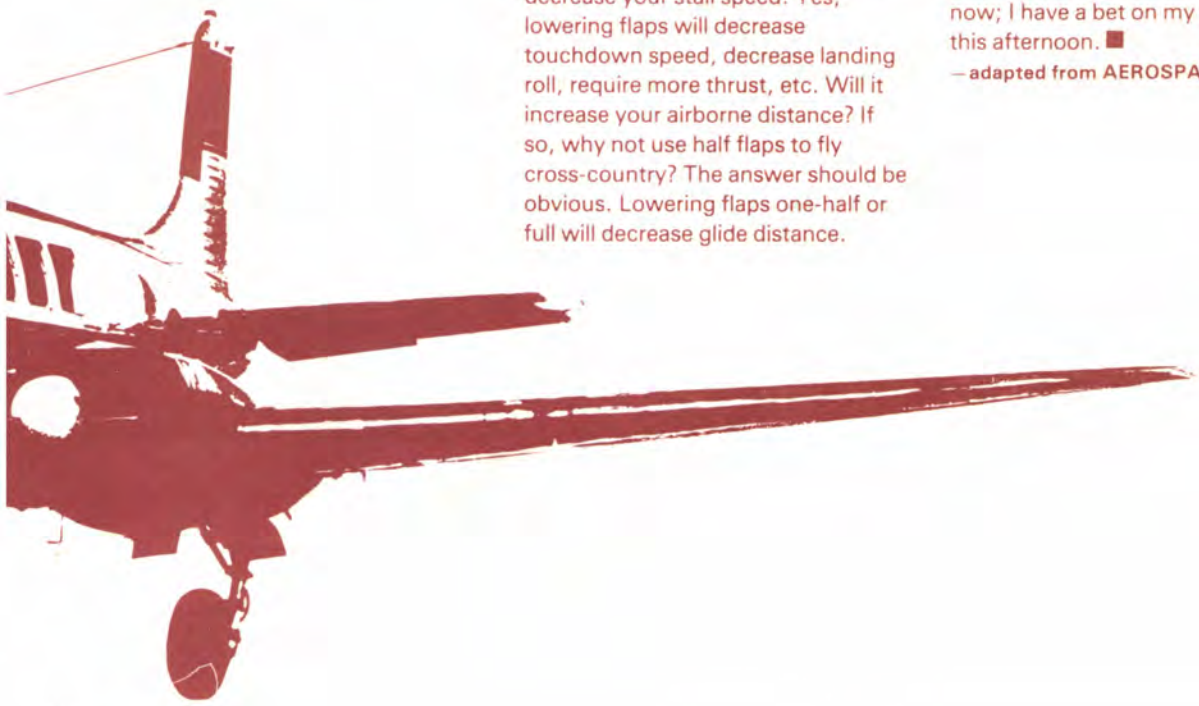
• The IP delayed adding power and retracting the speed brake until the aircraft approached a stall.

• He continued to fly the aircraft in the region of reverse command, or did the aircraft fly him?

• The IP stalled the aircraft just prior to impact.

Do these last three items sound a little familiar? Seems like I remember a movie about those things. Well, no matter. I know what my machine can do as well as I know what I can do. You will never catch me making any of those dumb mistakes. I have to go now; I have a bet on my check ride this afternoon. ■

—**adapted from AEROSPACE SAFETY**



Selected mishap briefs

uh1 **Accident** ☐ Pilot entered autorotation during maintenance test flight. Severe vibration developed when recovery was initiated. Pilot could not stop rate of descent, and aircraft crashed in wooded area. One occupant was killed and two were injured. 8011

Precautionary landings ☐ High engine oil temperature and high transmission oil temperature were caused by frozen oil cooling fan bearing. ☐ During demonstration of manual throttle control with left pedal turn, compressor appeared to stall, followed by decrease in rpm and rise in egt. Caused by internal failure of engine. ☐ Hydraulic master caution light flickered, followed by control stiffness. Caused by failure of hydraulic pressure switch. ☐ Loud high-pitched whine was heard during cruise flight. After aircraft was landed, parts of a bearing were seen being thrown out of main inverter.

ah1 **Precautionary landings** ☐ No. 1 hydraulic caution light came on, and tail rotor control became stiff. Inspection revealed hydraulic pressure line between pump and reservoir was leaking at fitting. ☐ Master caution light system failed during runup checks.

ch47 **Precautionary landings** ☐ Crew felt unusual shudder in airframe, followed by three or four less severe shudders. Caused by malfunctioning self-tuning vibration absorber. ☐ When unforecast weather conditions of one-quarter to one-half mile visibility with light ice and heavy snowshowers were encountered, pilot landed in field. Crew waited 12 hours until daylight and continued mission. ☐ No. 1 a.c. beep failure on final approach was caused by failure of resistor.

oh58 **Forced landing** ☐ Pilot noticed unusual sound from engine during hover. Engine then failed and hovering autorotation was made.

Precautionary landings ☐ Crew noticed spots on windscreen and landed. White main rotor blade grip lubrication reservoir was empty. Main rotor yoke bushing was excessively scored. ☐ Transmission oil pressure light came on. Caused by failure of oil pressure switch. ☐ Generator caution light came on during runup. Caused by failure of starter.

th55 **Accident** ☐ SP reported that engine quit during final approach. Hard landing at termination of autorotation caused main landing gear to fail. Main rotor blades hit ground, and aircraft rolled onto left side. 8012.

Precautionary landings ☐ Throttle became inoperative during hover. Caused by broken throttle cable. ☐ Severe vibrations during approach were caused by malfunction of three main rotor blade dampers.

c12 **Precautionary landing** ☐ (A series) Pilot's windscreen shattered during cimb.

ov1 **Precautionary landings** ☐ (D series) No. 2 propeller would not feather during shutdown. Caused by failure of propeller auxiliary motor. ☐ (D series) No. 2 engine would not accelerate above ground idle during runup. Caused by failure of fuel control.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ During light rain, visibility went IMC as aircraft entered clouds. Pilot stated he initiated a climbing left turn to get out of weather. Since his attitude indicator was inoperative, he had to make visual reference to the copilot's instrument to determine bank angle. Aircraft crashed shortly afterward. Immediately before impact, pilot was looking out of chin bubble in an attempt to see the ground.

☐ Aircraft was flying in light rain at about 1,000 feet when engine failure occurred. Pilot entered autorotation. Terrain beneath aircraft was a large, flat area without any trees or buildings to help provide either relative altitude or true horizon information. As descent started, forward visibility was restricted due to rain on windshield. Instead of turning on windshield wipers, pilots looked outside windows of aircraft. Pilot misjudged altitude and flared too low, resulting in hard landing.

Maintenance

uh1 **Cargo handling mishap** ☐ Aircraft, flying at 100 feet agl and 50 knots, was carrying a truck on a sling load. Crew chief was lying on floor watching the load. Pilot felt jolt in aircraft, and crew chief confirmed that load had dropped. Shear pin on cargo hook sheared, allowing cargo hook to rotate. Manual release tripped, opening cargo hook. Manual release was out of adjustment.

c12 **Precautionary landing** ☐ (A series) No. 2 engine failed during descent. Engine was restarted, but when condition lever was moved from high idle to low idle position, engine failed again. Second restart was made and condition lever was left at high idle. No. 1 starter generator then failed. Aircraft was landed with both condition levers at high idle and engines operating normally. Caused by improper rigging of No. 2 engine fuel control idle cutoff.

u8 **Precautionary landing** ☐ (F series) Engine backfired during takeoff. Fuel injector pump was out of adjustment.

u21 **Precautionary landings** ☐ (A series) As flaps were being lowered for approach and landing, right side would not retract. Right inboard flap actuator cable was disconnected. ☐ (F series) As power was applied for takeoff, right main landing gear green light went out, landing gear warning horn sounded, and red lights in gear handle came on. Power was reduced and green light came back on, lights in gear handle went out, and warning horn silenced. Caused by out-of-adjustment gear limit switch. ☐ (A series) Fifteen minutes into flight, crew could not transmit on radio or ICS. Inspection revealed radio junction box wire bundle was not properly secured and connector plug vibrated loose.

ov1 **Forced landing** ☐ (D series) During cruise flight at 14,000 feet in IMC, No. 1 engine oil pressure gauge went to zero. About 1 minute later, No. 1 engine failed and seized. Engine was secured and aircraft landed. Caused by broken bolt on lube oil filter. Suspect mechanic overtorqued filter.

Safety-of-flight messages

- Change to TB 55-1520-243-20-2 for one-time inspection of drive shaft (short shaft) assemblies on all UH-1/AH-1 aircraft (UH-1-79-26, AH-1-79-24, 302100Z Nov 79). Contact: Dick Mooy, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.
- One-time inspection of all CH-47A/B/C aircraft to locate and inspect forward transmissions (CH-47-79-17, 302130Z Nov 79). Transmissions found with improper self-locking nuts are to be removed from service. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-0396. commercial 314-263-0396.

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Bring your own flight clothing

Central Issue Facility at Fort Rucker maintains stockage quantities of organizational clothing and individual equipment based on the total number of troops supported. This includes initial entry flight students and permanently assigned personnel. Individuals on TDY status to Fort Rucker for training should, upon arrival, have in their possession the clothing and equipment necessary to complete that training. Fort Rucker has not planned for nor been allocated funds to meet these requirements. ■

Recap of TSARCOM messages

Following is a list of all AIG 8881 addressed messages transmitted by TSARCOM (DRSTS-M) from 1 April through 30 June 1979.

GEN-79-06 Technical advisory message on internal cockpit painting

CH-47-79-04 SOF one-time inspection of combining transmissions

CH-47-79-05 Maintenance information message on aft swashplate slider shaft assembly

CH-47-79-06 Maintenance advisory message on operation of all T55-L-11 series engines

OV-1-79-04 Operational advisory message on unusable figures in TM 55-1510-204-10/3 and TM 55-1510-213-10

No number Operational advisory message to correct control number. OV-1-79-04 was originally transmitted as OV-1-79-02

OV-1-79-05 Maintenance information message on compressed gas cylinders

OV-1-79-06 Maintenance information message on shelf life extensions for MK-J5D ejection seat cartridges

OV-1-79-07 Operational advisory message to advise of figures in TM 55-1510-204-10/4 that are unusable

OV-1-79-08 SOF one-time inspection to advise of erroneous illumination of an engine fire warning lamp

OV-1-79-08 amendment SOF one-time inspection to amend NSNs cited in OV-1-79-08 message

OH-58-79-06 SOF technical message to establish mandatory changeout schedule concerning replacement of TT straps in main rotor head

OH-58-79-07 Maintenance advisory message on main rotor head outboard seal

OH-58-79-08 SOF one-time inspection of tail rotor blades

OH-58-79-09 CERCOM message on battery storage, retransmitted using TSARCOM control number

OH-58-79-10 Maintenance advisory message on skid shoes

OH-58-79-11 SOF one-time inspection of storage battery BB-676/A

U-21-79-04 Maintenance advisory message on landing gear drag brace torque requirements

U-21-79-05 Maintenance advisory message on propeller dome retaining nut

U-21-79-06 Maintenance advisory message on elevator connecting link

U-8-79-02 Maintenance advisory message on propeller dome retaining nut

U-8-79-03 Maintenance advisory message on elevator connecting link

U-8-79-04 Maintenance information message on defective valve springs installed in O-480 series engines

UH-1-79-05 SOF operational message concerning failure of P1 bellows fuel control on T53-L-13B engine

UH-1-79-06 Technical information message to relieve operational restriction on flight checks of P1 bellows problems

UH-1-79-07 Maintenance advisory clarifying tail rotor drive shaft flexible coupling lubrication requirements

UH-1-79-08 Maintenance information message to eliminate T53-L-13B engine 1800-hour time between overhaul (TBO)

UH-1-79-09 Maintenance advisory message on heavy duty skid shoes

AH-1-79-03 Maintenance advisory message on sealing of panels

AH-1-79-04 SOF operational message concerning failure of P1 bellows fuel control on T53-L-13B engine

AH-1-79-05 Technical information message to relieve operational restriction on flight checks of P1 bellows problems

AH-1-79-06 Maintenance information message eliminating T53-L-13B engine 1800-hour time between overhaul (TBO)

AH-1-79-07 Maintenance advisory message on canopy removal system

AH-1-79-08 Maintenance advisory message on environmental control system

AH-1-79-09 Maintenance advisory message on heavy duty skid shoes

Addressees requiring copies of messages should contact their next higher headquarters.

POC at TSARCOM is LTC (P) Therman Greene, AUTOVON 693-0466, commercial 314-263-0466. ■

Standardization Communication | Directorate of Evaluation & Standardization USAAVNC, Fort Rucker, Alabama 36362 | STACOM 51 12 Dec 1979

Stacom

IP accidents—FY 79

While Army aviation experienced an impressive improvement in aircraft accident statistics in FY 79 (75 accidents) over FY 78 (90 accidents), the instructor pilot (IP) force did not fare so well. IP-related accidents during this period increased from 20 in FY 78 to 24 in FY 79.

Two areas, autorotations (13) and NOE decelerations (3), appear to be responsible for the majority (67%) of IP-related FY 79 accidents. These are the areas where our SIPs must concentrate their efforts if this accident trend is to be reversed.

DES reemphasizes strict adherence to the four conditions necessary for the completion of an autorotation. At 100 feet agl:

1. Be in a position to make the intended landing area.
2. Have a normal rate of descent.
3. Have the rotor in the green.
4. Have the proper airspeed.

All of the above conditions must be present for a **safe** autorotation.

The three deceleration accidents were all caused by the aviator incorrectly rotating the helicopter around the axis of the main rotor. The correct method is to rotate the helicopter around the axis of the tail rotor. For more on this subject, see FLIGHTFAX, Volume 8, Number 8, 21 November 1979. ■

Health indicator test

Current rotary wing operators manuals (i.e., UH-1H -10 dated 18 May 79) have omitted the Health Indicator Test (HIT) criteria for accepting or rejecting aircraft for flight. Instructions for completing the HIT are in each aircraft logbook.

The Health Indicator Test provides the aviator with a day-to-day or flight-to-flight check for engine condition prior to takeoff. Additionally, egt trend analysis aids the maintenance officer in optimizing the maintenance effort and ensuring that engines receive adequate attention as performance degradation is noted.

DES has received information that Department of the Army plans to produce a new HIT check form. Until this form is distributed, the local unit maintenance activity should refer to the appropriate engine maintenance manual (-24) for instructions on the preparation of the HIT log. For example, URGENT change 16 to TM 55-2840-229-24, dated 15 August 1979, provides the criteria used to determine acceptability for aircraft equipped with T-53 engines.

The crew should:

- Perform HIT check, following procedures outlined in aircraft logbook. CAUTION: The aircraft altitude may vary from light on the skids to a hover, depending on gross weight of the aircraft and ambient density condition.
- Complete HIT check log.
- If differences between indicated egt and baseline egt are:

a. 20° C. or greater from baseline, record the FAT, N_1, and egt in the DA Form 2408-13.

b. 30° C. or greater from baseline, record the FAT, N_1, and egt in the DA Form 2408-13 and do not fly the aircraft until maintenance personnel determine cause for excessive egt.

NOTE: It is imperative that accurate readings are made and annotated since there are no scheduled internal engine inspections. Engine operating condition is based solely on the HIT. For example, a misreading of 2° FAT is equivalent to Δ 6° egt to Δ 20° egt and 5% N_1. This could cause the mission to be aborted unnecessarily. ■

Engine performance

"Torque available" performance charts are based on engines which meet prescribed military specifications. The charts do not compensate for deterioration of performance because of wear on turbine wheels, bearings, etc. It is advisable that units maintain a log of the performance of each aircraft engine and that this information be made available to all unit aviators. **Known** engine performance should be used by aviators to adjust **predicted** performance data extrapolated from performance charts. ■

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.

The wire strike picture

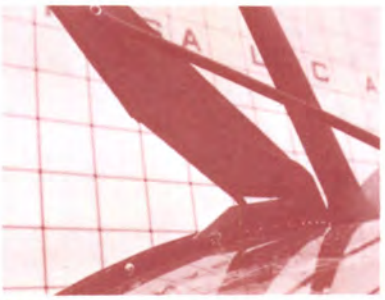
A Canadian firm, Bristol Aerospace, Ltd., has developed a helicopter wire strike protection system (WSPS) for the Canadian Armed Forces. The system consists of upper and lower wedge-type cutters and a windshield center post wire deflector with a sawtooth cutting edge.

A WSPS-equipped OH-58 has been swing-tested on cables at 40 knots against a 7-strand steel cable with a breaking strength of 11,100 pounds, carrying a 50-pair communications cable. Successful cuts were made by both the upper and lower cutters without significant helicopter loads or pitch changes. In one test, the system defeated this cable with the lower cutter and simultaneously cut two 7-strand copper cables with a strength of 5,000 pounds each with the upper cutter. Again there was no significant reaction by the aircraft.

OH-58A lower deflector and cutter.

The OH-58 system weighs 16.3 pounds. The manufacturer has designed an adaptation of the OH-58 system for the UH-1. These two aircraft have accounted for 80 percent of the U.S. Army's wire strikes since January 1974.

Since Army aviators continue to hit wires at the rate of one every two weeks, the Safety Center strongly supports early fielding of wire strike protection systems. ■



OH-58A windshield deflector and upper deflector and cutter.

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The FY 79 fixed wing mishap picture

During recent years, the overall Army aviation safety record has steadily improved. However, it was not until FY 79 that fixed wing aircraft played any significant role in this improvement. In fact, FY 79 marked the first year since FY 73 that the fixed wing mishap rate dropped below that for rotary wing.

To determine what improvements were made in fixed wing operations, we analyzed and compared the fixed wing mishap experience of fiscal 79 with that of fiscal 78. This comparison showed that the number of mishaps resulting in fatalities and total loss or substantial damage of aircraft decreased by more than 50 percent in fiscal 79. The overall fixed wing mishap rate decreased by 40 percent; however, fixed wing aircraft were flown 7,000 hours less in FY 79 than 78.

That's the bright side of the fixed wing picture. There's another side that's not so bright. Our analysis showed that human error accounted for 80 percent of all mishaps, and it was human error which caused five of the seven total loss mishaps for fiscal 79.

Analysis also revealed that those involved in fixed wing mishaps were not the young, inexperienced aviators fresh out of flight school. Quite the contrary. They were high-time aviators with an average flight time of 4,300 hours and an average age of 34.

The seasoned aviators are the ones causing the problem. Perhaps more alarming is that there was an IP on board and at fault in half of the mishaps.

• An RV-1D pilot and technical observer were on an IMC operational mission when they encountered forecast moderate icing about 20 minutes after takeoff. The pilot continued flight until the ice became severe. The No. 1 engine deicing equipment was defective. During the ILS approach, the pilot turned off all deicing equipment with ice still on the air inlet cowling. Large chunks of ice broke off the No. 1 engine cowling and were ingested into the engine compressor area, causing air flow interruption and subsequent engine failure. Before the failure of the No. 1 engine, the pilot unintentionally autofeathered the No. 2 propeller. The aircraft was destroyed, but both crewmembers ejected successfully.

RV-1D pilot continued flight in severe icing conditions. Chunks of ice were ingested into engine compressor area, causing engine failure.

• The IP simulated a No. 2 engine failure while on the downwind leg of the traffic pattern. The student pilot responded with proper procedures. The IP then adjusted the No. 2 throttle to 11 inches of manifold pressure, creating a zero thrust condition. On short final, the IP reduced throttle on the No. 2 engine to the idle position and just before touchdown, the student pilot reduced power on the No. 1 engine. The aircraft fell through and bounced 15 to 20 feet in the air. The IP assumed the student pilot would add enough power to cushion the aircraft on the runway, but instead the student decided to go around and rapidly advanced both throttles.

Because the No. 2 engine had been operated in the low rpm range for an extended period, it was not able to respond as quickly as the No. 1 engine. Because of the differences in power, the aircraft yawed right, placing it on a collision course with a windsock pole. Rather than risk colliding with the pole, the IP decided to land in a sod area. The left wing hit the ground and the aircraft slid sideways, collapsing the right main and nose gear.

In this mishap, the IP violated flight training guide procedures, failed to recognize a dangerous situation, and failed to anticipate the student's actions. The IP was programmed for

T-42 IP was programmed to land, but student pilot made go-around.

landing and the student was programmed to go around.

• While a C-7A pilot was making an approach and landing in a gusty 30-knot left crosswind, he applied full bias reverse thrust to the left engine during rollout. The aircraft veered left, went off the runway, struck a fire hydrant and concrete retaining wall, and was destroyed.

Had this pilot abandoned manipulation of the reverse thrust levers when the aircraft went off the runway and used nosewheel steering to maintain directional control, this mishap may have been prevented. Also, when it became imminent that the aircraft would strike the obstacles, the pilot should have applied brakes rather than concentrating on using reverse thrust to correct the situation. This condition was further aggravated by the copilot who failed to assist the pilot. It should be noted that using bias reverse thrust during rollout is not addressed in the operators manual.

• Two OV-1 aircrews were on a photo training mission. After leaving operations, the crews discussed their mission and decided to practice formation flight to the vicinity of the mission area. The No. 2 aircraft flew lead and the No. 1 aircraft was in the right echelon position. After flying about 20 to 30 minutes, the aircraft changed positions and flew for another 10 to 15 minutes. The pilot of the No. 1 aircraft then asked the No. 2 pilot to come up beside him so the TO could photograph the No. 2 aircraft.

The pilot of the No. 2 OV-1 inaccurately estimated clearance between the two aircraft and they collided. Both aircraft were destroyed, but all four crewmembers successfully ejected.

The No. 2 pilot inaccurately estimated clearance between aircraft because he had not received adequate training, unit or formal, in formation flying techniques and recognition of potential hazards. OV-1 formation flying was not a graded maneuver and no requirement existed for a student to possess or demonstrate any level of formation flying or proficiency to successfully transition into the aircraft. At the time of this mishap, the ATM only required unit pilots to practice formation flight once every 6 months. Formation flying has since been deleted from the ATM as a required maneuver.

OV-1 pilot inaccurately estimated clearance between two aircraft during formation flight.

• Five mishaps were caused by failure to follow established procedures, failure to follow checklists, and/or failure of IPs to recognize the reaction of pilots during emergency situations.

Deviation from the intent of ARs and nonprofessional operations are evident in too many mishaps.

Positive measures must be taken by commanders and individual aviators if further improvements are to be made in the fixed wing mishap picture.

The strict enforcement by commanders of established procedures and flight rules would be a giant step toward improving the fixed wing safety program. But in the final analysis it is the individual aviator who must get the job done. He is the basic element in the command line of aircraft mishap prevention. Aviator duties in the prevention program are clearly spelled out in AR 95-5.

• Build and maintain proficiency in the aircraft he is assigned to fly.

• Maintain sound physical and mental fitness.

• Maintain strict air discipline with respect to regulations, rules, and ethics.

You are that Army aviator.

Any improvements in the fixed wing mishap picture—and the fixed wing safety program—will be in direct proportion to the amount of effort you put forth. ■

Selected mishap briefs

uh1 **Accident** ☐ Aircraft landed hard during simulated antitorque failure. Minor damage to landing gear and attaching points. 8013

Incident ☐ Tiedown, which was not removed before start, hit tail rotor and vertical fin. Pilot failed to use proper checklist sequence.

Forced landing ☐ Loud explosion was heard, and aircraft yawed 90° to left. Rotor and engine rpm decreased, and aircraft was landed. Caused by compressor stall.

Precautionary landings ☐ Fuel leak from top fitting of start fuel manifold line was noticed during start. Caused by cracked manifold line. ☐ N_1 tachometer gauge remained at zero percent during attempted start. Caused by broken generator splines. ☐ Aircraft hit one of six powerlines during night low-level autorotation. ☐ Moderate 1:1 vibration was felt during takeoff. Postflight inspection revealed inboard mixing lever bearing was distintegrated. ☐ Aircraft vibrated slightly, followed by whistling noise. Tip cap on red main rotor blade was broken at forward attachment point and was bent backward.
☐ Hydraulic failure during landing was caused by failure of irreversible valve. ☐ Pilot felt severe vibration in controls. Bonding separation was found on main rotor blade at tip cap. Blade skin was peeled back on lower side of blade, exposing about 12 square inches of honeycomb.
☐ Third and fourth tail rotor drive shaft sections and tail rotor drive shaft cover were damaged due to drive shaft cover being unsecured during preflight. Screw driver was not available to secure dzus fasteners, and copilot forgot to tell crew chief to secure fasteners before engine crank.

ah1 **Precautionary landings** ☐ Rpm warning light and audio came on. Caused by N_2 tachometer failure. ☐ N_1 and egt decreased during runup. Engine would not respond to throttle movements. Caused by main fuel shutoff valve stuck in closed position. ☐ Engine oil pressure light came on. Caused by failure of pressure switch. ☐ Alternator warning light came on during landing. Caused by failure of alternator. ☐ Transmission oil bypass light came on. Caused by leaking input quill. ☐ When aircraft was inspected in hot refueling area, one fastener on tail rotor drive shaft cover was missing, one was broken off, and one was wearing through. ☐ Master caution and No. 1 hydraulic lights came on. Inspection revealed pressurized hose assembly chafed against transmission housing assembly.

ch47 **Forced landing** ☐ No. 1 engine failed during approach. Cannon plug on No. 1 engine condition lever was loose.

Precautionary landings
☐ Forward speed trim actuator stuck in extended position during landing. Caused by internal failure of speed trim motor. ☐ Master caution light came on and No. 2 boost pressure gauge went to zero. Caused by failure of hydraulic tube assembly. ☐ Entire cabin area filled with smoke. Inspection revealed crack in utility hydraulic pump housing allowed hydraulic fluid to spray into No. 1 and No. 2 generators. ☐ Noise was heard and copilot felt jerk in cyclic during takeoff. Controls then became stiff. Caused by failure of viscous dampner. ☐ Fuel gauge dropped to 1,400 pounds indicated with switch in total position and read 400 pounds in left position. Bare wire was shorting out fuel quantity indicator.

oh58 **Accident** ☐ As aircraft was circling tactical location at night, it hit a tree, knocking out windshields and bubbles. Because of low ceilings, rain, and ground fog, crew was unable to see the ground and returned to a lighted airfield. 8014

Incident ☐ Aircraft was flown into trees during descent to runway at night. Low ceiling and poor visibility were factors.

Forced landing ☐ Aircraft had been landed when engine chip detector light came on. Engine chip plug had been inspected, cleaned, and reinstalled. As maintenance officer was recovering aircraft to home station, engine failed.

Precautionary landings ☐ Fuel filter light came on. Filter was clogged with carbon and metal particles over one-fifth of its surface area. ☐ Engine-out light came on and N_1 became erratic. Caused by failure of engine-out solenoid. ☐ TOT went to 928° C. for 2 to 3 seconds. Pilot had to use emergency fuel shutoff valve to shut down engine. During hot end inspection, carboned fuel nozzle was found along with a warped combustion chamber liner. Heatshield was cracked at weld. Indications are that it was not a sudden happening but a buildup. ☐ Pilot could not maintain visual contact with horizon at night and landed. Attitude indicator was not operational because inverter was not installed in aircraft. Visibility through windshield was very limited because defogger would only clear an 18-inch area. Low visibility, low clouds, and moderate-to-heavy rain were factors. ☐ Pilot heard loud noise during flight at 1,000 feet agl. His right foot flew off tail rotor control pedal and aircraft yawed to left. Suspecting tail rotor failure, pilot entered autorotation. Crew chief found bullet hole in fuselage. Pilot complained of pain in his right foot and found a bullet lodged in his ankle. ☐ Crew heard noise from left passenger door area, returned to helipad, and landed. About 8 inches of fabric end of left passenger seatbelt was extending outside of closed passenger door. Crew chief had secured passenger gear with seatbelt. Portion of seatbelt left outside door was not detected due to darkness. ☐ Crew detected peculiar odor, and cockpit filled with smoke. Failure of No. 1 compressor bearing was caused by lack of lubrication due to failure of oil seal and pressure line.

th55 **Accidents** ☐ While hovering to lane, student pilot inadvertently activated antioverspeed device, resulting in hard landing and minor damage. 8015 ☐ Engine quit during power recovery from simulated forced landing. Landing was made to plowed field, and main rotor blades flexed into and severed tail boom. 8016

Precautionary landings ☐ Engine lost power on takeoff. Pilot smelled odor of hot oil, and oil pressure went to zero. Special oil sample showed excessive increases in iron and aluminum. Spectrometric explanation of oil sample showed large metal particles. ☐ Engine ran rough and aircraft vibrated. Caused by broken valve spring on intake valve of No. 3 cylinder. ☐ Rough running engine was caused by broken ring on No. 3 cylinder. ☐ Failure of main rotor pitch bearing assemblies caused controls to bind and aircraft to vibrate.

c12 **Precautionary landing** (D series) Defective right flow control package for environmental system caused loss of cabin pressurization.

ov1 **Precautionary landings** ☐ (D series) No. 2 propeller would not autofeather during taxi. Caused by failure of propeller motor. ☐ (D series) When gear was placed in down position, indicators showed right main gear was not down and locked. Gear handle light was not on. Visual inspection showed gear appeared to be down and locked, and aircraft was landed. Caused by failure of down-lock switch.

t42 **Precautionary landing** ☐ Aircraft yawed when wing flaps were applied. Caused by failure of right wing flap extension drive actuator.

u21 **Precautionary landings** ☐ (A series) When flaps were retracted, flap motor would not stop, causing circuit breaker to pop. Limit switch was out of adjustment. ☐ (G series) Off flags appeared on attitude indicator and RMI, followed by inverter No. 1 caution light. Pilot turned inverter selector to inverter No. 2 and No. 2 light came on. Both inverters failed and were turned off. High speed bearing in inverter No. 1 failed. Cause of No. 2 failure is unknown. ☐ (A series) As cruise power was set, right engine torque and fuel flow went to zero. Single-engine landing was made. Caused by malfunction of main ►

Mishap briefs

turbine fuel control. ☐ (A series) Vapor was seen coming from No. 1 engine cowling. Caused by failure of preformed packing on adapter between automatic dump valve and fuel manifold. ☐ (H series) No. 2 engine would not restart in flight. Caused by bad ignition assembly box. ☐ (F series) When gear handle was placed in up position, gear was heard coming up, but intransit lights in gear handle remained on. Gear was cycled down and locked. Gear was cycled back up, with same conditions as before. Gear was cycled back down and aircraft landed. Caused by failure of main landing gear actuator assembly, motor, and gearbox assembly.

Maintenance

uh1 **Forced landing** ☐ Pilot noticed gradual but steady decrease in engine and rotor rpm during flight. As rpm was passing through 5800, pilot used procedure for low-side governor failure. Rpm could not be regained, and aircraft was landed. Large amount of water was found in auxiliary fuel tanks.

Precautionary landings ☐ Low fuel light came on. Fuel quantity gauge indicated 360 pounds. Fuel light float switch was not properly adjusted. ☐ Crew chief noticed oil on cargo door windows during landing. Engine oil tank cap was not properly secured after engine oil sample was taken. ☐ Fuel was seen seeping from fuel servo filter during runup. Filter was installed with incorrect O-ring. ☐ Crew noticed sparks coming from inverter/battery area during flight. Electrical arcing was caused by unsecured cannon plug dangling between main and spare inverter power relays. ☐ Smoke and fumes in cockpit were caused by installation of improper battery relay. ☐ N_2 bled to 6400 rpm with 37 psi torque during climbout. Bleed band and IGVs were out of adjustment. ☐ Vibrex target on end of main rotor loosened in flight, creating flapping noise. Target bracket was installed with incorrect washer. Washer was too large, allowing bolt to loosen and target to turn. ☐ Oil pressure dropped below normal limits, and master caution and transmission oil pressure lights came on. Inspection revealed hose assembly line chafed against hydraulic line, causing hole in line and loss of transmission oil. ☐ During runup, smoke came out of aft heater outlets and transmission oil pressure dropped. Jam nut on transmission sump outlet hose had backed off.

ah1 **Precautionary landings** ☐ N_1 fluctuated during runup. Caused by improper installation of engine tachometer generator. ☐ After landing, oil was seen seeping from around transmission cowling door. Spray of hydraulic oil was coming from pressure line where it connects to No. 2 hydraulic pump. Caused by improper installation of fitting to pump.

ch47 **Precautionary landings** ☐ Forward transmission oil pressure fluctuated 8 to 10 psi in flight. Loose fitting on oil return line to oil cooler caused loss of oil. ☐ Crew chief saw fuel leaking from No. 2 crossfeed valve during hover. Leak was caused by improperly installed O-ring in crossfeed fuel valve.

Other ☐ Flight engineer performing preventive maintenance daily found foreign object damage on engine inlet guide vane. Inspection of engine transmission cowling showed that a sheet metal repair had been made to outer metal covering. It appears that during the process of completing the repair sheet metal rivets were left in the bleed air sleeve between the two metal layers. A rivet vibrated out through a bleed air hole and was ingested into the engine.

oh58 **Precautionary landings** ☐ Friction would not release on collective and friction knob came loose. Caused by installation of improper hardware. ☐ Pilot heard chattering noise from aft section and felt severe vibrations in antitorque pedals during climbout. Two self-locking steel nuts on No. 2 drive shaft coupling were improperly torqued. ☐ Aircraft developed high frequency vibration in antitorque pedals during landing. Tail rotor blade was out of balance. ☐ Pilot heard loud noise from engine area during climb. Noise was caused by loose KY-28 mount. ☐ Fuel filter light came on. Aircraft had been grounded for a long time, and fuel filter was clogged.

ov1 **Precautionary landing** (D series) Loud popping sound was heard from No. 2 engine during climb, and aircraft yawed to right. Caused by maladjusted inlet guide vane actuator rod. Rod was chafing on main oil line from fuel heater to oil filter.

Messages received

• Maintenance advisory message on extension of retirement life for stabilizer bar tube assemblies (UH-1-79-27, 071830Z Dec 79). Retirement life is extended to 6½ years if tube assembly has been reworked at CCAD and reidentified as P/N 204-011-328-11C.

• Change to maintenance advisory message UH-1-79-25 concerning assembly screws bottoming on rollover vent valve assembly (UH-1-79-28, 071840Z Dec 79).

• One-time inspection of UH-60A inlet anti-icing valve (UH-60A-79-2), 061950Z Dec 79). The possibility exists that the protective red plastic cap has been left installed on the inlet anti-icing valve ejector tube and that the AN929-4K fitting cap has not been installed on the pneumatic fitting within the inlet anti-icing valve cavity.

• One-time inspection of UH-60A collective mixer assembly (UH-60A-79-3, 072030Z Dec 79). The main rotor blades on some UH-60s have been folded/unfolded without disconnecting the pitch change rods. This action may have damaged the outer race of the bearings in the collective mixer link assemblies.

• Safety-of-flight message concerning one-time inspection for UH-60A yaw pedal adjustor support bearing attachment bolts (UH-60A-79-4, 142015Z Dec 79). A Black Hawk was found to have missing and loose pedal adjustor support bearing attachment bolts. The loose bolts could jam in the yaw controls. Contact Ms. Denise Bouchard, TSARCOM, AUTOVON 693-1732, commercial 314-263-1732.

• Maintenance advisory message concerning special inspection of UH-60A adjustable push rods and replacement actions (UH-60A-79-5, 191415Z Dec 79).

• Safety-of-flight message concerning one-time inspection for UH-60A swashplate linkage push rod (UH-60A-79-6, 142225Z Dec 79). Cracks have been found in push rods. Rods will be visually inspected and fluorescent dye penetrant inspected. Contact: Ms. Denise Bouchard, TSARCOM, AUTOVON 693-1732, commercial 314-263-1732.

• Maintenance advisory message concerning inspection of bulkhead and horizontal stabilizer aft spars on U-21/RU-21, JU-21, and U-8F aircraft (U-21-79-08 and U-8-79-06, 031630Z Dec 79).

• Maintenance advisory message concerning UH-60A inspection effectivity (UH-60A-79-7, 311700Z Dec 79).

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Computing direct man-hour mishap labor cost

To clarify paragraph 5-5a, AR 385-40, dated 1 January 1978, and paragraph E5c, DODI 1000.19, dated 18 October 1979, the following applies.

All direct man-hour mishap labor costs reported on PRAMs and DA Form 2397 mishap reports will be computed at the rate of $8 per work-hour. This rate will be used in lieu of any hourly pay rate being received by individuals performing the work. ■

Recap of TSARCOM messages

Following is a list of all AIG 8881 addressed messages except AH-1s transmitted by TSARCOM (DRSTS-M) from 1 July through 30 September 1979.

GEN-79-07 Technical advisory message on internal cockpit painting for use of night vision goggles in night training

GEN-79-08 Maintenance advisory message on test set, indicator, fuel quantity gauge manufactured by Simonds Precision on contract DAAJ01-76-C-0547

CH-47-79-07 SOF one-time inspection of CH-47A/B/C aircraft rotor system phasing, TB 55-1520-241-20-3

CH-47-79-08 SOF one-time inspection of combining transmissions, TB 55-1520-227-20-19

CH-47-79-09 Maintenance advisory message for CH-47C aircraft with combining transmissions installed

CH-47-79-10 SOF one-time inspection of all CH-47C aircraft to locate suspect combining transmissions, TM 55-1520-227-20-20

CH-47-79-11 SOF one-time inspection of aircraft electrical wiring, TM 55-1520-241-20-4

CH-47-79-12 Change to SOF one-time inspection of aircraft electrical wiring

CH-47-79-13 SOF one-time inspection of CH-47A/B/C aircraft cargo hook beam tracks, TB 55-1520-241-20-5

CH-47-79-14 Maintenance information message concerning painting of latch plates

CH-47-79-15 Maintenance advisory message concerning aft transmission lube filters

OV-1-79-09 Maintenance information message concerning a maintenance procedure change to the drogue gun firing spring force test

OV-1-79-10 Maintenance information message concerning avoiding damage to round dial torque indicator

OV-1-79-11 Maintenance information message concerning implementation of phased maintenance on OV-1/RV-1 aircraft

OH-58-79-12 SOF one-time inspection to locate specific serial numbers of OH-58A/B/C main rotor heads

OH-6-79-01 SOF one-time inspection of fuel cells, TB 55-1520-214-20-41

U-21-79-07 Maintenance advisory message on implementation of phased maintenance on U-21/RU-21 series aircraft

U-8-79-05 SOF one-time inspection of 0-480 series engine defective engine bolts, TB 55-1510-201-30-5

UH-1-79-10 Maintenance advisory mesage concerning roller type tail rotor control chain

UH-1-79-11 Technical advisory to clarify par. 3b of technical information message No. UH-1-79-06 and AH-1-79-05

UH-1-79-12 SOF (operational) message for UH-1B/C/M/D/H aircraft equipped with internal rescue hoist

UH-1-79-13 SOF one-time inspection of UH-1B/D/H, EH-1H and UH-1V series aircraft collective connecting link, TB 55-1520-245-20-2

UH-1-79-14 Not transmitted, not a good number

UH-1-79-15 Maintenance advisory message on UH-1B/D/H and EH-1H droop compensator installation shear pin inspection

UH-1-79-16 Maintenance advisory message for UH-1 aircraft users concerning nonuse of control number UH-1-79-14

UH-1-79-17 SOF one-time inspection concerning tail rotor hub assemblies, TB 55-1520-242-20-1

UH-1-79-18 SOF one-time inspection of drive shaft (short shaft) assemblies, TB 55-1520-243-20-2

UH-1-79-19 Change to SOF one-time inspection of tail rotor hub assemblies, TB 55-1520-242-20-1

UH-1-79-20 Change to SOF one-time inspection of drive shaft (short shaft) assemblies

UH-1-79-21 Change to SOF one-time inspection of drive shaft (short shaft) assemblies

UH-1-79-22 Technical advisory message concerning P1 bellows problems with T-53 engines

UH-1-79-23 Change to SOF one-time inspection of drive shaft (short shaft) assemblies

C-12-79-01 Maintenance advisory message concerning brake freezing

C-12-79-02 Maintenance advisory message concerning Army Oil Analysis Program for C-12 engines

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Addressees requiring copies of messages should contact their next higher headquarters.

POC at TSARCOM is LTC(P) Therman Greene, AUTOVON 693-0466, commercial 314-263-0466. ■

CY 79 FLIGHTFAX index

Accident reports are for prevention purposes (contents disseminated on need-to-know basis) - 7 Feb
Aeromedical safety (keep flight surgeon informed) - 14 Mar
AH-1S fire hazard (burn damage to hose assembly) - 26 Sep
Aircraft with emergency locator transmitters grounded (safety-of-flight message) - 4 Apr
A new approach to an old problem (disorientation accident experience) - 18 Jul
Any takers? (fire extinguishers fell from aircraft) - 31 Jan
A position you can live with (crash position) - 12 Sep
A professional look at professionalism (importance of professionalism to aviation safety) - 6 Jun
A result of many factors (medevac accident) - 29 Aug
ATMs available (from USAAVNC) - 22 Aug
At the three-quarter mark (accident statistics through third quarter FY 79) - 25 Jul
Aviation safety-of-flight implementation information (compliance data must be reported) - 21 Feb
Back to basics (fixed wing accident with IP aboard) - 12 Dec
Batteries and deodorant bars don't mix (bar found in battery compartment) - 31 Oct
Be it ever so humble (get-home-itis accidents) - 25 Jul
Blowing snow whiteouts (techniques for operating in snow) - 10 Oct
Bring your own flight clothing (when TDY to Fort Rucker) - 12 Dec
Broken Wing Award winners (recipients for April through June 1979) - 25 Jul
Broken Wing Award winners (recipients for July through September 1979) - 31 Oct
Call for help (medical evacuation) - 15 Aug
Caution: Clean T53 engines by the book (unauthorized procedures causing problems) - 8 Aug
Caution: OH-58C engine overtorque (inspection and maintenance guidelines) - 3 Oct
Check and double check (importance of using checklist) - 28 Nov
Check OH-58 seatbelt support brackets (hinge pin security) - 29 Aug
Check your ELTs (remove shipping screw) - 15 Aug
Check your SPH-4 retention systems (helmet deficiencies) - 16 May
CH-47C transmission (return unserviceable transmissions) - 24 Oct
CH-47 lag damper (rotor damper failure) - 3 Oct
CH-47 work platform assemblies (observe load limit) - 14 Mar
Christmas card art (near accident in IMC) - 7 Mar
Chuck Greenie learns a trade (flight planning) - 10 Jan
Collapsible fuel cells (how to store) - 24 Jan
Commercial pilots rate safety factors (list of factors) - 8 Aug
Computing lateral c.g. (formula) -12 Sep
Condition of repair and replacement parts (submit QDRs and EIRs) - 21 Nov
Conversion of hydraulic system fire retardant hydraulic fluid (maintenance advisory message) - 17 Jan
Copilot error? (importance of copilot) - 8 Aug
Correction (to Chuck Greenie learns a trade) - 7 Feb
Correct trunnion bearing installation vital (instructions for installation) - 20 Jun
Cotter pins found corroded (received through supply channels) - 11 Apr
Could this happen to you? (near accident caused by complacency) - 20 Jun
CY 78 FLIGHTFAX index - 17 Jan
Danger on the ground (ground accidents) - 14 Feb
Density altitude . . . summertime or all the time? (factors that make up DA) - 2 May
Different modes of terrain flight (NOE, contour, and low level) - 25 Jul
Do something (report unsafe people) - 21 Nov
Emergency landing techniques (be prepared) - 30 May
Everybody talks about it (weather information) - 18 Apr
Expedited return of T53 engine fuel controls (return unserviceable controls) - 18 Jul
Facts about ALSE (contact DARCOM for info on life support equipment problems) - 24 Jan
Finite life items (retirement schedules should be complied with) - 14 Feb
First half FY 79 accident count (number of accidents) - 11 Apr
First quarter FY 79 recap (recap of mishaps) - 21 Feb
FOD pamphlet available (from USASC) - 21 Mar
FOD reflective tape (Navy tape) - 22 Aug
Followups (of accidents previously reported) - 24 Jan, 14 Feb, 28 Mar, 25 Apr, 6 Jun, 1 Aug, 19 Sep, 21 Nov

Index

Fuel caps—a continuing problem (loose caps causing precautionary landings) - 11 Jul
Gantry damages helicopters (failure of pin caused leg to collapse) - 18 Apr
Getting the job done (FY 79 accident recap) - 17 Oct
Ground handling wheel causes injury (rim separated) - 5 Sep
Guidelines for handling materials containing asbestos (when substitutions cannot be made) - 23 May
Helicopter in-flight icing (hazards of icing) - 14 Nov
Hydraulic jack hazard (explanation of hazard and list of safety procedures) - 12 Sep
"I have never done one by the dash ten" (U-21 accident) - 1 Aug
Incorrectly installed lapbelts fail (UH-1 accident) - 6 Jun
In memoriam (George Saunders) - 31 Jan
Install bug screens in OH-6As (instructions) - 21 Nov
Instructional material catalog available (submit DA Form 17 to Extension Training Management Branch, USAAVNC) - 7 Feb
It can happen to you (in-flight weather emergency) - 22 Aug
It's a fact (speed is killer in wire strikes) - 23 May
It's a fact (wire strike statistics) - 11 Apr
Keep it straight (SPH-4 suspension assembly and chin strap) - 24 Jan
Keep that tail up! (NOE deceleration maneuver) - 21 Nov
Keep your flight surgeon informed (when flying restrictions may be appropriate) - 25 Apr
Lapbelts may be deficient (things to look for) - 13 Jun
Leave M60s at home (on training missions) - 17 Oct
Letters (pilot's shoes stuck to floor and pedals) - 14 Feb
Maintenance-error mishaps increasing (synopsis of study) - 19 Sep
Maintenance procedures for seal leakage (CH-54B sleeve and spindle assemblies) - 20 Jun
Mishap experience provided to commanders (to determine aviator qualifications) - 25 Apr
Missent TAMMS forms (should go to DARCOM) - 24 Oct
More on computing lateral c.g. (formula) - 7 Nov
More on U-21 landing gear problems (actuator inspections) - 7 Mar
New ASO book available (second edition of "Safety Talks for ASOs") - 7 Mar
New directions for water purification tablets (treating water in canteens) - 15 Aug
New monkey harness (with leg straps) - 14 Mar
New procedures for T55-L-11 engines (supplement to FLIGHTFAX) - 27 Jun
New telephone number for teardown analysis (at USASC) - 14 Mar, 9 May
New TM 55-1520-210-CL (has been distributed) - 9 May
New, yet old (1953 seatbelt issued in 1979) - 11 Apr
Nicad batteries: a hot summer item (preventive measures) - 25 Apr
Nicad battery explosion (electrical receptacle connectors) - 30 May
19- or 20-cell batteries? (certain units authorized 20-cell batteries) - 24 Oct
OH-58 aircraft released to field (C model) - 24 Oct
OH-58 main rotor blades (use the term "repaired" on 2410 form) - 14 Mar
OH-58 maintenance problem (incorrect installation of tail rotor pitch change control tube) - 29 Aug
OH-58 maintenance questionnaire coming (will be in FLIGHTFAX) - 14 Mar
OH-58 modification kits (shortage of kits) - 14 Feb
OH-58 torque available charts (urgent change to operators manual) - 21 Feb
OHR for accident prevention only (not for punitive action) - 11 Jul
OHR system to be revised; ASO input needed (self-addressed form) - 30 May
One more for Murphy (AH-1 accident) - 7 Feb
One item maintenance can do without (flashlight clips) - 11 Apr
Operations around thunderstorms (tips on flying in vicinity of thunderstorms) - 9 May
Out of sight (accidents caused by loss of visual cues) - 13 Jun
Overpressurized fuel cells (can cause damage) - 11 Apr
Oxygen requirements (in-flight requirements) - 24 Jan
Permion or cellophane? (report battery type) - 5 Sep
Personal viewpoint (definitions of flight discipline) - 18 Apr
Personal viewpoint (letter from Army Guardsman) - 21 Mar
Phasing your CH-47 rotor system (new phasing block method) - 18 Jul
Pilot error greatest single cause of Navy, Army aircraft accidents (types of pilot-error accidents) - 11 Jul

Pilot/mechanic communication (need for good communication) - 15 Aug
Plan it, then fly it (importance of mission planning) - 21 Mar
PRAM addressees (list of mandatory addressees) - 20 Jun
Precautionary and forced landing survey results (report on survey) - 21 Feb
Prepare for winter operations (precautions) - 14 Nov
Put it down; leave it down (land at first sign of trouble) - 23 May
Put yourself in the dead man's shoes (OH-58 accident) - 1 Aug
Reader contribution (comments on IPs) - 5 Sep
Readership survey (of FLIGHTFAX) -21 Feb
Real to reel accidents (info on safety films) - 18 Jul
Recap of TSARCOM messages (from 1 Jan through 31 Mar 79) - 14 Nov
Recap of TSARCOM messages (from 1 Apr through 30 Jun 79) - 12 Dec
Report all facts (par. 14 of PRAM) - 14 Feb
Rescue hoist safety-of-flight (use of hoist prohibited) - 8 Aug
Retorquing or checking torque? (what is the difference) - 7 Nov
Return of T53-L11 series engines with K-4 gearing (return to depot) - 14 Feb
Reuse of crash-damaged component causes accident (combining transmission dephased, causing main rotor blades to mesh) - 28 Nov
Safety-of-flight messages
- ☐ AH-1 hose assembly - 14 Nov
- ☐ AH-1S inspection of T53-L-703 fuel controls - 11 Apr
- ☐ CH-47 combining transmissions - 8 Aug
- ☐ CH-47 inspection for washer installation in rotor heads - 25 Apr
- ☐ CH-47 inspection of combining transmissions - 25 Apr
- ☐ CH-47 jettisonable door latch inspection - 25 Apr
- ☐ CH-47 prohibition of use of night vision goggles - 25 Apr
- ☐ Inspection of ELTs - 11 Apr
- ☐ OH-58 battery inspection - 11 Jul
- ☐ UH-1/AH-1 drive shaft inspection - 12 Sep
- ☐ UH-1 and AH-1 P1 bellows failures - 18 Apr
- ☐ UH-1 collective connecting link inspection - 15 Aug
- ☐ UH-1 inspection of swashplate outer ring - 11 Apr
- ☐ UH-1 inspection of T53-L-13B fuel controls - 11 Apr
- ☐ UH-1 rescue hoist - 8 Aug
- ☐ UH-1 rescue hoist - 15 Nov
- ☐ UH-1 tail rotor hub assembly inspection - 12 Sep
- ☐ UH-1 tail rotor hub assembly inspection (change) - 12 Sep

Safety award eligibility (units should request awards) - 15 Aug
Somebody didn't get the word (FOD mishaps) - 21 Mar
Speed is killer in wire strikes (wire strike experience) - 31 Jan
SPH-4 helmets for passengers in LOH aircraft? (need for helmets) - 6 Jun
STACOM - 10 Jan, 24 Jan, 14 Feb, 28 Feb, 28 Mar, 18 Apr, 16 May, 6 Jun, 27 Jun, 25 Jul, 22 Aug, 26 Sep, 24 Oct, 28 Nov, 12 Dec
Still no ELT batteries (for emergency locator transmitters) - 28 Nov
Stop pneumatic leaks (procedures for installing fittings and tubing) - 24 Oct
Store bags in baggage compartment (in OV-1) - 14 Mar
Strainer element for T63-A-700 engine (new element) - 10 Oct
Stress (how it plays a part in accidents) - 17 Jan
Substitution of battery relay with starter relay not recommended (similar in appearance) - 21 Nov
Success stories we all like (prevention actions) - 22 Aug
Survival kit shipped without lighter (for safety reasons) - 25 Apr
"Tell it like it is" PRAMs (request for more info) - 17 Oct
Ten receive Broken Wing Award (recipients for Oct through Dec 1978) - 7 Feb
Ten receive Broken Wing Award (recipients for Jan through Mar 1979) - 9 May
T53 fittings—there is a difference (restricted and nonrestricted) - 7 Nov
T53 fuel control modification scheduled (controls to be modified) - 10 Oct
The job's not finished until the paperwork's done (need for follow-up reports) - 26 Sep
The only answer (importance of following standard procedures) - 27 Jun
The salesman (safety attitude) - 11 Jul
The ultimate decision (things crewmembers can do to guard against accidents) - 31 Oct

Index

The wire strike picture (wire strike protection systems) - 12 Dec
Tires for OH-58 ground handling wheels (available) - 14 Mar
Tool control (cure for tool FOD) - 21 Mar
Torquemeter indicator (in short supply) - 14 Mar
Trouble with maintenance (maintenance errors increasing) - 14 Mar
T63 engine vibration check (procedures) - 15 Aug
Turbine engines and summer flying (steps to take in checking engines) - 28 Mar
UH-1/AH-1 P1 bellows failures (explanation of bellows failures) - 16 May
UH-1C and M aviators note (fuel loading table) - 10 Oct
UH-1 series elevator horn assembly (special finish) - 3 Oct
UH-1 soundproofing blanket modification (use washers and bolts) - 19 Sep
UH-1 tail rotor roller chain (problem with cable tension) - 14 Feb
Unauthorized alteration of electrical equipment (Air Force mishap) - 7 Nov
Unsecured parachutes vs helicopters . . . and the winner is? (dangers of operating near unsecured parachutes) - 5 Dec
USAAAVS no more (now Army Safety Center) - 10 Jan
USASC FY 80 safety courses (dates of courses) - 2 May
Use drycleaning solvent sparingly (apply with cloth or sponge when cleaning aircraft or components) - 7 Mar
Use it or lose it (instrument proficiency) - 26 Sep
U-21 landing gear problems (materiel and maintenance) - 14 Feb
Vibration and the T63 engine (vibration checks recommended) - 28 Feb
Warning—C-12 under pressure (wait for signal when boarding aircraft) - 9 May
Warning: UH-1 trunnion deficiencies can kill (improper procedures being used) - 4 Apr
Welding injuries on the increase (use protective devices) - 27 Jun
Well done (bird strike to OV-1) - 22 Aug
We'll make a weather check (weather accident) - 5 Sep
What a thunderstorm is not (discusses absence of typical thunderstorm phenomena) - 26 Sep
What is inoperable SCAS? (motoring SCAS) - 5 Sep
When does an IP take the controls? (when in doubt, take control) - 11 Apr
When go should have been no-go (don't fly after making precautionary landing) - 4 Jul
When in doubt (IP should take control) - 25 Jul
Whose error? (pilot or supervisory error?) - 4 Jul
Will you be ready? (in-flight emergencies) - 7 Nov
Wire strike kills four (recap of first quarter FY 79 mishaps) - 21 Feb
Wire strike profile (typical wire strike and 7-point prevention program) - 31 Jan
Wire strike update (info on wire strikes) - 30 May
Witty one-liners (just before an accident) - 11 Jul
You have to trust somebody (teamwork) - 27 Jun ■

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Accident review

Synopsis

A pilot and four maintenance personnel were on a maintenance test flight. During a low rpm hover check, the UH-1H began turning to the right. It then descended in a rapid autorotation, hitting the ground hard.

History of flight

A pilot on a UH-1 post-phase inspection maintenance test flight completed his hover checks, takeoff and climb checks, level-off checks, and control rigging checks. During the control rigging check, the left antitorque pedal was about 2 inches forward of neutral, necessitating a tail rotor adjustment. An unusual lateral vibration was felt, and the pilot decided to return to the airfield to adjust the tail rotor and troubleshoot the vibration.

Returning to the airfield, the pilot had the transmission mounts checked to see if they were the cause of the unusual vibration. (The transmission had been changed during the phase.) The maintenance supervisor told the crew chief to shorten the tail rotor pitch change links two full turns. The crew chief shortened the links three full turns. The supervisor did not see the adjustment but signed off the writeup on the dash 13.

The pilot asked the two individuals who had installed the main transmission, plus the maintenance supervisor and crew chief, to go on the next test flight. Gross weight of the aircraft was 7,764 pounds.

Reaching the hover check area, the pilot made a 3-foot hover check and then brought the aircraft to a 35- to 40-foot hover at 6600 rpm, headed into the wind. He decided to make another low rpm hover check at out-of-ground-effect altitude to verify that no lateral vibrations were present. The Huey was stabilized at 35 to 40 feet at 6600 rpm with 2 to 3 inches of left pedal applied forward of the neutral position. As the pilot beeped the rpm down to 6000, aircraft heading stayed momentarily at 60 degrees, and then the aircraft began to slowly turn to the right. Left pedal did not stop the right turn. The pilot reduced throttle and the aircraft stopped turning.

The Huey descended in a rapid autorotation, hitting the ground in a 5-degree left-skid-low attitude with no turn rate. The blades flexed up and down and were turning slowly after the landing. The five occupants exited uninjured.

Crewmember experience

The 35-year-old pilot, who was the unit maintenance officer, had more than 1,600 rotary wing flight hours, with more than 800 in Hueys.

Commentary

The maintenance test pilot misinterpreted insufficient tail rotor thrust as an in-flight tail rotor failure. Had he recognized what was happening, he could have recovered by reducing collective pitch until he was safely on the ground or until he had descended to a safe hover autorotation altitude. The operators manual does not adequately discuss tail rotor failure or insufficient tail rotor thrust at an out-of-ground-effect hover, nor does it prescribe recovery techniques for either of these emergencies.

The pilot operated his UH-1H at a gross weight of more than 7,500 pounds and an engine rpm of less than 6400 in violation of the operating limits in the operators manual and those placarded on the aircraft instrument panel. As a result, he lost tail rotor thrust at 35 to 40 feet.

TM 55-1500-219-MTF, the manual for maintenance test flights, prescribes that low rpm hover checks be performed at 6000 N_2 but contains no advisory or caution against flying at a gross weight in excess of 7,500 pounds and N_2 of less than 6400. As a maintenance test flight is probably the only justifiable reason for flying with N_2 below 6400 rpm, the checklist for maintenance test flights should contain a discussion of and caution against performing any part of the maintenance test flight with a gross weight of more than 7,500 pounds and N_2 less than 6400. ■

The copilot

"If it had not been for my copilot, this mishap could have easily terminated in a major accident instead of an incident. After we lost hydraulics, the controls were so difficult to move that I had to have his assistance to make a significant change. But more importantly, he tuned the radios and made all the emergency checks listed in the checklist. He had been monitoring my navigation and when the emergency arose, he assumed navigation and directed me to the nearest suitable landing area."

". . .I always leave the flaps down until I reach about 300 feet after takeoff. Much to my surprise, we had barely become airborne when the copilot raised the flaps. By the time I reacted, we had lost so much altitude that I almost hit the perimeter fence . . . ."

Who is this individual we call copilot who, in one situation, saves an aircraft and crew from disaster while, in another, triggers the events that lead to an accident? When is he required? What are his duties?

The prefix "co-" is a shortened form of "com-," meaning "together with, as in co-operation." Logically then, the copilot is the assistant pilot. Under provision of AR 95-1, he is required for all fixed and rotary wing aircraft being flown into known or forecast instrument conditions. (This requirement is waived for OV-1 aircraft when mission requirements dictate otherwise.)

But since a major portion of our flying is accomplished with a copilot on board, what are his duties? If you are expecting a "laundry list," there is none. How, then, is the copilot to know what is expected of him? To answer this question, first consider the pilot's duties.

AR 95-1 states that the commander places full responsibility on the designated pilot in command who is final authority for all aspects of the operation, servicing, security, and hangaring or parking of the aircraft. That statement embraces a lot of territory—preflight, use of checklists, flying the aicraft within its envelope, passenger briefings, compliance with regulations—you name it. It's the pilot's responsibility. What he requires of his assistant, the copilot, depends on the particular situation. That's the way it should be. Only after an analysis of his own experience and proficiency; the experience and proficiency of his copilot; and the area of operations, flight conditions and mission requirements can the pilot logically determine the appropriate duties for his copilot. Some general and specific duties could be appropriately included in local SOPs as copilot responsibility. This inclusion might be of particular value in areas where aviators regularly fly the same type, model, and series aircraft on similar type missions.

General duties might require the monitoring of engine and flight instruments, as well as the pilot's navigation, and watching out for other aircraft. Specific duties might include the clearing of weapons systems (using checklist), point to entry into cantonment areas, tuning and operating radios during emergencies and disembarking and monitoring refueling operations.

But regardless of the duties assigned a copilot, one point must be emphasized: The key to proper use of copilots is briefings. These briefings must be conducted in a thoroughly professional manner, and they must be programed into the preflight planning phase—not conducted in the cockpit as an afterthought or, worse, neglected. This procedure will eliminate or reduce confusion in the cockpit, promote competence and foster confidence between the pilot and his key man, the copilot. ■

Selected mishap briefs

uh1 **Precautionary landings** ☐ As forward hover was begun, pilot noticed progressive binding of cyclic flight control. Pedal turn to left was completed and aircraft was parked. About 45 minutes before takeoff, aircraft had been deiced using a Herman Nelson heater. Postflight inspection revealed water had accumulated and frozen on right cyclic servo, causing servo to bind. After aircraft was deiced, low temperatures coupled with wind chill factor caused rapid refreezing of melted water. ☐ While on medical evacuation flight, crew flew into unforecast thunderstorms with heavy precipitation and severe turbulence. Landing was made, and mission was continued after 1½-hour delay.

ah1 **Precautionary landing** ☐ Forward fuel boost pump light came on. Caused by failure of boost pump.

ch47 **Precautionary landings** ☐ No. 1 engine chip detector light came on and torque increased to 900 pounds. Caused by failure of torque drive roller assembly. ☐ No. 1 engine oil pressure gauge read 200 psi during landing. Caused by failure of oil pressure transmitter. ☐ Forward transmission debris detection screen latch indicator on flight engineer's maintenance panel tripped during landing. Metal piece and metal flakes were found on forward transmission chip detector.

Aviation-related ☐ Wrecker with flat bed trailer was being operated in hangar in close proximity to parked CH-47. Trailer had two avionics shelters chained to it. As wrecker was being moved, forward blade tiedown rope snagged on avionics shelter, pulling blade into shelter. Driver did not use ground guide properly. ☐ Overhead hoist was being used to assist in replacement of aft rotor blade. Hoist was lowered to desired position but would not stop, and it continued all the way to the floor. Blades and rotor head were damaged.

oh58 **Forced landing** ☐ Test pilot heard loud hissing noise during power recovery from autorotation. TOT went up through 940° and N_1 went down through 101. Pilot continued to land with power available and ran out of left pedal at the bottom. Caused by failure of bleed air fitting located on left front of engine on diffuser scroll assembly going to particle separator and cabin heat.

Aviation-related ☐ Warehouse tractor was backed into aircraft. Fatigue and inexperience were cause factors.

u8 **Precautionary landing** ☐ (F series) Gear indicators showed gear was down and locked. When power was reduced, gear warning horn sounded. Go-around was made. Visual inspection revealed gear appeared to be down, and landing was made. Caused by short in position indicating system.

u21 **Precautionary landings** ☐ (H series) No. 1 engine was shut down to simulate engine failure. Three restarts were tried, but engine would not start. Single-engine landing was made. Caused by failure of both spark igniters on No. 1 engine. ☐ (H series) No. 1 power lever froze during climb. Aircraft descended and operation of lever returned to normal. Suspect moisture on rod end bearing froze. Temperature was -34° C.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Flight of eight was on VFR flight plan and behind schedule because of a 3-hour delay in takeoff. Nightfall closed in as flight approached destination with heavy clouds in region. Since pilot was not familiar with area and was the only person aboard, he had to read his maps with a neck-suspended flashlight. Pilot had switched to wrong UHF radio frequency, thus losing radio contact with remainder of flight. Pilot encountered heavy clouds and turbulence and had difficulty maintaining visual contact with

formation. He saw a steady bright light and headed toward it since he thought it was another aircraft. It then began to rain hard, and pilot had the sensation of being pushed up. He thought he could see clouds and that he was going to be pushed up into one. He saw a bright light again and flew toward it, finally realizing it was on the ground. He tried to flare but hit trees. Two other pilots in the same flight reported similar difficulties and near accidents.

Maintenance

uh1 **Precautionary landing** ☐ On postflight inspection test pilot found tailpipe drain lying across short shaft section of tail rotor drive shaft. When doghouse assembly was replaced, line to fitting above short shaft section of drive train was not properly secured.

oh58 **Precautionary landings** ☐ Cyclic stiffness in left quadrant occurred during takeoff. Two thrust washers on cyclic control mixing lever were installed backwards on last phase inspection. ☐ DC generator light came on during takeoff. Voltage regulator was set too high.

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Keep cowlings and fairings in top shape

Someone had either stepped on or set a heavy toolbox on this piece of cowling, causing it to rub the drive shaft in flight.

A recent CH-47 crash was indirectly caused by a piece of cowling rubbing on an engine drive shaft.

Cowlings and fairings should be checked closely at all inspection intervals for cracks, dents, and proper security, especially in areas where they are in close proximity to drive shafts, flight control tubes, electrical wires, and hydraulic and oil lines.

Several cases of improperly secured cowlings and fairings coming off in flight have been reported. The condition of the dzus, airloc, and camloc fasteners on cowlings and fairings is very important. A broken pin or spring in the fastener could cause the fastener to vibrate loose in flight.

All cowlings and fairings are, for the most part, no-step areas. They are not designed to sustain weight or abuse. They should not be used to support toolboxes and heavy parts or used as a convenient work bench on top of the aircraft.

If you see someone abusing cowlings and fairings, stop him and tell him how he could be setting the scene for a mishap.

Also, don't get into the it'll-wait-until-the-aircraft-goes-into-phase-maintenance syndrome to repair a piece of cowling or fairing. Relatively small cracks could be big cracks by the time you get the aircraft into phase maintenance. It only takes a few minutes to stop drill a crack or replace a dzus, airloc, or camloc fastener. That few minutes could keep a piece of cowling or fairing from coming off in flight and striking a critical component or being ingested into an engine, causing its failure.

POC at the Safety Center is SFC James J. Wheeler, AUTOVON 558-4202/4198, commercial 205-255-4202/4198. ■

Shortfax

Recap of TSARCOM messages

Following is a list of AIG 8881 addressed messages for the AH-1 transmitted by TSARCOM (DRSTS-M) from 1 July through 30 September 1979.

AH-1-79-10 Maintenance advisory message concerning maintenance instructions for those aircraft not equipped with a fine mesh screen on the FOD screen

AH-1-79-11 Maintenance advisory for AH-1 canopy removal system

AH-1-79-12 Maintenance advisory on safetying of pin quick release, P/N 11830424, 20mm auto gun XM97E1 universal turret

AH-1-79-13 Technical advisory to clarify par. 3b of technical information message UH-1-79-6 and AH-1-79-5

AH-1-79-14 Maintenance advisory message on AH-1S aircraft concerning seal of fuel quantity transmitters

AH-1-79-15 SOF one-time inspection of AH-1S (mod) corrosion on shaft assemblies, TB 55-1520-234-20-1

AH-1-79-16 SOF one-time inspection of drive shaft (short shaft) assemblies, TB 55-1520-243-20-2

AH-1-79-17 Change to SOF one-time inspection of drive shaft (short shaft) assemblies

AH-1-79-18 Change to SOF one-time inspection of drive shaft (short shaft) assemblies

AH-1-79-19 SOF inspection of hose assembly

AH-1-79-20 Technical advisory message concerning P1 bellows problems with T-53 engines

AH-1-79-21 Change to SOF one-time inspection of drive shaft (short shaft) assemblies

Storage of torque wrenches

An article in the July 1979 PS magazine was in conflict with procedures outlined in the General Aircraft Maintenance Manual, TM 55-1500-204-25/1, paragraph 6-153a. The article stated: "Never store a torque wrench with a torque setting less than 20 percent of the maximum range."

The TSARCOM Technical Support Division, in a memo dated 15 October 1979, indicated "the information contained in the bottom two frames of page 30 of the July 1979 PS Magazine that advocates setting a preload on torque wrenches before storing the wrench is to be completely disregarded."

According to TSARCOM, the "authorized guide for use and storage of torque wrenches is still TM 55-1500-204-25/1, chapter 6. Any time a torque wrench is dropped, regardless of height, or when accuracy of a torque wrench is suspect, the wrench should be withdrawn from use and returned to the servicing agency for calibration. When an audible indicating torque wrench is used, the micrometer type barrel should be returned to zero or the lowest setting after each use and before storing." ■

Check OV-1 cowlings

Two OV-1Ds recently lost No. 2 engine cowlings, one an inboard cowling and the other an outboard cowling. After the first mishap, the unit inspected 60 engine cowlings and found 10 latch assemblies were defective or out of adjustment. After the second incident 21 days later, the unit inspected 28 cowlings and found 10 defective or out-of-adjustment latch assemblies.

It is suspected that latching studs or latch assemblies are not properly securing cowlings for the following reasons:

- Aircraft and engine vibrations are causing the jam nut on the stud assembly to back off. This allows the T fitting to twist during the locking sequence. The latch closes, but the stud is not properly seated. From the outside the latch is flush and appears locked.

- The latch assembly's hooks are being spread through repeated use. This allows the hook to slip from the T bar during flight due to aircraft or engine vibrations.

Recommend all units with OV-1s inspect latch and stud assemblies for proper installation, adjustment, and serviceability.

Thanks to David R. Preddy, Fort Hood, for sharing this information with our readers. ■

Icing—rethought

Aircraft icing to most pilots is thought of in terms of clear, rime or frost and light, moderate or heavy. Most pilots must refer to the IFR Sup or Weather for Aircrews manual to spurt out accurate definitions of icing. One thing is certain, however. Pilots know you need visible moisture (clouds) and freezing temperatures to experience icing. Another thing pilots know is that the first place where ice usually starts forming is on the windscreen (or windshield wipers for heavy drivers), and this visual indication usually precedes cockpit ice warning lights.

Despite these commonly held beliefs, there is another form of icing not defined in the IFR Sup or preceded by visibly detectable airframe icing. I am, of course, referring to inlet duct icing. Pay close attention to the following facts and be aware you do not have to think winter to experience this phenomenon.

NASA's Lewis Research Center reports that the conditions that produce turbine inlet icing are visible moisture from ground level to 15,000 feet and temperatures from -5 to -18° C. The exception to this is cumulonimbus clouds which can cause inlet icing as high as 40,000 feet. Engine and inlet icing builds up fast and can occur before an accretion of ice is visible on the aircraft surface. This situation is most likely at high engine rpm and low flight speeds associated with takeoff, penetration, and approach.

Also consider that maintenance specialists use an air temperature of less than 40° F. and a temperature and dew point spread of less than 7° as a guide to run engines on the trim pad due to the possibility of ice formation. Therefore, the possibility for induction icing to occur below the freezing level does exist.

The situation presents itself during the fall and winter months during GCA patterns with an overcast and temperatures near freezing, even though the clouds may actually be below the freezing level. Another weather phenomenon which may provide conditions right for induction icing is heavy to moderate rainshowers.

A T-38 cruising at 6,000 feet msl with the freezing level reported between 10,000 and 12,000 feet experienced a dual engine flameout on landing from ice ingestion. The crew reported at no time entering what they thought were icing conditions (that is, temperature below freezing and seeing accretion or ice on the airframe). However, maintenance investigation revealed that engine damage—and subsequent flameout—was caused by icing.

Weathermen report that during heavy precipitation the OAT may be lowered as much as 10 degrees due to the cooling effect associated with the falling water. So, even though below the freezing level, conditions for icing may exist.

What is the danger associated with induction icing? First of all, the pilot isn't aware it is happening.

Secondly, for non all-weather aircraft without anti-icing equipment the danger may be fatal depending on when the icing occurs.

Talon Service News, Oct-Nov 78, describes what the result of engine icing may be. "Ice particles dislodged from the air inlet duct lip and/or inlet guide vanes can cause foreign object damage. Ingestion of dislodged ice particles into an engine may be evidenced by increased vibration or unusual noise from the engine. Normally, this FOD will reduce the stall margin but not cause engine failure. However, be alert for a possible compressor stall when increasing power. Engine instrument indications may remain normal, even though the inlet guide vanes and first stage compressor blades have been damaged."

A senior maintenance engine specialist says, "I've inspected over 1,000 engines with ice damage, and not a single one was written up for possible induction icing."

So, what tips can the pilot use? Obviously, don't forget or discount all you know about structural icing and the icing limitations for your aircraft. In addition, be aware of the conditions in which induction icing may occur. Be especially aware that the takeoff and approach phases of flight, with slow airspeed and high power setting, are conducive to induction icing when atmospheric conditions are proper. Don't forget that, just because you cannot see structural ice forming, you are safe. Try to remember the conditions under which induction icing may occur. It may save your life. ■

—from AEROSPACE SAFETY

Eye ointment may be outdated

Eye ointment may be outdated

All aircrews and life support equipment personnel should check the eye ointment in their eye dressing kits, NSN 6545-00-853-6309, to see if it is out of date. The only acceptable eye ointment in first aid kits is NSN 6505-00-183-9419, Sulfacetamide Sodium Ophthalmic Ointment, USP, 10 percent, 1/8 oz/3.5 gram.

Kits containing eye ointments catalogued under the following NSNs are considered not suitable for use because of outdated materiel and should be destroyed in accordance with par. 3-48, AR 94-61, and par. 2-28, AR 735-11.

- NSN 6505-00-299-8174, Sulfacetamide Sodium Ophthalmic Ointment, modified, 30 percent, 1/8 oz/3.5 gram, 125.
- NSN 6505-00-530-6469, Bacitracin Zinc, Neomycin Sulfate, and Polymyxin Sulfate Ophthalmic Ointment, 1/8 oz/3.5 gram.

Replacements should be ordered through normal supply channels. The eye dressing kit is a component of the following kits and sets:

- 6545-00-116-1410, First Aid Kit, General Purpose
- 6545-00-168-6893, First Aid Kit, Life Raft
- 6545-00-823-8165, First Aid Kit, Individual
- 6545-00-919-6650, First Aid Kit, General Purpose, Panel Mounted
- 6545-00-922-1200, First Aid Kit, General Purpose, Rigid Case
- 6545-00-927-3000, Medical Instrument and Supply Set, Aeronautic Emergency
- 6545-00-927-4925, Surgical Instrument and Supply Set, Flight Nurse

U.S. ARMY AVIATION LIFE SUPPORT SYSTEM

Inspect the eye dressing kit as follows:

Do not open the eye dressing package. This will render the kit unserviceable. Check the list of contents printed on the eye dressing package. If the correct eye ointment, NSN 6505-00-183-9419, is not listed, discard the eye dressing kit and replace it with one which has the correct eye ointment. For eye dressing kits with the correct eye ointment, inspect the eye ointment tubes by moving them around to a clear place in the package to read the date on the tubes. Eye ointment tubes will have a manufactured date, e.g., Mfd 6 79, or an expiration date, e.g., 6 79. These dates may be found in any one of three locations: on the tube label, on the crimp at the bottom of the tube, or on the box in which the tubes are packed.

Information on shelf life medical items can be found in SB 8-75, Army Medical Department Supply Information, which can be ordered from the St. Louis AG Publications Center. ■

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new mishap classifications in this issue

No more major or minor accidents

Aircraft Class A Mishaps Worldwide

	Fiscal Years		
	77	78	79
Number of Class A Mishaps	48	47	39
Class A Mishap Rate	3.2	3.2	2.7
Number of Fatalities	26	58	18
Total Flying Hours	1,498,906	1,449,788	1,443,836
Total Mishap Dollar Costs	32,085,410	34,104,103	43,178,108

That's the latest word. The Army has made the decision to eliminate all major and minor accidents—at least from our mishap classification and reporting system. And AR 385-40 is being revised to reflect this decision.

No longer will aircraft mishaps be classified as major accidents, minor accidents, incidents, etc., as in the past. Instead, they will be identified as either Class A, B, C, D, or E mishaps; and the criteria stipulated in the revised AR 385-40 will be used to determine in which of these categories a particular mishap will be assigned.

This change is not an arbitrary one. It puts the Army in compliance with DOD Instruction 1000.19 requirements for classifying and reporting mishaps and also provides a standard for valid comparison of Army mishap experience with that of other services.

Army aircraft mishap

An Army aircraft mishap is a mishap involving Army aircraft when intent to fly exists. Intent to fly exists when an aircraft engine is started for the purpose of commencing authorized flight (scheduled flight by a rated crew). Intent to fly continues until the aircraft comes to rest (e.g., brakes set or wheel chocks in place with the engine(s), propeller(s), or rotor(s) stopped). An aircraft's engines are considered started or running the instant an attempt is made to set any one engine in

motion, either by power from within or outside the aircraft. Intent to hover a helicopter under its own power from its parked position will be considered intent to fly. For amphibian aircraft landing on water, intent for flight ceases when the aircraft has made a water landing, engine(s) have been stopped, and the aircraft has either been moored or taken in tow. Helicopters designed with hulls capable of landing on water and remaining afloat are not considered amphibian aircraft.

Army aircraft mishaps are subdivided into two types:

• Flight mishap. Mishap in which there is damage to the aircraft itself. Explosives, chemical agents, or missile events that cause damage to an Army aircraft with intent to fly are categorized as flight mishaps to avoid dual reporting.

• Flight-related mishap. Mishap in which there is no damage to the aircraft itself, e.g., injury to ground crew or passengers, other property damage, and events identified as precautionary landings, forced landings, aborted takeoffs, and human factor events.

Aircraft ground mishap

An aircraft ground mishap is a mishap involving an Army aircraft in which:

• There is no intent to fly, and

• The engines are in operation. The engines are considered in operation the instant any engine is set in motion intentionally, either by power from within or outside the aircraft.

• Injury, occupational illness, and/or property damage occurred.

Aircraft mishap cost

• Mishap cost. Sum of the cost of injuries, fatalities, occupational illnesses, Army property damage, and non-Army property damage resulting from Army operations.

• Destroyed, missing, or abandoned aircraft cost. The cost of total loss, missing, or abandoned Army aircraft is the total replacement cost per Supply Bulletin 700-20 and includes the cost of all modifications.

• Army damage cost. Cost of damage to Army property and equipment will include the actual cost of parts and labor.

• Army parts cost.
- For destroyed parts or components, the cost of replacement per Army Master Data File or Base Master Data File which can be found in technical supply or direct support units.
- The cost to repair damaged parts.

• Direct man-hours are computed at a standard rate of $8 per man-hour and reported on DA Form 2404, Equipment Inspection and Maintenance Worksheet for Class A, B, or C Mishaps.

Since no compatibility exists between the old mishap classification system and the new one, no attempt should be made to correlate the two. Following are the criteria to be used in classifying Army aircraft mishaps:

Class A

• A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or

• An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or

• A fatality occurs as a result of Army operations.

Class B

• A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C

• A mishap in which the total cost of property damage is at least $300 but less than $50,000; or

• An injury or occupational illness resulted in a lost workday case involving days away from work.

(continued on next page) ►

To familiarize yourself with the new mishap classifications, use the chart

Class D

• A mishap in which the resulting cost of property damage is less than $300; and

• An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays. Nonfatal cases without lost workdays are those cases where Army military, civilian, or contract personnel, because of an injury or occupational illness:

- Were permanently transferred to another job or terminated, or
- Required medical treatment greater than first aid, or
- Lost consciousness, or
- Were diagnosed as having an occupational illness that did not result in a fatality or lost workday case. This includes newly diagnosed occupational illnesses detected on routine physical examinations, but requiring no job limitation or change, e.g., nonprogressive, noise-induced hearing loss in which the wearing of adequate ear protection devices is the only action required.

Class E

• A high-mishap-potential event in which the resulting cost of property damage is less than $300; and

• There was no injury or occupational illness, or injury resulted in first aid only. Examples include precautionary landings, forced landings, or a human factors event.

Precautionary landings, forced landings, aborted takeoffs, human factors events, cargo personnel handling and storage events, multiple aircraft events, and misappropriated aircraft events are reported as events associated with an aircraft mishap. The mishap may be class A through E where there was intent to fly.

As of now, all information published by the Safety Center or furnished to requesting units or individuals will be in accordance with the new classification system. In this respect, the Management Information Systems Division will provide data classified under the new system for all mishaps which have occurred since the beginning of FY 1977. Beginning with this issue of FLIGHTFAX, the mishap briefs will be classified using this new criteria. The new classification definitions will be carried regularly with the selected briefs.

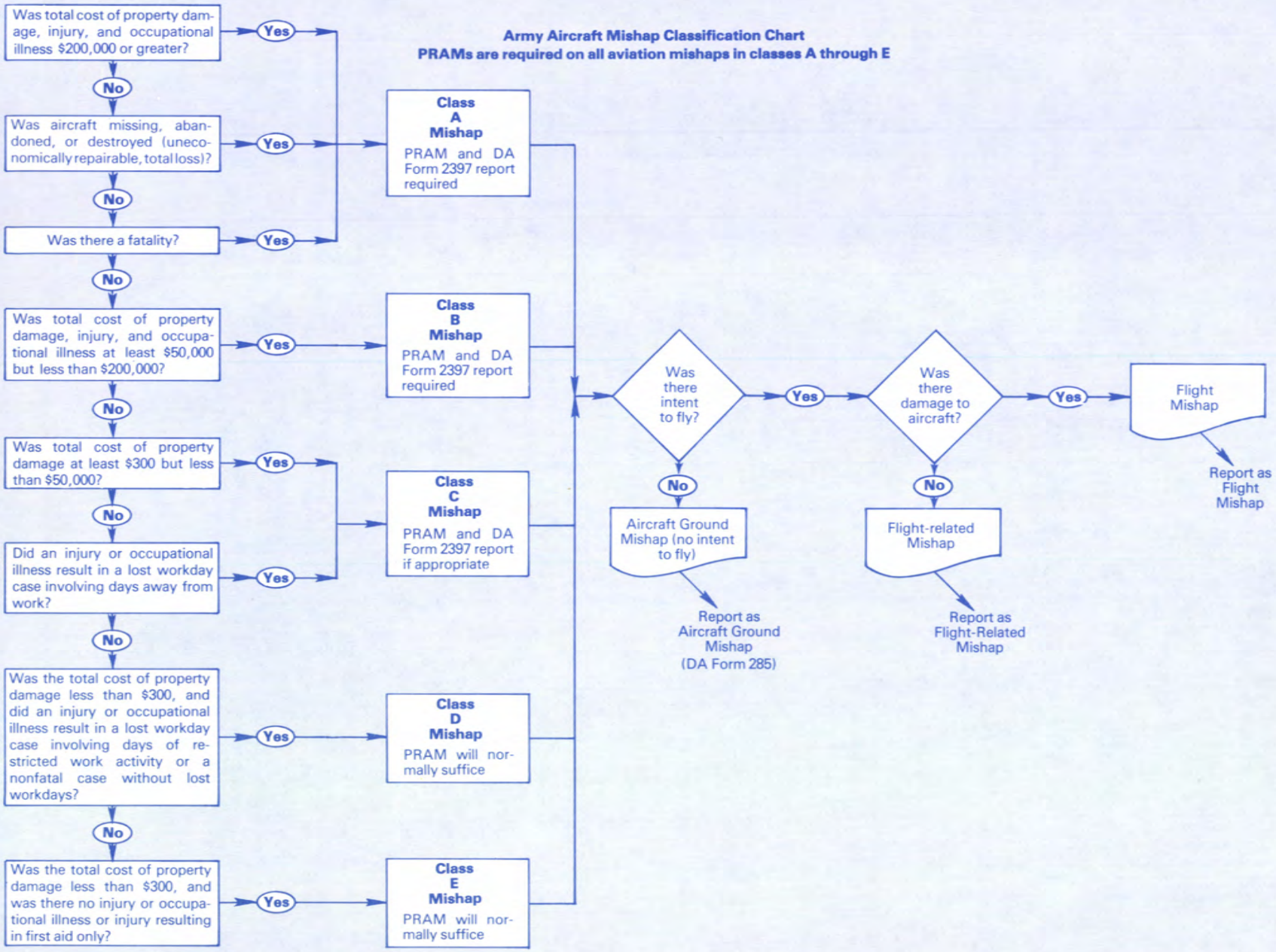
Since it will be several months before the revised AR 385-40 will be ready for distribution, plans are to print and distribute copies of chapters 3 (General Safety Investigation, Reporting, and Recordkeeping) and 5 (Army Aircraft Terms, Mishap Classifications, Investigation and Reporting) as soon as possible for immediate use by units in the field.

You will be kept advised of future developments by message and subsequent editions of FLIGHTFAX. All aviation mishaps in classes A through E are reportable by PRAM to the Safety Center. Other mishaps in classes A through C only are reportable to the Safety Center.

So, now is the time to familiarize yourselves with the new classification system. To help you, use the classification chart provided.

Point of contact at the Safety Center is Mr. A.F. Almquist, AUTOVON 558-6510/6385, commercial 205-255-6510/6385. ■

Army Aircraft Mishap Classification Chart
PRAMs are required on all aviation mishaps in classes A through E



Selected mishap briefs

uh1 **Class C mishap** Aircraft with six troops on board was parked right side low on 10° slope. When copilot initiated takeoff, aircraft began to roll to right. At about 14°, collective was lowered quickly, jarring aircraft. Pilot decided to continue mission. When aircraft was set down on pad at destination, pilot noticed right-side-low attitude. Maintenance inspection revealed bent aft cross tube and retaining straps.

Class D mishap Aircraft was forced to land because of unforecast deteriorating weather. Main rotor blade hit lower wire of powerline during landing.

Class E mishaps Transmission oil hot light came on, and transmission temperature gauge indicated 65° C. Caused by failure of transmission temperature thermo bulb. Fire warning light came on during takeoff. Caused by corrosion in electrical connector plug on left side engine cowling.

ah1 **Class E mishaps** Steep left turn was made with high torque setting and torque increased to 104%. Aircraft was landed and trunnion bolts changed. Main inverter failed during taxi to takeoff. Transmission oil bypass and master caution lights came on. Caused by failure of pressure switch.

ch47 **Class E mishaps** Aircraft yawed right and nose dipped slightly. Aircraft was equipped with snow skis attached to landing gear. Broken eyebolt allowed aft right ski to come loose, causing enough drag to give yaw input. No. 1 engine PTIT fluctuated from 600° to 0° C. Caused by failure of engine temperature indicator. Pilot smelled fuel odor after level-off check. Heater was shut down and visual check of cabin area was made. Crew chief saw what appeared to be JP4 seeping through floor at station 128. Postlanding inspection could not verify suspected fuel leak, but it was suggested that JP4 may have spilled on the floor and mixed with water which froze and then melted when heater was turned on.

oh58 **Class A mishap** Engine chip detector light came on about 400 feet agl, and pilot initiated approach to open field. About 150 feet agl and 300 feet short of intended landing area, aircraft yawed right and lost power. About 18 feet agl, engine stopped. Aircraft landed 25 feet short of intended landing area on 29-degree slope, rolled, and came to rest on right side. Fire was present in engine area and was extinguished within minutes by local fire department. Preliminary findings indicate that hot end of engine exploded in flight. 8017

Class E mishaps After engine shutdown, pilot smelled smoke. Caused by defective defogger blower motor. During hover check, copilot noticed N_2 at 102%. When copilot tried to beep up N_2, it decreased. Caused by sticking double check valve. Pilot felt binding in cyclic controls during landing approach. Caused by defective force gradient spring. Flight of six aircraft entered unforecast blowing snow. Aircraft 3 through 6 lost visual reference with aircraft 2 and landed.

u21 **Class E mishaps** (A series) Oil filler cap was locked but not seated in filler neck of No. 1 engine, causing loss of oil pressure. (A series) Torque and rpm were lost when takeoff power was applied. Caused by broken rod end ball bearing to reversing interconnect linkage.

u3 **Class E mishap** Left engine began smoking in flight. Caused by failure of turbocharger shaft oil seal.

ov1 **Class E mishap** (D series) Hydraulic pressure went to zero during flight. Caused by failure of left brake assembly.

c12 **Class E mishap** (A series) Outboard tire on right main landing gear skidded and blew out during touchdown. Inboard tire on right gear skidded and flat spot occurred, but tire did not deflate. Weather was a factor. When takeoff was made from another airfield, there was melting snow and slush on runway, with FAT 0° C. FAT at cruise was -40° C. Aircraft was not equipped with "hot wheels" modification. Ice had frozen both brakes on right main gear, causing skidding and blowout on landing.

Maintenance

uh1 **Class E mishaps** Master caution and hydraulic lights came on, and controls became stiff. Improperly positioned hose assembly chafed against hydraulic pressure line, causing hole in line. ☐ N_2 rpm decayed during flight. Pilot lowered collective while simultaneously retarding throttle so he could place governor switch in emergency position and landed at airfield. Customer bleed air line was incorrectly positioned, causing contact between line and throttle linkage assembly at fuel control. ☐ Rotor tachometer went to zero and rpm warning light came on. Seconds later, transmission temperature pegged out high and transmission pressure went to zero. Caused by loose plug at transmission disconnect at firewall. Female end was not tight.

ch47 **Class E mishaps** ☐ Rotor tachometers dropped to zero. Caused by loose cannon plug wire at tachometer generator. ☐ Flight engineer saw oil leaking from forward transmission area during flight. Inspection revealed several loose oil line fittings to forward transmission.

oh58 **Class E mishap** ☐ Pilot noticed d.c. amps climbing to 65 and smelled fumes. Caused by improper voltage regulator setting.

ov1 **Class E mishap** ☐ (D series) Airspeed indicator went to zero during takeoff. Postflight inspection revealed pitot static line had come off pitot air manifold. Mechanic did not properly secure line from manifold to pitot static system and failed to make proper entry in logbook that would have required TI.

Messages received

• Safety-of-flight message concerning one-time inspection of OH-58A/C helicopter tail rotor rigging (OH-58-80-01, 172320Z Jan 80). Bell Helicopter Textron examined OH-58A and C helicopters during visits to Army activities. Several aircraft were found to have tail rotor control systems improperly rigged to the extent that a significant loss of left pedal blade angle was evident. The discrepancies found were far greater than any which would result from normal wear or proper application of current procedures in TM 55-1520-228-23. This condition results in loss of available tail rotor thrust and may contribute to an accident in situations where full left pedal control power is required. This message requires a one-time inspection for proper tail rotor rigging and provides new rigging procedures and inspection requirements to assure maximum possible left pedal tail rotor control power is available. Contact: Richard Smith, TSARCOM, AUTOVON 693-0396, commercial 312-263-0396.

For more information on selected mishaps, call AUTOVON 558-3901/3913.

Army aircraft mishap classification criteria

Class A
• A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
• An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or
• A fatality occurs as a result of Army operations.

Class B
• A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C
• A mishap in which the total cost of property damage is at least $300 but less than $50,000; or
• An injury or occupational illness resulted in a lost workday case involving days away from work.

Class D
• A mishap in which the resulting cost of property damage is less than $300; and
• An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays.

Class E
• A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
• There was no injury or occupational illness, or injury resulted in first aid only.

Broken Wing Award winners

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.

Four aviators received the Army Aviation Broken Wing Award from October through December 1979.

• **CW3 Robert B. Cabell, Flight Detachment, U.S. Army Readiness Region VIII, Denver, Colorado.** CW3 Cabell was on a U-21 service mission. After takeoff at night, the nose gear partially retracted and could not be moved up or down by electrical or emergency means. The runways at the airfield were covered with ice and snow. Cabell decided to land with the main gear extended for aircraft control after landing. The engines were shut down on final and the landing was completed. The nose gear collapsed on rollout.

• **WO1 Kurt K. Geerer, 1st Brigade, 101st Airborne Division (Air Assault), Fort Campbell.** WO1 Geerer was on an OH-58 service mission with two passengers on board. He was flying 60 feet agl over a thick wooded area when he heard a loud hissing noise from the engine compartment. He immediately checked the instruments and found the turbine outlet temperature had exceeded 1,000° C. Power was then lost, and Geerer initiated a right 180-degree turn toward a clear area. After clearing trees about 40 feet tall, he successfully autorotated to a field partially covered with waist-high brush and knee-high weeds. Power loss was caused by separation of the bleed air elbow assembly from the diffuser scroll.

• **Captain Michael G. Johnston, 5th Infantry Division, Fort Polk.** CPT Johnston was returning to his home base from a service mission. On approach, the U-21 landing gear would not extend electrically or mechanically. Johnston flew to an airfield where runway foaming and crash rescue equipment were available. Ninety minutes elapsed between discovery of the emergency situation and the gear-up landing. Johnston had all the cargo aboard the aircraft tied down and the four passengers thoroughly briefed on crash landing procedures. Several low passes were made over the narrow (24 feet) strip of foam on the runway. Touchdown was made precisely in the center of the foam, and lateral control was maintained as the aircraft skidded to a stop, with minimum damage.

• **WO1 Steven C. Wentling, 335th Aviation Company, 1st Infantry Division, Fort Riley.** WO1 Wentling was on a UH-1H instrument training flight. Flying under IMC at an indicated altitude of 6,000 feet, the crew saw the hydraulic warning light illuminate. Seconds later, hydraulics failed and the controls became stiff. Wentling made necessary adjustments in his airspeed and attitude to ease controllability of the aircraft and completed emergency procedure operations. He requested descent to 3,000 feet and flew to the nearest airfield with a good runway and crash rescue facilities. A running landing was made, with no damage to the aircraft. ■

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Army aircraft mishap prevention data

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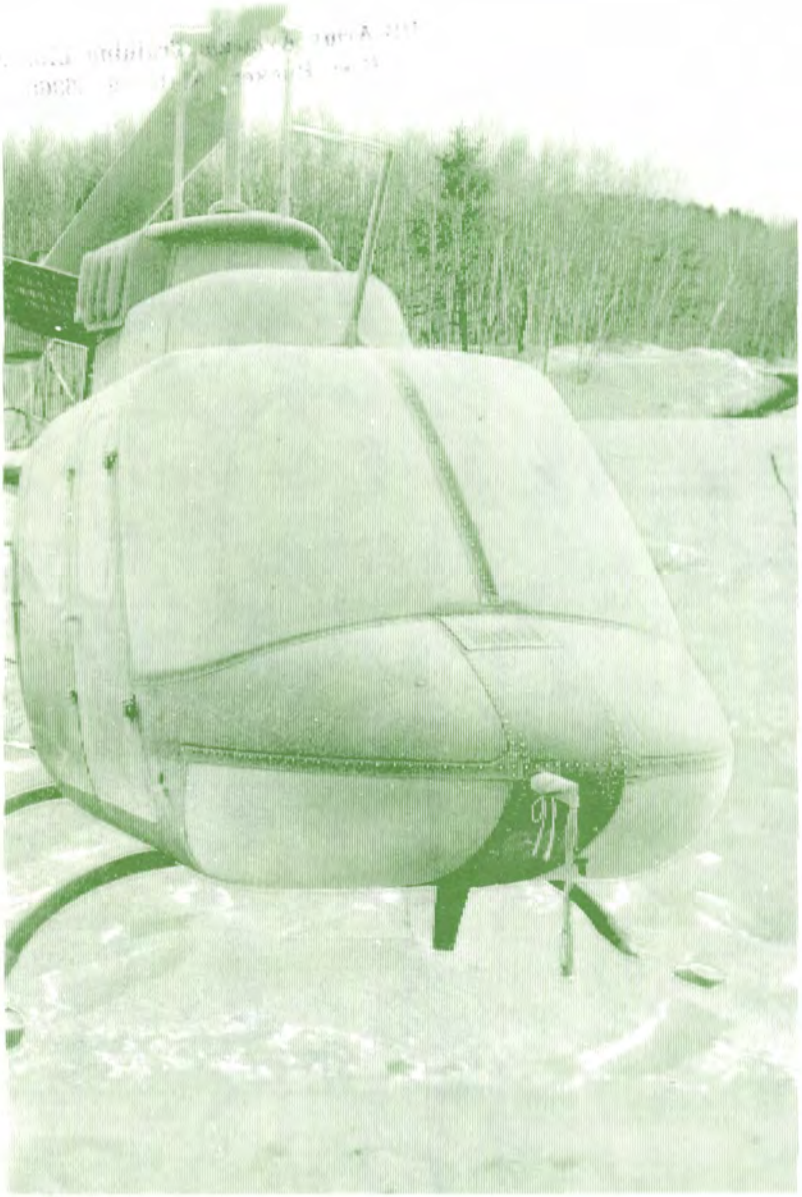
Winter operations demand accurate planning

Correct OH-58 ice removal important



With winter firmly entrenched in most sections of the world, it is important that you know and follow approved cold weather operational procedures—including those concerned with the removal of ice and snow from aircraft.

Recently, an OH-58 pilot had to make a precautionary landing after the pitot-static instruments of his aircraft failed. The instruments failed because the static ports became clogged. And the static ports became clogged because someone used water to defrost the windshield. Subsequently, the water froze over the ports.

TM 55-1520-228-23-1, page 1-8, par. 1-17A, tells you to use deicing fluid (MIL-A-8243), NSN 6850-00-901-0591, to remove ice and frost from aircraft surfaces. This deicing fluid, a mixture of ethylene glycol and propylene glycol in water, is commonly known as glycol-water solution and should be used in accordance with procedures outlined in TM 55-1500-204-25/1. (It is important to note that this TM lists two types of deicing fluids. One is MIL-D-8243B and the other is MIL-A-8243. However, MIL-D-8243B fluid is outdated and no longer authorized for use. It contains a solid that can cause problems if it should get into such areas as carburetor and oil cooler air inlet ducts. The manual will be revised to delete this item. Consequently, only the glycol-water solution (MIL-A-8243) is to be used as a deicing agent.)

For detailed instructions on preventing as well as removing snow, ice, and frost from aircraft surfaces, refer to TM 55-1500-333-24, with 3 changes, page 2-10, section IV.

Some important points you should keep in mind include brushing or sweeping heavy deposits of snow from aircraft surfaces before trying to melt any ice layer that may be present under the snow. Deicing fluid should not be used to remove those heavy snow deposits because snow not only absorbs wasteful amounts of fluid but also forms a slush. This slush is hard to remove and, in time, can refreeze—possibly in critical areas such as control surface hinges—if the temperature is sufficiently low.

However, in an emergency, when aircraft must get off the ground in a hurry, thin layers of snow can be removed by using a **diluted** mixture of **heated** deicing fluid. Similarly, this fluid may also be used to melt the layers of rough ice that may be present under the snow covering.

Anti-icing fluids such as isopropyl and denatured alcohol can be effectively used to remove ice from **glass** surfaces as well as from propellers and carburetors. However, care must be taken to make sure these fluids do **not** contact **acrylic** surfaces as they will cause cracking or crazing of plastic windshields and windows.

When using deicing and anti-icing fluids, be sure to observe precautions to prevent injury to personnel as well as damage to equipment. Glycol-water deicing solution is mildly toxic to skin and eyes. Both isopropyl and denatured alcohols are poisonous and should not be swallowed. Vapors from these fluids are harmful and should not be breathed. In addition, these vapors irritate the eyes, throat, and nasal passages. Since alcohol is flammable, care should be taken to insure it is not used around open flames or in areas of aircraft subjected to high temperatures.

Just as discretion is the better part of valor, prevention is the most desirable means of dealing with the problems caused by ice and snow.

The following guidelines are recommended:

- When facilities are available, hangar aircraft during cold weather.
- If no hangars or shelters are available in areas where extremely cold winters are common, use the special covers (reference TM 55-1520-228-23P dated March 1979, page 432, figure 2) designed for your aircraft.
- If small amounts of frost or ice coat the windshield, start the engine and use bleed air to defrost it.
- When heavy deposits of ice and snow cover the aircraft, follow removal procedures outlined in TM 55-1500-204-25/1 and TM 55-1500-333-24. BUT WHATEVER YOU DO, DON'T USE WATER.

Since individual covers to protect OH-58 windshields are not available through our supply system, it may be that some units have designed and fabricated their own. If your unit has done this, please submit an EIR to TSARCOM. Address all correspondence to Commander, TSARCOM, ATTN: DRSTS-MEM(1), 4300 Goodfellow Boulevard, St. Louis, MO 63120. ■

Selected mishap briefs

uh1 **Class E mishaps** ☐ On IFR climbout to 7,000 feet in moderate rain, N_2 began to bleed off at 37 psi torque and at 40 psi torque was down to 6300 rpm. Maximum beep, bleed air, and deice on or off did not affect rpm settings. Continual N_2 beep changes were required to maintain constant rpm. Running landing was made. Suspect air inlet screens iced over due to rain and near-freezing temperatures. Although weather forecast was for a freezing level of 8,000 feet for the flight, left and right air inlet screens were not removed from aircraft as per caution on page 8-27, TM 55-1520-210-10. ☐ Master caution light came on after takeoff. Crew was unable to trace reason for light and continued flight to home base. Light was recycled several times, but continued to come on after various short periods of time. When aircraft was landed, panel assembly was replaced. Master caution light continued to illuminate, and chip detector light came on. Investigation revealed enough chips on plug to warrant replacement of 90° gearbox. The pilot continued flight to home base because he attributed the malfunction to the master caution system instead of a component. Pilot and copilot stated that in the future they would land at the first sign of trouble. **See "Put it Down; Leave it Down" in the 23 May 1979 issue of FLIGHTFAX.** ☐ N_2 tachometer fluctuated during landing. Caused by failure of dual tachometer. ☐ Transmission oil temperature gauge fluctuated between 80° and 150° C. during takeoff. Caused by malfunction of temperature transmitter sending unit.

uh60 **Class C mishap** ☐ As lead aircraft in flight of two was on final approach to tactical LZ marked by single strobe light, pilot turned on landing light and saw nose of aircraft entering upper branches of tree. As power was applied, branches passed right side of aircraft, causing skin damage. Aircraft rose clear of tree and landed in LZ. Light haze and no moon illumination made landing light ineffective until short final.

Class E mishap ☐ Aircraft was No. 2 in flight of two on approach to tactical LZ. When lead aircraft descended into treetop, pilot of second aircraft flared to insure separation and applied power. Flare allowed tail to drop. Stabilator hit tree and was punctured.

ah1 **Class B mishap** ☐ Mishap occurred during NOE hover. Details unknown. Skids, tail boom, tail rotor, main rotor, and 90° gearbox were damaged. 8018

ch47 **Class E mishaps** ☐ About 10 minutes into flight, visibility decreased to less than one-half mile because of unforecast heavy snowshowers. Pilot landed and then continued flight 30 minutes later when weather cleared. ☐ No. 2 flight boost hydraulic and No. 2 SAS caution lights came on. Caused by cracked elbow fitting.

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

oh6 **Class E mishap** ☐ Main transmission oil pressure light came on. Caused by failure of transmission oil pump.

oh58 **Class C mishap** ☐ Aircraft was hovered to center of LZ. At 10-foot hover, cyclic made swift left rear movement, and pilot countered pressure to right front. Aircraft assumed nose-low attitude, and tail rotor hit tree. Pilot cut throttle, and aircraft made two 360° right turns and landed hard.

Class E mishaps ☐ While aircraft was in level flight at 1,000 feet agl, 8" X 14½" X ½" piece of plexiglass vibrated off instrument console and fell through pilot's chin bubble behind antitorque pedals. Plexiglass board was locally fabricated to protect the Chadwick form used to record data when tracking the main rotor. The unit was trying to protect its last form because they had difficulty getting the special forms. **The Safety Center is trying to get requisitioning data on the forms. This information will be published when available. Chadwick advises that their forms will fit nicely on the pilot's kneeboard. To prevent similar mishaps, we recommend the kneeboard be used.** ☐ As engine was started, pilot noticed hung start at 25-26% N_1. Flames were seen coming from both stacks, and TOT reached 995°. Pilot completed hot start abort procedure. Accumulator was cracked where 90° elbow is attached. Cracked accumulator resulted in hung start. Hung start led to hot start. ☐ Pilot and copilot cyclic binding occurred in flight.

Caused by failure of magnetic brake to release. ☐ Vibrations in pedals were felt at flight idle, and loud squealing noise was heard. Caused by frozen No. 7 hanger bearing.

th55 **Class E mishaps** ☐ Cyclic binding in flight was caused by failure of lateral cyclic trim motor. ☐ Main rotor tachometer failed during flight. Caused by failure of cable. ☐ Lateral vibrations were caused by malfunction of main rotor blade damper.

c12 **Class E mishaps** ☐ (C series) During climb, left bleed air light came on and TGT on left engine increased 20° C. Postlanding inspection revealed bleed air warning line outboard of left nacelle had small hole in it. ☐ Left landing gear did not give down indication during landing check. Caused by failure of gear-down indicator switch.

u21 **Class E mishap** ☐ (A series) No. 2 engine oil pressure slowly decreased during climbout. Caused by unsecured oil cap.

t42 **Class C mishap** ☐ Gear was not extended during landing. Propellers, nose gear doors, and bottom of aircraft were damaged.

Tighten up

You fixed wing pilots are still leaving your fuel and oil caps loose, and you've been lucky. Since 1 October 1979, seven cases of aircraft leaking fuel and oil in flight have been reported. None have been disastrous. Tighten up before your luck runs out. ■

Maintenance

uh1 **Class E mishaps** ☐ Pilot smelled JP4 fumes and landed. Preformed packing on right side of tee tube connection on rear crossover fuel line where flex hose assembly attaches to tee tube was not seated properly, causing fuel leak. ☐ Loud banging noise was heard from engine after takeoff. Inspection revealed bleed band was out of adjustment. ☐ Fireguard noticed fuel leaking from fuel control during start. Caused by improperly torqued fuel line. ☐ Master caution and d.c. generator lights came on, and main generator loadmeter dropped to zero. Voltage regulators were out of adjustment.

oh58 **Class E mishap** ☐ Climb power was reduced from 60 psi to 56 psi. N_2 fluctuated and aircraft was landed. Fuel control strainer element was installed backwards and crimped.

Messages received

• Maintenance advisory message for UH-60A tail rotor gearbox output shaft spline inspection (UH-60A-80-1, 091600Z Jan 80). Message includes a change to TM 55-1520-237-23-4, task 9-16, paragraph 3.

• Maintenance information message for all Army aircraft concerning AR 95-16 (GEN-80-02, 091650Z Jan 80). AR 95-16, dated 1 Apr 79, requires a 30-month weight and balance check on each aircraft. If a valid weight and balance check has not been made on an aircraft in the last 30 months, on 15 May 1980 the status of that aircraft goes to a red X.

Army aircraft mishap classification criteria

Class A
• A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
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Class E
• A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
• There was no injury or occupational illness, or injury resulted in first aid only.

Mishap review

Synopsis

A pilot and IP were on a UH-1M transition training mission. At termination of a standard autorotation, the tail skid hit the runway, followed by the tail rotor. The aircraft bounced into the air, hit the runway, and slid 75 feet before coming to a stop.

History of flight

The pilot and IP arrived at the airport where they were to perform standard and nonstandard maneuvers. They were told winds were 140 degrees at 15 knots. Three normal approaches and two steep approaches were made before the practice autorotations were started.

The IP performed an autorotation to determine if the crosswind would allow practice autorotations. The autorotation was acceptable to the IP, although he told the pilot he had nearly run out of right pedal. He also noted that the rotor rpm was stabilizing in the low green. The pilot made the next autorotation. He applied excessive initial pitch, causing the helicopter to balloon. The pilot entered the next autorotation at 90 knots and 525 feet agl. After reducing the airspeed from 90 knots to 80 knots during entry, the pilot considered the rpm to be too low and flared to build it, a procedure he had seen performed by another pilot. The flare was made about 300 feet agl, and the airspeed was reduced to 60 knots.

At this time, the IP told the pilot to delay the deceleration until reaching 50 feet agl to try to regain airspeed. At about 50 feet, the pilot decelerated to a nose-high attitude estimated to be 20 degrees. At 15 to 20 feet, an excessive rate of descent developed. At about 10 feet, the pilot, aided by the IP, applied initial collective pitch. The nose-high attitude was maintained. Application of collective pitch did not arrest the descent, and the helicopter hit the runway with the tail skid and tail rotor. The aircraft became airborne for about 70 feet, hit the runway in a right yaw, slid 75 feet, and came to rest upright.

Crewmember experience

The 53-year-old IP had more than 2,500 rotary wing flight hours, and the 30-year-old pilot had almost 300 rotary wing hours.

Commentary

When descent airspeed slowed to 60 knots, the IP directed the pilot to delay deceleration until they reached 50 feet agl. TC 1-135 and TC 1-136 require decelerations be performed at 70 to 100 feet agl. Trying to slow the aircraft, the pilot applied excessive deceleration for existing crosswind conditions, causing a high rate of descent which collective application did not correct.

The IP was going to have the pilot for only two weeks and felt he needed to get the most out of the available training time. Therefore, when wind conditions were less than ideal and the maneuver deviated from the standard, the IP elected to modify the manner in which the maneuver was performed to salvage whatever trianing benefit he could. ■

Stacom

Operators Manual and Checklist update

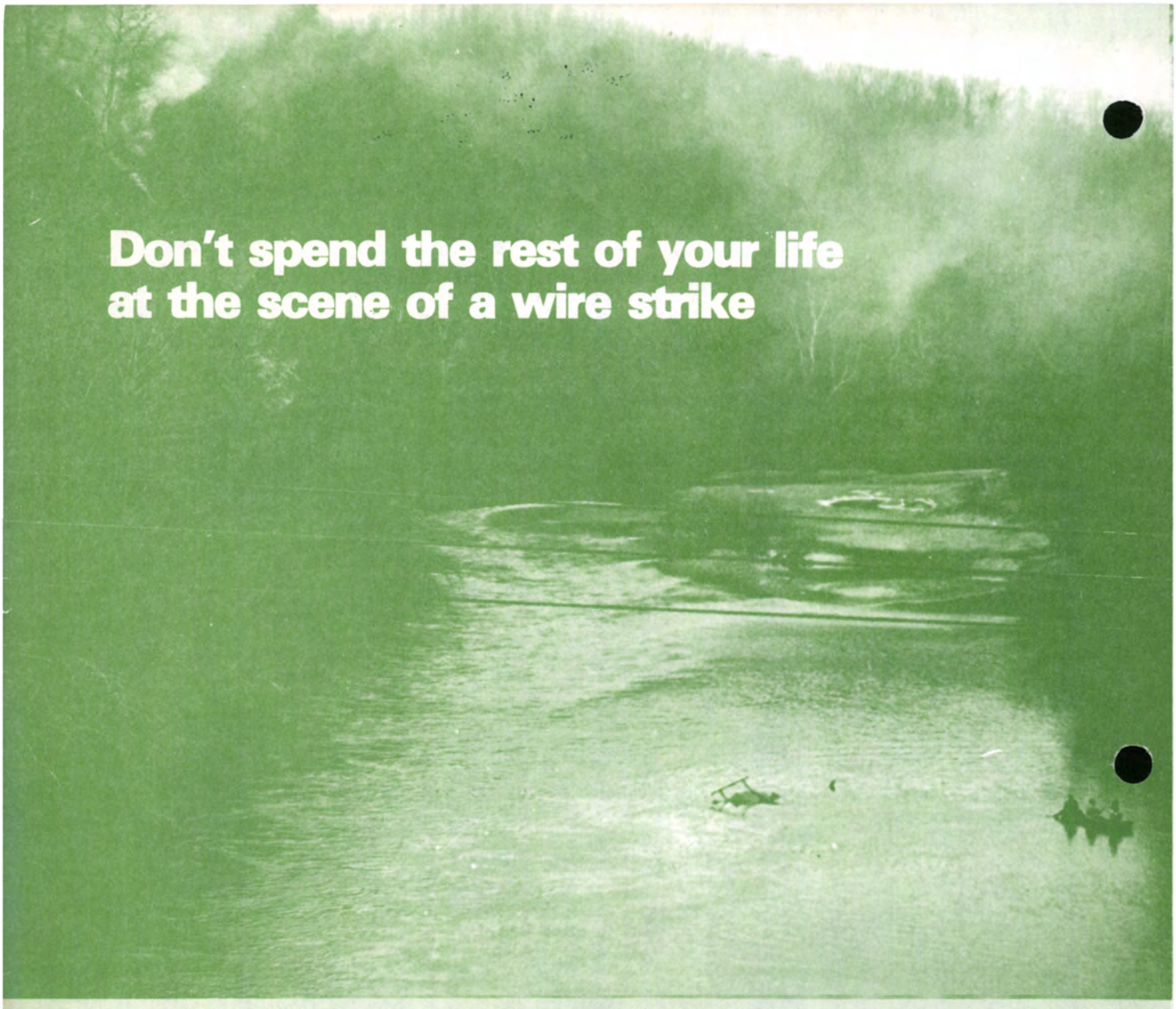
Listed below are the effective dates of the current aircraft operators manuals and checklists with the number and date of the latest change. Please check your weekly AG Publications Center Bulletin for subsequent changes.

Fixed Wing TM 55-1510-	Aircraft	9 Chapter	Basic Manual	Last Change	Basic Checklist	Last Change	New Type CL
201-10/4	U-8D/G	Yes					No
	RU-8D		3 Apr 78		Jul 78		
201-10/5	U-8F	Yes	21 Mar 78	1, 18 Dec 78	Jul 78		No
204-10/3	OV-1B	Yes	9 Mar 79		Feb 79		Yes
204-10/4	OV-1C	Yes	10 Apr 79	1, 31 Jul 79	Apr 79		Yes
208-10	T-42A	Yes	27 Feb 79		Feb 79		Yes
209-10	U-21A	Yes	25 Mar 77	4, 11 Oct 78	Feb 77	4, 16 Aug 78	No
209-10-1	RU-21A/D	Yes	28 Feb 77	4, 17 Jul 78	Mar 77	2, 23 Aug 78	No
213-10	OV-1D/RV-1D	Yes	4 Aug 78	1, 8 Jun 79	Nov 78		Yes
214-10	RU-21B/C	Yes	15 Mar 77	5, Undated	Apr 77	3, 5 Oct 78	No
215-10	U-21G	Yes	11 Mar 77	3, 16 Jan 78	Apr 77	2, 9 Jan 78	No
215-10-2	RU-21H (GR-V)	Yes	29 Dec 78		Dec 78		Yes
216-10	U-3A/B	Yes	11 Dec 78		Dec 78		Yes
	C-12A	No	15 Aug 77	1, 7 Dec 78	Dec 78		Yes
	C-12C	No	1 Dec 78		Jan 79		Yes
Rotary Wing TM 55-1520-	**Aircraft**	**9 Chapter**	**Basic Manual**	**Last Change**	**Basic Checklist**	**Last Change**	**New Type CL**
209-10	CH-47A	Yes	9 Jan 79		Dec 78	1, 2 Feb 79	Yes
210-10	UH-1D/H	Yes	18 May 79	1, 12 Sep 79	Feb 79	1, 26 Jul 79	Yes
214-10	OH-6A	Yes	17 Dec 76	7, 3 Apr 79	Dec 76	2, 3 Apr 79	No
217-10-1	CH-54A	Yes	8 Apr 77	1, 9 Jan 78	Mar 77	1, 13 May 77	No
217-10-2	CH-54B	Yes	15 Apr 77	2, 10 Oct 79	Mar 77	2, 22 Aug 79	No
219-10	UH-1B	No	16 Jan 69	16, 10 Sep 79	Dec 68	8, 11 Apr 79	No
220-10	UH-1C/M	No	Nov 68	18, 24 May 79	Jul 71	8, 13 Apr 79	No
221-10	AH-1G	No	12 Dec 75	7, 5 Sep 78	Dec 75	3, 10 Aug 77	No
227-10-1	CH-47B	Yes	23 Aug 78	2, 10 Oct 79	Dec 78	2, 22 Aug 79	Yes
227-10-2	CH-47C	Yes	23 Aug 78	3, 1 Nov 79	Nov 79		Yes
228-10	OH-58A	Yes	7 Apr 78	4, 23 Mar 79	Jul 78	1, 27 Nov 78	No
233-10	TH-55A	Yes	30 Sep 76	2, 14 Jul 78	Sep 76	4, 17 Oct 78	No
234-10	AH-1S (MOD)	Yes	17 Nov 76	8, 24 Jul 78	Nov 76	3, 3 Nov 79	No
235-10	OH-58C	Yes	7 Apr 78	8, 20 Jun 79	Jul 78	1, 10 Oct 78	No
236-10	AH-1S (PROD)	Yes	29 Apr 77	5, 15 Sep 78	Jan 80		Yes
237-10	UH-60A	Yes	21 May 79	3, 3 Oct 79	Dec 78	3, 3 Oct 79	Yes
239-10	AH-1S (MOD)				Jan 80		Yes

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.

AR 95-1

Now hear this! The big day has finally arrived! The new, revised AR 95-1, Army Aviation: General Provisions and Flight Regulations, has left the printers. It is currently being distributed and should be in your hands by the time you read this. The effective date is 1 February 1980. ■



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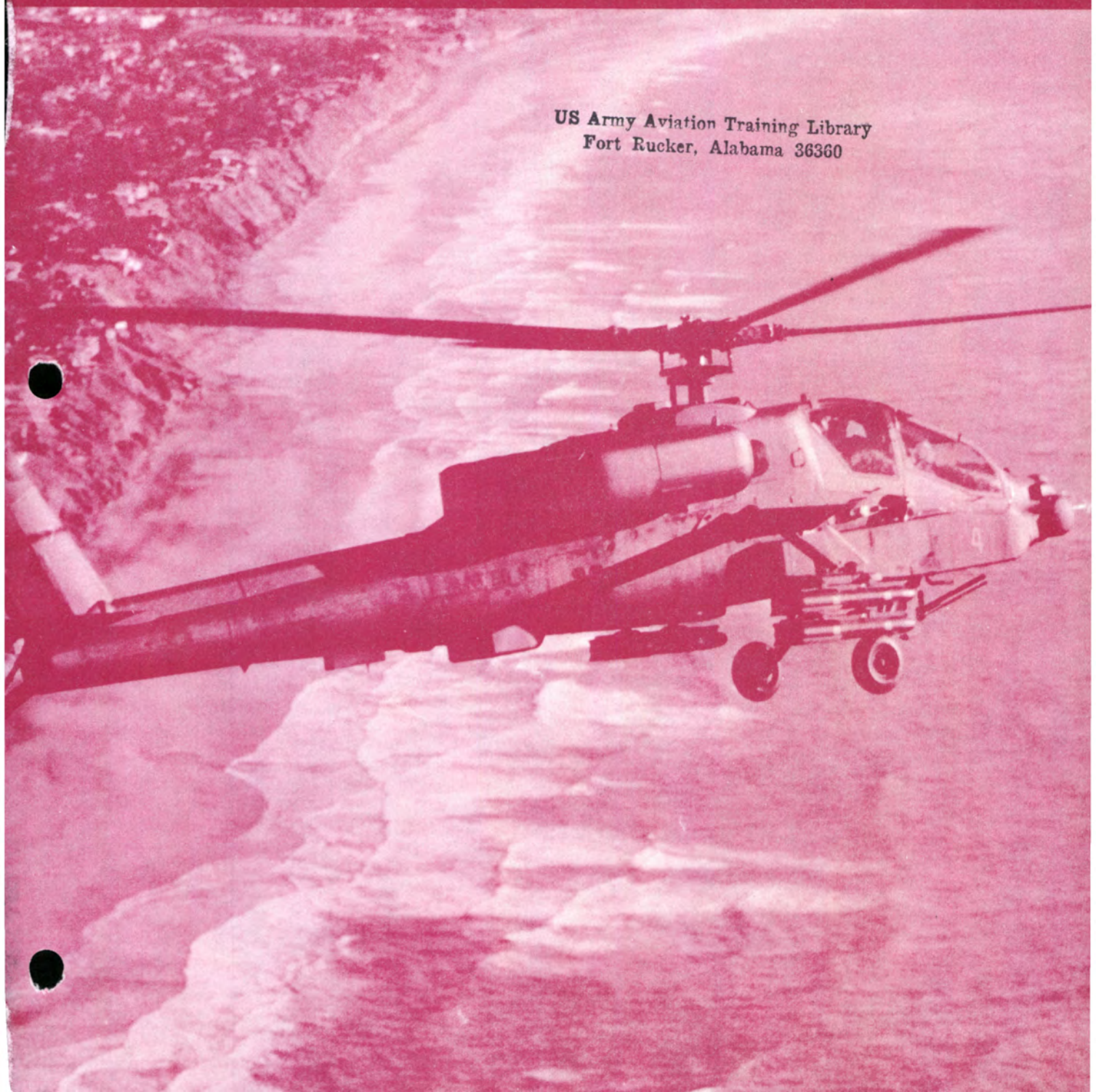

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Assistance visits offered again

Over the years, the Army Safety Center conducted numerous safety assistance visits to aid commanders in their aviation mishap prevention programs. But on the first of April 1978, we stopped these visits, primarily for two reasons: One was that, in 1975, each major command was tasked to come up with an aviation resources management survey (ARMS) team to perform duties similar to those we were performing during our assistance visits. The second was the initiation of Centralized Aircraft Investigation. This program required the realignment of some of our manpower to do on-site investigations of selected aviation mishaps worldwide.

While we have made no assistance visits since the end of March 1978, we have been able to provide some assistance to units through the use of our on-site Aviation Safety Officer Course. Part of the practical exercise of this course is a mishap prevention survey of an installation conducted by the students.

These surveys have been enthusiastically received by commanders, and have helped uncover many deficiencies. These positive results have prompted the reinstitution of the safety assistance and evaluation program by the Army Safety Center. However, manpower constraints dictate a more limited program than previously, with priority to those units with the greatest need.

The primary purpose of our safety assistance visits and evaluations is to determine the effectiveness of an aviation unit's mishap prevention program. Our assistance teams consist of trained safety personnel with the ability to study a unit's mishap prevention program objectively and in depth. Team members are not surveyors, inspectors, or critics. Their only purpose is to help commanders identify areas where improvements would increase the effectiveness of the overall unit safety program.

The efforts of our assistance teams only serve to complement the endeavors of a separate survey or inspection group by another headquarters. A useful purpose is served by all these efforts, particularly so when the combination of these efforts is instrumental in saving lives and equipment. Following are some of the areas we address during our visits:

- Aviation management
- Operations/facilities
- Standardization
- Maintenance, supply, and POL
- Aviation medicine
- Training
- Air Traffic Control

Now, here's how the USASC assistance teams conduct an evaluation. Upon arrival, the team chief gives an entrance briefing to tell unit personnel about the team's mission and the functional areas the team intends to visit. The team then splits into subteams with their unit counterparts, and the subteams proceed to their particular areas of interest.

Team members observe normal operations and ask questions of unit personnel without undue interruption of normal operations. When the evaluation is complete, the team chief gives an exit briefing which includes a concise summary of the team's findings by functional area. Specific mention is made of outstanding functional areas as well as areas with potential safety hazards. When the team returns to Fort Rucker, a careful analysis of all findings is made and the final report is compiled. The report, which is sent directly to the unit concerned, identifies areas for improvement and recommends corrective actions. It is then up to the unit commander and aviation safety officer to carry the ball and follow up with necessary actions to eliminate hazards.

In the past, acceptance of our assistance visits has been most gratifying. Assistance teams have been instrumental in getting the attention of several activities on many problem areas, resulting in immediate corrective actions.

As mentioned earlier, we are back in business and willing to help if you need us. Your request for an assistance visit must be made well in advance so that we will have sufficient time to schedule the visit. Our assistance must be requested by an installation, unit, or state.

Requests should be sent to Commander, U.S. Army Safety Center, Fort Rucker, AL 36362. Direct communication is authorized by AR 10-29. ■

The 5C procedure for unplanned IMC

IMC mishaps have claimed four lives and two aircraft in the past month. In one case, less than a minute had passed since takeoff when an OH-58 pilot told flight following he was in IMC and was climbing ahead. A short time later, the pilot lost control while in a gradual right turn and the aircraft crashed.

In the other case, a UH-1 service flight was to be performed under visual meteorological conditions. With less than VFR minimums at the departure point, the copilot requested a special VFR clearance for departure. After takeoff, the copilot, because of rising terrain and patchy fog, requested a climb through the overcast to VFR on top. Clearance was granted and the aircraft climbed. Cloud tops were estimated between 3,800 and 4,000 feet. Sometime during the climb through the cloud cover, the pilot became disoriented. The copilot took control with airspeed falling below 40 knots and with the aircraft in a right descending turn. Nine minutes after takeoff, the UH-1 cut through the tops of two trees and crashed.

Mishaps involving visual flight into IMC should be of great concern to the aviator and the aviation manager because they are so devastating. IMC mishaps seldom result in only a broken skid or a bent wing. They almost always are catastrophic in terms of lives lost and equipment destroyed. (Marginal weather should be treated the same as IMC insofar as instrumentation in the aircraft is concerned.)

Unplanned flight into IMC has long been a problem for Army aviation. IMC mishaps tend to follow closely the development of terrain flying tactics for the high threat environment. Techniques for dealing with IMC at terrain level require a new approach to the IMC problem. No longer is the old cure-all of "execute a 180-degree turn" valid. Successful transition from VMC to IMC requires the logical application of a step-by-step procedure to avoid loss of control, confusion, and more importantly, a catastrophic mishap.

Analyses of aircraft mishap reports have identified task errors that occur frequently in IMC mishaps. Identification of these task errors led to the development of a flight procedure which has been labeled the 5C's: control, coordinate, clearance, course, and call. The 5C's give the pilot a set procedure to follow. What this procedure does is provide an organized method that all aviators can remember when confronted with IMC.

Whether or not all 5C's will apply in each IMC circumstance will depend on existing conditions, e.g., terrain, obstacles, etc. Nevertheless, the 5C's contain all the necessary ingredients to decrease the occurrence of IMC mishaps. The 5C procedure is an aviator procedure and is to be carried out in conjunction with and as a part of the unit vertical helicopter IFR recovery procedure plans.

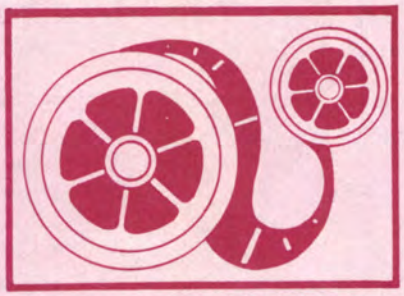
1. **CONTROL**—Establish positive aircraft control. Maintain straight and level flight by use of flight instruments. Control of the aircraft is the single most crucial factor in safe recovery from unplanned flight into IMC.

2. **COORDINATION**—Establish beforehand that the pilot at the controls will concentrate only on his flight instruments. The copilot is to monitor the instruments and advise when visual conditions are again encountered.

3. **CLEARANCE**—Insure clearance above the highest obstacle; gain required altitude with a straight controlled climb.

4. **COURSE**—Select and turn to appropriate heading.

5. **CALL**—Make required radio calls for necessary assistance. Coordinated radio frequencies should be specified and posted in the aircraft.



An Army safety training film on the 5C procedure is available from your audio-visual support center.
This film, titled "5C Recipe for Inadvertent Soup," TF 20-6041, is a 13-minute color film explaining the 5-step procedure for pilots to use to safely recover from unplanned IMC. Get it and show it at your next safety meeting. ■

Followups

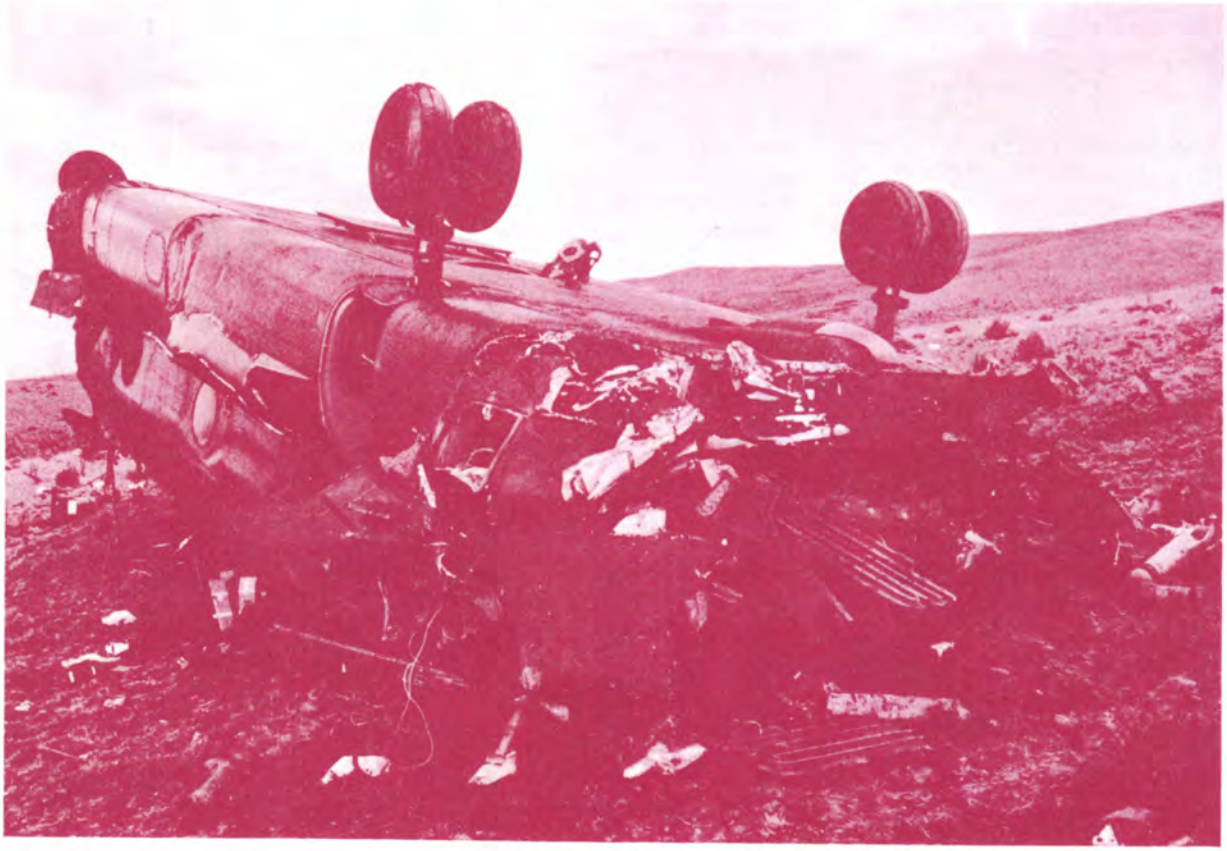
Additional information on mishap briefs previously published

ch47 **Class A mishap** in 5 September 79 issue (7969) ☐ Aircraft was taking off from tactical field site during the hours of darkness, with ground fog in the local area. Almost immediately after takeoff was initiated, aircraft hit on the 7° slope in its takeoff path, resulting in total loss damage. Pilot apparently executed too shallow a takeoff under terrain, light, and weather conditions. He lost visual contact with the ground and crashed while trying to transition to instrument flight.

uh1 **Class C mishap** in 25 July 79 issue (7953) ☐ Crew smelled smoke and landing was initiated to sandbar. Approach was terminated at high rate of descent, resulting in hard landing. Tail rotor and 90° gearbox separated from aircraft and hit main rotor blade.

Class C mishap in 19 September 79 issue (7973) ☐ During demonstration of autorotation with turn, IP made abrupt initial collective pitch application at 8 to 10 feet agl. Control was lost and aircraft touched down 30 degrees left of runway heading, causing damage to landing gear and bottom of aircraft.

Class C mishap in 10 October 79 issue (7976) ☐ During approach to tactical field site, pilot elected to fly his aircraft between two poles to an intended landing point. As aircraft approached the area between the poles, single strand of 1/8-inch copper wire was seen forward of and level with cockpit. Pilot tried to quickly stop aircraft and in doing so applied excessive aft cyclic without properly coordinating application of collective pitch. This resulted in the



tail rotor striking the ground and subsequent loss of tail rotor assembly and antitorque control. Aircraft began to spin in clockwise direction. Pilot did not interpret the clockwise spin as a loss of antitorque control and did not initiate appropriate corrective action. Collective pitch was abruptly reduced and aircraft landed hard.

th55 **Class C mishap** in 15 August 79 issue (7961) ☐ While at 3-foot hover, IP heard grinding noise and felt vibrations throughout airframe. As IP tried to take control of aircraft, it pitched nose down and yawed to right. As main rotor blades hit lane, tail of aircraft flipped over cabin area. Caused by materiel failure of tail rotor blade at tubular spar.

Class C mishap in 29 August 79 issue (7966) ☐ IP noticed full throttle was required to maintain 2900 rpm, 25" manifold pressure, and traffic pattern altitude. After turning on base leg for minimum power approach, rpm could not be maintained and aircraft descended too low to make stagefield. Open field was selected and autorotation initiated at about 25 feet. Aircraft fell through and landed hard. IP selected wrong course of action by continuing normal traffic pattern and losing altitude rather than landing immediately or maintaining altitude until within safe landing or autorotative distance to stagefield.

Class C mishap in 5 September 79 issue (7968) ☐ As SP turned final for approach, airframe vibrated, engine and rotor rpm fluctuated, and engine quit. SP entered autorotation, and aircraft landed hard. Engine stoppage was caused by failure of No. 4 piston.

c7 **Class A mishap** in 29 August 79 issue (7967) ☐ Pilot, making left crosswind approach and landing, failed to maintain directional control. During landing rollout, he applied full reverse thrust to left engine, causing aircraft to veer left, run off runway, and hit concrete abutment. Pilot had previously tried two approaches from the opposite direction where reverse thrust from left engine would have been appropriate. Pilot made no attempt to use nose wheel steering or braking action to maintain control because of preoccupation with operation of reverse thrust levers.

ah1 **Class A mishap** in 15 August 79 issue (7959) ☐ During practice autorotation to stagefield, aircraft ballooned, touched down long, slid off end of lane, and came to rest in drainage ditch 148 feet from end of paved surface. IP failed to initiate power recovery when it was apparent aircraft would overshoot center one-third of lane.

Class C mishap in 12 September 79 issue (7971) ☐ Aircraft was flying 10 feet agl and 40 to 50 knots. Pilot, without coordinating transfer of aircraft control or alerting his copilot, who was studying a map, to assist in maintaining terrain clearance, leaned forward and directed his attention to changing frequencies on the tactical FM radio. Aircraft entered shallow descent and hit sand dune, tearing off skids. Aircraft was flown to home base and set on improvised stand. Hydraulic jack failed during setdown, causing additional damage to aircraft.

Class A mishap in 29 August 79 issue (7965) ☐ Aircraft was being flown over rising terrain. Visibility was decreased by either ground fog or low-lying clouds and drizzle. As visibility decreased, pilot, realizing he was about to enter IMC, tried to turn 180 degrees to right. Aircraft crashed into trees. ■

Selected mishap briefs

uh1 **Class E mishaps** ☐ Master caution and engine oil pressure lights came on. Oil pressure dropped to zero and temperature started to rise. Caused by failure of engine oil pump. ☐ Crew felt fuselage vibration for 1 to 2 seconds. Caused by disintegration of No. 1 hanger bearing. ☐ Slight binding in cyclic was caused by faulty magnetic brake. ☐ N_2 rpm dropped to 6300 and aircraft vibrated. Caused by blown gasket at customer bleed air line.

ah1 **Class C mishap** ☐ As aircraft rolled out of descending right turn in hilly terrain, it hit three ½-inch wires extended across a valley. Aircraft continued descent and landed, with damage to upper cowling and main rotor blade. 8025

Class E mishaps ☐ Oil pressure fluctuated between 85 and 95 psi in flight. Aircraft had history of fluctuating engine oil pressure. Engine was removed and new one installed. Aircraft continued to have oil pressure problems with new engine. Oil sample bottle was found in engine oil tank, and excessive play was found in engine oil outlet quick disconnect coupling. ☐ Abrupt left lateral cyclic input during hover was caused by failure of roll SCAS transducer. ☐ During ground fuel control check at 6200 rpm, rpm dropped 160 and held steady at 91% N_1. Caused by sheared droop cam pin.

ch47 **Class E mishaps** ☐ Master caution and No. 1 engine oil low lights came on. Postflight inspection revealed engine oil filler cap was off. ☐ No. 1 engine chip detector light came on during takeoff. Caused by faulty magnetic plug. ☐ Rotor tachometer failed in flight. Caused by faulty tachometer generator.

oh58 **Class C mishap** ☐ Main rotor blades hit tree during NOE hover. Both blades were damaged. 8026.

Class E mishaps ☐ Loose wire to annunciator panel caused oil bypass to activate, resulting in high oil temperature. ☐ While on the ground at flight idle, pilot saw and smelled smoke in cockpit. Caused by malfunction in anticollision light flasher. ☐ Hydraulic-off check was made, and hydraulic pressure and light failed to come on line. Caused by failure of hydraulic pump. ☐ Low rpm audio and light activated. Caused by internal voltage regulator failure.

c12 **Class E mishap** ☐ Abnormal airframe vibration was felt on liftoff. Caused by worn shimmy dampner.

u21 **Class E mishaps** ☐ (A series) Flap motor circuit breaker popped when flaps were retracted. Caused by failure of flap up limit switch. ☐ (A series) About 20 minutes into flight, light airframe icing was encountered. All anti-ice equipment was functioning. About 15 to 20 minutes later, ice was accumulating faster than it could be removed. Pilot requested several altitude changes, but icing conditions would not clear. ILS approach was made to airport. ☐ (A series) No. 2 engine failed during cruise flight. Caused by failure of high pressure fuel pump and sheared shaft.

Maintenance

ch47 **Class E mishap** ☐ Leak developed in forward transmission area during climb. Leak was caused by improperly installed O-ring on forward transmission oil filter.

ov1 **Class E mishap** ☐ (D series) No. 2 propeller surged to 1775 rpm for about 2 seconds on takeoff climb. Caused by out-of-rig propeller control.

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

Safety-of-flight

• Safety-of-flight message concerning one-time inspection of AFCS dual input servo cylinder valve and cap screws on all CH-54 aircraft (CH-54, 1980-1, 282215Z Jan 80). Summary: The CH-54 has four AFCS cylinder valves. Each servo cylinder has eight cap screws and two end caps. Failure of all four cap screws on any one end cap can result in a hardover condition. CH-54s should be inspected for failed cap screws. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight message concerning one-time inspection of all OV-1D and RV-1D series aircraft propeller assemblies for discrepant barrel bolts and incorrectly installed key washers (282230Z Jan 80). Summary: Discrepant barrel bolts may have been installed in new or overhauled OV-1D/RV-1D propeller assemblies and may also be in local and/or Army depot stock. Newly manufactured propeller assemblies delivered to the Army supply system may have key washers incorrectly installed. Contact: Ivan Mead, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight message concerning failure of C-12/Beech model 200 aircraft lower forward wing attachment bolt due to stress (C-12-80-2, 022339Z Feb 80). This message supercedes TSARCOM message 262150Z Jan 80, same subject. Aircraft previously inspected in accordance with the first message must be reinspected in accordance with this message. Contact: Robert Clark, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

Ask for dividers

The new aircraft checklist (CL) for pilots is 4½ inches x 8 inches, and it won't fit in the old TM 1500-1 binder.

There is no binder for the new size CL . . . so what do you do? Order TM 1500-2 from your pub source and you'll get a package of tabbed dividers. The dividers match up with the new size CL and you use them to divide your CL into sections for ready reference.

How do you hold the works together? With electrical component tiedown straps. Never use key rings because they could cause FOD problems.

The checklists and tabbed dividers have seven holes on the left side for the straps. Use at least three straps so you won't tear the pages. Those plastic straps can also be used on the maintenance test flight pubs.

Just insert the strap through the holes, adjust to length you need, and cut off the remainder. The straps stack up like so:

NSN	Length
5975-00-074-2072	6.5 inches
5975-00-156-3253	13.25 inches
5975-00-570-9598	10.20 inches

—from PS Magazine

Army aircraft mishap classification criteria

Class A
• A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
• An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or
• A fatality occurs as a result of Army operations.

Class B
• A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C
• A mishap in which the total cost of property damage is at least $300 but less than $50,000; or
• An injury or occupational illness resulted in a lost workday case involving days away from work.

Class D
• A mishap in which the resulting cost of property damage is less than $300; and
• An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays.

Class E
• A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
• There was no injury or occupational illness, or injury resulted in first aid only.

Combating complacency

Of the many threats to a successful safety program, one of the most common and persistent is complacency. Complacency in itself is a deceiving and unwarranted satisfaction with a given level of proficiency which leads to stagnation and unknowing deterioration of competency. It is of primary concern to any organization and a major problem area requiring constant supervisory surveillance. When it develops among pilots or maintenance personnel, it inevitably results in mishaps, both in the air and on the ground.

Recognizing the onset of complacency is not a difficult task. Signs develop as supervisory controls are relaxed and objectives become vague. There is an observable lack of dedication and enthusiasm to the job, and the prescribed standards of performance and care are disregarded. For example, pilots in a "routine" environment, lulled by their level of experience and proficiency, may rationalize that detailed flight planning is not necessary. Briefings become sketchy or nonexistent as the pilots assume that the crewmembers understand what is expected of them or what their responsibilities and assignments are. This attitude will be reflected throughout the entire flight, resulting in inefficient utilization of flight time, and may terminate in a mishap.

Similar analogies can be made for the maintenance department personnel which would soon reflect the effect of a complacent attitude through mismanagement of men and material assets. The results are the same, a disregard for the normal standards of quality workmanship, a lack of commitment, and an increase in mishap potential.

The old cliche "an ounce of prevention is worth a pound of cure" is certainly applicable in this case. Combating complacency once it has developed is extremely difficult. Preventing its development is obviously the simplest and most desired approach to the problem. In either case, prevention or correction, the measures to be taken are basically the same.

Supervisors must establish the required standards of performance. Through leadership, guidance, and training, the standards of performance and quality of production become known and understood. Following this, the supervisor must insure that the established standards are maintained through the exercise of reasonable discipline and firm leadership. Supervisors must delineate the objective requirements and provide their personnel with the means by which ultimate achievement can be accomplished. Pilots, mechanics, and clerks provided with reasonable, challenging, and attainable goals, along with the knowledge and incentive required to achieve established objectives, will not become complacent. ■

—from MAG-56 COLLECTIVE PITCH

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More on new mishap classifications

Preparing PRAMs

The following data elements (in bold type) are required on all PRAMs submitted on class A through E mishaps. Sample entries are printed in light face type to show you how a PRAM should be prepared. A worksheet for preparing PRAMs is on page 5. Clip it out, have it reproduced, and use it when you have to report an aircraft mishap.

1. a. **Date** 10 Jan 79
   b. **Time (local)** 1500 CDT
   c. ( ) **Dawn** (X) **Day** ( )**Dusk** ( ) **Night**

2. **Give distance from mishap site in direct nautical miles and direction from nearest military installation or prominent geographical feature; otherwise, use latitude and longitude.** 10 nautical miles (NM) north of Ft Sykes, Al

3. a. **Aircraft type, design, series** UH-1H
   b. **Complete serial number** 74-21345

4. a. **Unit identification** 175th Avn Co
   b. **Unit identification code (UIC)** W3CNAA
   c. **Home station of unit operating the aircraft** Ft Sykes, AL

5. a. **Mishap classification** Class A aircraft mishap
   b. **Actual or estimated cost** Est $203,280 (Inj cost $285 + parts $199,995 + man hours 375 X $8 = $3,000)
   c. **Brief description of damage** 8-inch tear in both main rotor blades, main rotor and transmission separation

6. a. **Operator's duty (IP or pilot)** Pilot
   b. **Name (last, first, MI)** Wilmot, Charles R
   c. **SSN** 424-54-3473
   d. **Grade** CW3
   e. **Unit assigned** 175th Avn Co
   f. **Home station** Ft Sykes, AL

7. a. **List all other crewmembers (name, SSN, grade, duty position, unit).** Copilot: Arnold, Robert N., 559-31-9540, WO1, 175th Avn Co; Crew Chief: Franks, James W., 420-15-1363, SGT, 175th Avn Co
   b. **Number of military occupants on board (other than crew)** 5
   c. **Number of other occupants (other than crew)** 0

8. **List all injured personnel and give the following information for each: name, SSN, grade, duty position, sex, degree of injury.** Smith, Wayne L., 411-06-4792, SSG, pax, male, broken left arm, est 3 lost work days (3 X $95 = $285)

9. a. **Mission** Service b. **Type clearance (IFR or VFR)** VFR
   c. **Destination** Tac X d. **Time in flight** 1 + 05

10. **Phase of operation (landing, takeoff, etc.)** Landing touchdown

11. **Description of how mishap occurred. Begin with first indication of emergency, malfunction, failure, or unusual occurrence. Include crew response and reaction of aircraft to control inputs if other than normal. Include airspeeds and altitudes agl as necessary to aid in description. Include density altitude and gross weight where inadequate aircraft performance is a factor (inadequate power for conditions) and describe termination of problem (landing, further damage, procedures used). Give details of any ejection or bailout.** At 10 feet agl and approximately 5 kts airspeed pilot lost visibility due to blowing snow and inoperative defroster. Aircraft drifted left and main rotor blade struck a 6' pine tree causing an 8-inch tear in both main rotor blades. Density altitude and gross weight were not factors in this mishap. Aircraft rolled left with main rotor separating and transmission being thrown from aircraft.

Note: For Class D and E mishaps, add the following information when known; for each cause factor identified in terms 12, 13, and 14, tell what caused or permitted it to happen and what corrective action should be taken. If information is not known within 24 duty hours of mishap, provide via supplemental report as soon as known.

12. **Describe each environmental cause factor and how it contributed to the mishap.** Visibility had dropped from 2 miles forecast to 1/2 mile actual because of falling snow. Landing zone contained loose snow which rotorwash blew into a cloud. As a result, the combination of falling snow and blown snow restricted the pilot's visibility and he allowed the aircraft to drift into a tree.

13. **Describe each human error cause factor and how it contributed to the mishap.** Because it was closer to the assault objective, pilot elected to use a confined area landing zone instead of an open field 500 meters west that had been used the previous day. This violated unit SOP which requires 1 mile visibility for confined area operations. As a result, aircraft drifted into a tree when pilot's visibility became restricted.

14. a. **Describe each materiel failure or malfunction cause factor and how it contributed to the mishap.** Defroster duct was deteriorated and, during flight, separated at connecting point on pilot's side. As a result, window fog further decreased the pilot's visibility which was already restricted by blowing snow and the aircraft drifted into a tree.

For each failure or malfunction identify the following:

b. **EIR control number (block 3 of SF 368)** W079013/1

c. **NSN** 1560009121172

d. **Part number (obtain from failed part)** 204-072746-3

e. **Nomenclature of suspected or failed part** Duct assy

f. **Name of publication from which nomenclature obtained** TM 55-1520-210-23PC, 13 Jun 78 w/C2, page 1680, fig 371IT46

If major component failure or malfunction contributed, additionally submit:

g. **Component model**

h. **Series** i. **Serial number**

j. **Total Time** k. **Time since overhaul (to nearest hour)**

l. **Overhaul facility** m. **Date of last overhaul**

n. **Previous storage history**

o. **Cause of failure**

p. **Power settings**

q. **Significant indications**

Note: For each separate failure or malfunction that contributed to the mishap, repeat item 14.

15. a. **List other personnel injured as a result of mishap.** None

b. **Brief description of damage to government or public property other than the aircraft.** None

16. a. **Date nearest FAA facility was notified, if required (AR 95-30).** N/A

b. **Brief description of any violations to civil or military regulations (if none, so state).** None

c. **Classified material ( ) was (X) was not on board (for missing aircraft only).**

d. **Aircraft** (X) **was ( ) was not serviced with fire resistant hydraulic fluid.**

e. **Dangerous or hazardous material ( ) was** (X) **was not being transported at time of mishap. Material ( ) did** (X) **did not contribute to mishap. Any other information pertinent to hazardous materials being transported at time of mishap.**

f. **Aircraft** (X) **was ( ) was not performing** (X) **authorized ( ) unauthorized, ( ) supervised** (X) **unsupervised**

(1) **Terrain flight: ( ) low level** (X) **contour ( ) NOE**

(2) **( ) Tactical IFR training** N/A

g. **USASC will periodically issue instructions requiring the reporting of other specific data pertaining to mishap prevention problem areas. Such data will be reported in this subparagraph.**

17. **For additional information contact: Name** CW2 Ben Dover **Address** 175th Avn Co, Ft Sykes, AL **Duty** Flight safety technician **Telephone number** AV 344-6212/5488 ■

Selected mishap briefs

uh1 **Class C mishap** ☐ As aircraft was in low-level flight, turkey vulture hit left windshield below windscreen pivot arm. Windscreen shattered, and aircraft was landed to open field.

Class E mishaps ☐ Hydraulic light came on, without hydraulic failure. Caused by failure of pressure switch. ☐ Transmission oil pressure fluctuated 10 to 20 psi, then went to zero. Caused by failure of oil pressure gauge. ☐ Right fuel boost pump light came on. Caused by failure of fuel pump. ☐ Engine oil temperature rose to red line during hover. Caused by failure of oil cooler turbine bearings. ☐ High frequency vibration in pedals was caused by failure of tail rotor servo cylinder.

ch47 **Class E mishaps** ☐ No. 2 engine transmission oil temperature went to -10° C. in flight. Caused by faulty temperature gauge. ☐ Abrupt pitch change occurred twice during instrument training flight. Caused by failure of No. 1 actuating extensible link. ☐ No. 1 engine would not respond to normal trim. Caused by failure of N_2 actuator.

oh6 **Class E mishap** ☐ Two aircraft were on direct VFR flight to airport. Lead aircraft turned to a heading of 090 on compass and flew for 1 hour. Pilot of second aircraft requested lead pilot to advise him of heading. It was determined there was a 30° difference in compass readings of the two aircraft. Lead aircraft maintained same heading for another 30 minutes before making course correction. One hour and 50 minutes into flight, fuel low light of lead aircraft came on, and pilot landed about 45 miles northwest of airport. No. 2 aircaft had enough fuel to reach destination. High rate of fuel burn was caused by high power setting during entire flight. Compass of lead aircraft was in error by 35 degrees.

oh58 **Class E mishaps** ☐ Excessive N_2 drop during takeoff was caused by failure of overspeed governor. ☐ Aircraft began to vibrate and wallow around vertical axis at hover following landing approach. Caused by excessive play in transmission drag pin. ☐ Master caution and hydraulic pressure lights came on. Caused by failure of pressure switch.

ov1 **Class E mishap** ☐ (D series) No. 2 anti-ice generator light came on during climb, and ice started to accumulate on engine intake cowling. Generator voltage increased to 125 volts. Caused by failure of regulator to maintain output within limits, activating overload protective circuit and shutting system off.

u21 **Class E mishaps** ☐ (F series) Left engine oil pressure dropped during takeoff. After aircraft was landed, engine oil pressure was seen at 60 psi. Engine oil filler cap was unlocked, allowing oil to be siphoned out. Pilot apparently did not completely lock cap when he replaced it during preflight. ☐ (D series) Fuel started siphoning slowly from left nacelle cap during flight. Suspect fuel cap was not properly seated during preflight. ☐ (D series) Failure of No. 1 fuel boost pump caused illumination of light, followed by drop in fuel pressure.

Maintenance

ch47 **Class E mishaps** ☐ No. 1 flight boost caution light came on. Caused by chafed flex line to top of SAS extensible link. ☐ No. 1 generator caution light came on. Caused by broken wire at F1 terminal. ☐ No. 1 engine oil low light came on. About 4 minutes later, oil pressure began fluctuating and gradually decreased from 50 psi to 40 psi. Single-engine landing was made. Before this flight, engine oil pressure had to be adjusted. To adjust oil pressure, tube assembly running between oil scavenge and oil pump had to be repositioned. Line was not sufficiently tightened and vibrated loose during flight.

u3 **Class E mishap** ☐ After aircraft had flown for 45 minutes at 6,000 feet, ice buildup was noticed on oil breather pipes of both engines. Breather action appeared normal as vapor was visible. Flight was continued for an additional 45 minutes, with ice building up to large golf ball size. Very little vapor was seen. Aircraft was landed, and breather vent pipes were thawed. Flight was continued, and same problem occurred again. Recent engine conversion changed exhaust system from top to bottom of wing. Crankcase vent tube was not installed properly.

Messages received

- Maintenance advisory message concerning OH-58A and C main drive shaft coupling wear limits (OH-58-80-03, 042015Z Feb 80).
- Message concerning off-spec fire resistant hydraulic fluid, MIL-H-83282 (051320Z Feb 80).

WORKSHEET FOR PREPARING PRELIMINARY REPORT OF AIRCRAFT MISHAP (PRAM)

U.S. ARMY SAFETY CENTER

Addresses

Subject: Preliminary Report of Aircraft Mishap, CSGPA 1550 (MIN)

1. a. Date_____ b. Time (local)_____
   c. ☐ Dawn ☐ Day ☐ Dusk ☐ Night

2. Give distance from mishap site in direct nautical miles and direction from nearest military installation or prominent geographical feature; otherwise, use latitude and longitude.

_____

3. a. Aircraft type, design, series _____
   b. Complete serial number _____

4. a. Unit identification_____
   b. Unit identification code (UIC)_____
   c. Home station of unit operating the aircraft _____

5. a. Mishap classification _____
   b. Actual or estimated cost _____
   c. Brief description of damage _____

_____

6. a. Operator's duty (IP or pilot) _____
   b. Name (last, first, MI) _____
   c. SSN_____ d. Grade _____
   e. Unit assigned _____
   f. Home station _____

7. a. List all other crewmembers (name, SSN, grade, duty position, unit).

_____

_____

   b. Number of military occupants on board (other than crew) _____
   c. Number of other occupants (other than crew) _____

8. List all injured personnel and give the following information for each: name, SSN, grade, duty position, sex, degree of injury.

_____

_____

9. a. Mission_____ b. Type clearance (IFR or VFR) _____
   c. Destination_____ d. Time in flight _____

10. Phase of operation (landing, takeoff, etc.) _____

11. Description of how mishap occurred. Begin with first indication of emergency, malfunction, failure, or unusual occurrence. Include crew response and reaction of aircraft to control inputs if other than normal. Include airspeeds and altitudes agl as necessary to aid in description. Include density altitude and gross weight where inadequate aircraft performance is a factor (inadequate power for conditions) and describe termination of problem (landing, further damage, procedures used). Give details of any ejection or bailout.

_____

_____

_____

_____

Note: For Class D and E mishaps, add the following information when known; for each cause factor identified in items 12, 13 and 14, tell what caused or permitted it to happen and what corrective action should be taken. If information is not known within 24 duty hours of mishap, provide via supplement report as soon as known.

12. Describe each environmental cause factor and how it contributed to the mishap.

_____

_____

Cut along dotted

PRAM worksheet

13. Descibe each human error cause factor and how it contributed to the mishap.

_____

_____

14. a. Describe each materiel failure or malfunction cause factor and how it contributed to the mishap.

_____

_____

For each failure or malfunction identify the following:

b. EIR control number (block 3 of SF 368) _____

c. NSN _____

d. Part number (obtain from failed part) _____

e. Nomenclature of suspected or failed part _____

f. Name of publication from which nomenclature obtained _____

If major component failure or malfunction contributed, additionally submit:

g. Component model _____

h. Series _____ i. Serial number _____

j. Total time _____

k. Time since overhaul (to nearest hour) _____

l. Overhaul facility _____

m. Date of last overhaul _____

n. Previous storage history _____

o. Cause of failure _____

p. Power settings _____

q. Significant indications _____

NOTE: For each separate failure or malfunction that contributed to the mishap, repeat item 14.

15. a. List other personnel injured as a result of mishap. _____

_____

b. Brief description of damage to government or public property other than the aircraft.

_____

_____

16. a. Date nearest FAA facility was notified, if required (AR 95-30).

_____

b. Brief description of any violations to civil or military regulations (if none, so state).

_____

_____

c. Classified material ☐ was ☐ was not on board (for missing aircraft only).

d. Aircraft ☐ was ☐ was not serviced with fire resistant hydraulic fluid.

e. Dangerous or hazardous material ☐ was ☐ was not being transported at time of mishap.

Material ☐ did ☐ did not contribute to mishap. Any other information pertinent to hazardous materials being transported at time of mishap:

_____

f. Aircraft ☐ was ☐ was not performing

☐ authorized ☐ unauthorized,

☐ supervised ☐ unsupervised

(1) Terrain flight: ☐ low level ☐ contour ☐ NOE

(2) ☐ Tactical IFR training

g. USASC will periodically issue instructions requiring the reporting of other specific data pertaining to mishap prevention problem areas. Such data will be reported in this subparagraph.

17. For additional information, contact: Name _____

Address _____

Duty _____ Telephone number _____

long dotted line

Stacom

Have the odds in your favor

Let's look at a precautionary landing that could just as easily have been an accident. An aviator landed his OH-58 after he determined he could not maintain visual contact with the horizon at night.

Commendable; good judgment; indicative of an excellent unit training and standardization program; strong supervisory attitude toward aviation safety. Maybe so, but let's look a little closer.

Further investigation discloses that this aviator's visibility was very limited because the defogger would only clear an 18-inch area. Well, we all have that happen once in a while. **HOWEVER**, on this particular night flight, the aviator was confronted with low visibility, low clouds, and moderate to heavy rain. A few of us can recall nights like that, too. **HOWEVER**, this aviator's OH-58 had an attitude indicator that was not operational because the inverter was not installed in the aircraft. The lack of an inverter also makes the radio magnetic indicator inoperative and prevents ADF turning capabilities in some models. One's imagination must be stretched to the ultimate limit to state that the aircraft was being operated, with all the required equipment for night VFR flight installed, as prescribed in paragraph 4-17b, AR 95-1.

HOWEVER, it does not take much to imagine the embarrassing questions that an investigation board might be asking if the situation had resulted in an accident.

A cursory examination of this mishap indicates the possibility of a breakdown in flight standardization and safety procedures from the supervisory level down to the operational aviator level. The old cliche "Was this trip really necessary?" seems appropriate in this instance. Supervisors—make certain you have the odds in your favor when you accept missions and assign equipment to your aviators. Aviators—be sure you have the odds in your favor when you accept a mission under marginal conditions.

Although the aviator involved in this mishap took the proper course of action when everything closed in on him, we leave it to the judgment of the reader as to the wisdom of assigning or accepting the mission. ■

AR 95-1

Distribution of the new AR 95-1 should now be completed. To expedite implementation of the new AR 95-1, the following corrections and clarifications of the regulation are provided. They may be implemented at this time and are due to be published in the forthcoming Change 1.

1. The Cost Analysis section has been deleted. New terminology and clarification are provided in paragraphs 1-21 and 1-22.

2. Paragraph 2-8, Currency requirements: Add to subparagraph d: (13) OH-58A,C. Change (12) to (13) in subparagraph d.

3. Paragraph 3-2, Practice rotary wing touchdown emergency procedures training:

a. Delete third sentence ("IFEs performing evaluation duties from a cockpit or jump seat station may direct rated aviators to perform simulated engine failures or forced landings (d below).").

b. Delete: "or IFE" from line 9, basic paragraph.

4. Paragraph 3-8, Multiengine operations. Delete the word "aircraft" in subparagraph a(4).

5. Paragraph 3-13, Aircrew and maintenance check. Insert a comma between "preflight" and "ground" in subparagraph c, second line. NOTE: This paragraph has also been significantly reworded.

6. Paragraph 4-2, Fuel requirements: This paragraph reduces fuel reserve requirements for VFR and IFR flights.

7. Paragraph 4-15a, Weather requirements: Delete everything after the first sentence and insert the following: "Destination weather must be forecast to be equal to or greater than VFR or S-VFR minimums at ETA through 1 hour after ETA."

8. Paragraph 4-17, Required equipment: A clock or watch and a free-air temperature gage have been added to VFR requirements.

9. Paragraphs 4-22 and 4-24: These paragraphs, which cover destination and alternate weather requirements, have been changed from "1 hour before through 1 hour after ETA" to "ETA through 1 hour after ETA."

10. Paragraph 6-40a, Aircraft: Insert the word "category" between "the" and "aircraft" in line 6.

STACOM

11. Paragraph 6-41a, Conduct of examination: Delete the third sentence beginning with "Unusual attitude" and insert the following: "IFEs performing evaluation duties from a cockpit or jump seat station may direct rated aviators to perform simulated engine failures or forced landings."

12. Paragraph 6-42, Simulated and actual instrument flight restrictions: There has been some discussion on subparagraph b(5) in regards to the windshield and chin bubble devices used at USAAVNC. It has been determined that the devices used at USAAVNC are not restrictive under this paragraph and they may be used by any unit in the field in accomplishing instrument flight training. For additional information, contact this office at AUTOVON 558-7174/3589 (Mr. Hickman or CW4 Novosel).

13. Table 7-3 should be consulted for distribution of completed DA Forms 759 and 759-1.

a. Copies of flight records are no longer required to be forwarded to the U.S. Army Safety Center.

b. Nonoperational active duty aviator's flight records will be closed and remain closed until the individual is placed in an operational flight position.

Change 1 to the regulation is in development at this time. Suggestions for improvement, corrections, and changes are encouraged. Please submit DA Form 2028, Recommended Changes to Publications and Blank Forms, before 15 March 1980, so that your contributions are given proper consideration. ■

Simulated emergency procedures

STACOM 49, 24 October 1979, addressed the IP's role in conducting simulated emergencies. In this article, the Directorate of Evaluation and Standardization outlined its position re multiple inoperative systems training.

Extracted from the December 1979 Naval Aviation Safety Review, APPROACH, is a naval aviator's views on the subject:

"The possible consequences of compound emergencies should certainly be emphasized in training, but NOT by practicing them in the aircraft . . . It is imperative that the instructor pilot conduct all emergency simulations within the limits of aircraft performance and his own ability. Simulated emergencies shall not be compounded. Compounding simulated emergencies has the effect of unnerving the student and thereby decreases his ability to absorb further instruction. In addition to confusing the student, a compounded simulated emergency might obscure an actual malfunction and thereby jeopardize the aircraft . . . Let's leave this sort of training for simulators and "what if" discussions. Otherwise, we're liable to create real emergencies out of training situations." **LT Mark H. Crouter, VP-31**

A big thank you to APPROACH, an outstanding flying safety publication! ■

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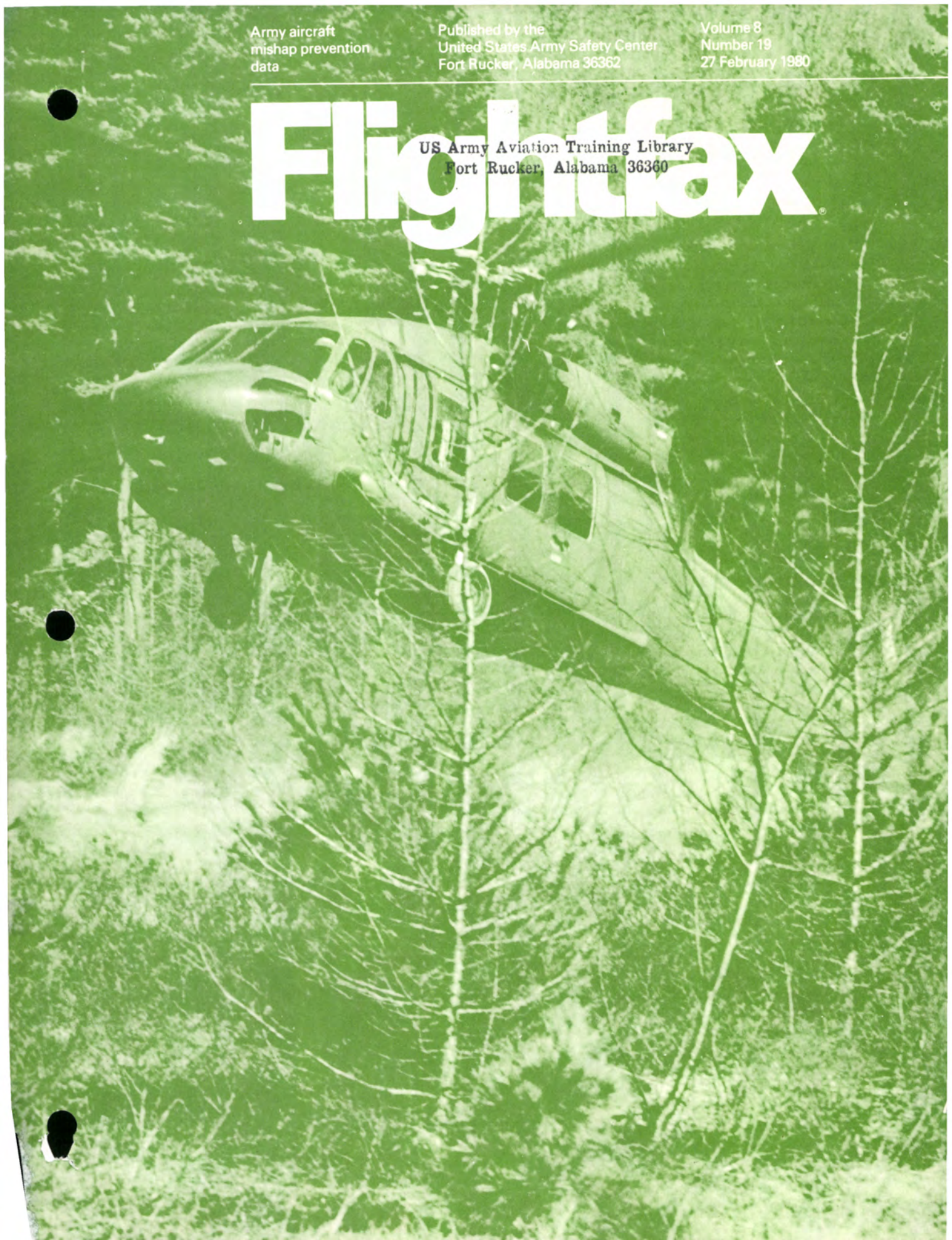


Wind shear

The National Transportation Safety Board has determined that the major cause of a civil aircraft accident was wind shear. In fact, according to the NTSB, "It is probable that the wind shear might have been too severe for a successful approach and landing had the crew relied upon and responded rapidly to the indications of their flight instruments."

This accident is one of many, over the past decade, in which evidence has indicated wind shear was the primary cause.

Severe wind shear is certainly associated with thunderstorms or other severe meteorological phenomenon but can also exist in clear weather. Frontal passage, airport terrain, and topography can also set the conditions for wind shear to exist.

The effects of wind shear on an aircraft are complex and can affect it in many ways. When flying a cross-country flight, it is likely that your aircraft will encounter several wind shear areas that are present between the many different air masses around the earth. Some turbulence may be encountered, even moderate to severe at times, but the altitude and airspeed are such that the airplane can be safely maneuvered through it. However, when your aircraft is in a high drag, landing configuration with lower airspeeds and altitudes, little altitude is available for recovery, and stall margins are at their lowest. This is the most critical situation in which to encounter wind shear.

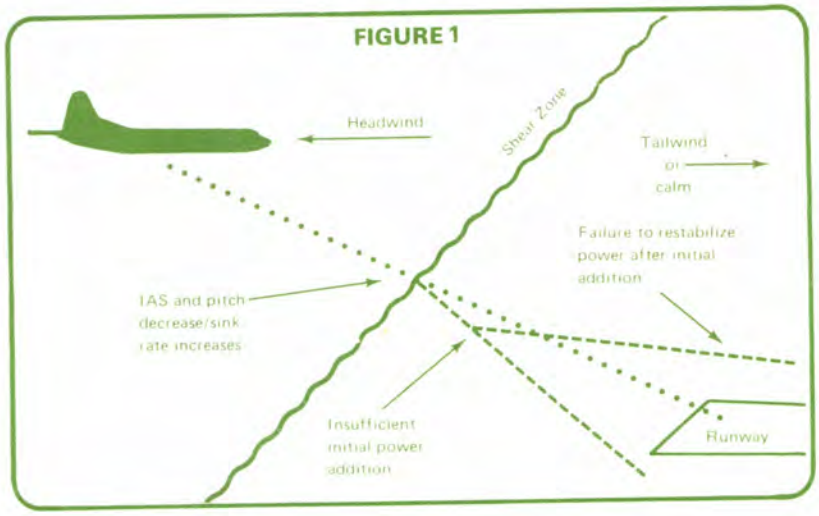
If the wind shear is severe enough, the best pilot will not be able to cope with it using his best skills and the maximum performance of his aircraft. Therefore, the discussion will center around low level wind shear or wind shear encountered during an instrument approach.

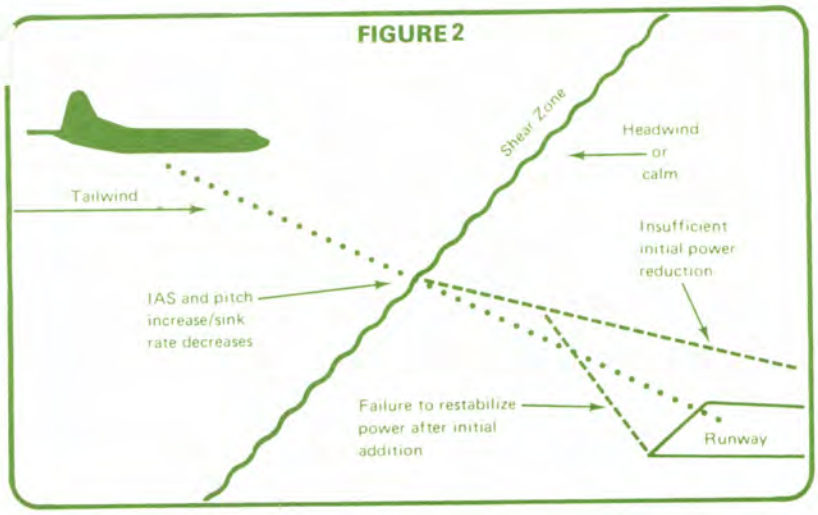
First of all, consider an aircraft flying a typical ILS approach or GCA on a fixed flight path related to a specific point on the ground. Let's assume we have a headwind of some steady magnitude and, at some point, it drops to zero or calm. While in the headwind, indicated airspeed, ground speed, and lift are constant. As the aircraft enters the shear area, indicated airspeed will decrease by the equivalent amount of headwind decrease, and a significant loss of lift will occur as the airflow over the wings decreases (angle of attack remains constant). Since the aircraft's gross weight has not changed, lift is no longer equal to gross weight. The aircraft will accelerate towards the unbalance, or go down. An increasing tailwind will produce the same effect.

Normally, in the above case, the aircraft will pitch down and accelerate to equilibrium. However, due to its proximity to the ground, the pilot must react instantly with increased power and angle of attack to prevent a disaster. This case is particularly dangerous because, within seconds, the aircraft is short of airspeed, in a high drag configuration, and at a high angle of attack. Also, the engines are at a low power setting.

Pilot reaction time and the ability of the engines to develop power in a short period of time are critical. If sufficient time to regain the proper airspeed and glide slope is available, power must be reduced after recovery to a value less than was originally set before entering the shear. With a 3-degree glide slope, less power is required in a no-wind or tailwind condition than for a headwind condition. If the power adjustment is not made, an excess power/airspeed condition will result and you will end up high and fast, and stopping within the available runway length may be impossible (see figure 1).

Let's consider now the opposite case—an aircraft encountering an increasing headwind or a decreasing tailwind. As the aircraft enters the shear area, the indicated airspeed and lift will increase. The aircraft will have a noticeable increase in performance. The aircraft will naturally pitch up and go above the glide slope as it seeks equilibrium, due to lift being more than the gross weight. The pilot must react with forward control and a reduction of power to get back on the glide slope. After the aircraft reaches equilibrium,





the pilot must add thrust and adjust the angle of attack to restabilize in the new headwind condition. Failure to restabilize after the initial power reduction will result in a high sink rate and a short, hard landing (see figure 2).

The above two cases involve a wind shear in the horizontal plane and only at one level. It is likely that things may not be this simple. Vertical wind shear may also exist, and the shear areas may be present at several layers on the approach. Combine all of the above with IFR weather and with the element of surprise (because all of this may be unanticipated), and the pilot will have his hands full.

The NTSB concluded that other significant factors that must be considered include the aircraft's approach speed or entry speed, its configuration, and its flight characteristics under such conditions. Increasing your approach speed will aerodynamically reduce the effect of wind shear on your aircraft. For example, a large aircraft which encounters a wind shear at 150 knots IAS will experience less loss of lift and will develop a lower initial descent rate than an identical aircraft which encounters the same condition at 140 knots IAS. The extra knots carried on the approach will allow you to stop the rate of descent imposed on the aircraft quicker, with lower control forces, and with less additional thrust. A smaller aircaft with less wing loading will be less affected, and nearer to normal approach speeds may be used.

Pilot awareness is of paramount importance. Any deviations from normal power settings may confirm that a wind shear exists. For example, on an ILS or GCA approach, higher than normal power settings and pitch attitudes indicate that a headwind component exists. Lower pitch attitudes and reduced power settings indicate a tailwind component exists.

The VSI (vertical speed indicator) is very useful in determining headwind or tailwind components.

(continued on next page)

Wind shear

Determination of the glide slope angle and predicted ground speed for a given precision approach will give you an expected rate of descent. If your actual rate of descent is higher than normal, a tailwind exists since your actual ground speed is higher than predicted. The opposite case is that a lower actual rate of descent indicates the presence of a headwind component, as your ground speed will be less than predicted.

If your aircraft is equipped with an inertial navigation system, you should make use of the wind, ground speed, and drift angle readouts. During the descent, compare the INS wind information with the tower-reported winds. If the winds are generally from the same direction and speed, chances are that there is no wind shear. If, for example, there are significant variations between the INS winds at 2,000 feet and the tower-reported surface winds, expect a wind shear on the approach. While flying a constant indicated airspeed, variations in ground speed and drift angle will also confirm the presence of wind shear. Remember that INS winds are in degrees true, and the tower-reported winds are in degrees magnetic. The local variation must be applied to the INS winds.

Pilot reports are very helpful. If you encounter wind shear on the approach, report it to the tower so that a pilot behind you may be made aware of the situation. A pilot in front of you may someday be of assistance to you.

Finally, you should know the latest weather conditions and local topography of your destination airport. A recent frontal passage or a nearby thunderstorm indicates that there may be wind shear. Island airports or airports in mountainous terrain may have a wind shear in clear weather. At many locations, the tower will report wind direction and speed at three points on the runway: touchdown zone; runway midpoint; and runway end. If the wind directions and speeds are generally the same, then there is no problem. However, if variations exist, expect a wind shear.

Flight station preparation and crew coordination are essential. Familiarity with the entire approach procedure and with your aircraft performance are very important in order that deviations from the norm can be immediately detected and appropriate adjustments made. It may be necessary to fly the approach 10 to 20 knots above the normal approach speed, depending on the intensity of the shear. The use of less than full flap settings will result in decreased drag and better controllability in the shear areas.

Knowledge of the runway length and condition is important. A wet, icy, or snow-covered runway will result in poor to nil braking action. The conditions may be such that stopping within the available runway length is impossible when using faster than normal approach speeds. If there is any doubt that a safe approach and landing can be made, two options exist: Hold until weather conditions improve (fuel permitting), or go to your alternate.

In summary, steady winds have little effect on aircraft performance, except for constant influence on ground speed and drift angle. Abrupt wind changes affect an aircraft aerodynamically. An approach or landing into an increasing headwind component **increases** aircraft performance, while an approach or landing into a decreasing headwind component **decreases** aircraft performance.

A wind shear condition that leaves you short of airspeed and close to the ground can be disastrous. Faster approach speeds will result in less loss of lift and better controllability. If more power is needed, add it quickly. Be more conscious of the rate of information available from the glide slope or GCA controller, altimeters, and rate-of-climb indicators. Also, include your power gauges in your instrument scan. Insure that one pilot stays on instruments until adequate visual cues are present to conduct a safe landing. Make a careful evaluation of all factors. If any doubt exists, execute a missed approach. ■

—adapted from APPROACH

Confusion about red Xs and circle red Xs

We have received many questions recently concerning who has the authority to sign off red Xs and circle red Xs on aircraft maintenance and historical records, who can downgrade or change status symbols, and who can authorize one-time flights on aircraft placed in a red X condition.

First, let's look at who has the authority to sign off a red X or a circle red X. TM 38-750, page 4-2, par. 2(a)1, states: "When action is accomplished to correct the condition indicated either by a red X or circle red X, the completed action must be inspected by qualified supervisory personnel or unit technical inspector as designated in **written orders** by the commanding officer."

Next, who can downgrade or change a status symbol once it is entered on the aircraft maintenance and historical records? TM 38-750, page 4-2, par. 2a, states: "Status symbol blocks. Symbols entered in a status block represent the considered opinion of the person making the inspection, operating the equipment, or performing the work. No one will direct an individual to change his opinion as represented by the symbol. If the **commanding officer** of the person entering the status symbol or the **commanding officer** responsible for the equipment considers the condition **less** than represented, **he** can change it as follows:

"1. For aircraft. The statement 'status symbol changed' will be entered on DA Form 2408-13 on the same line on block 18 followed by **his** signature in block 19, and initial in block 16. A new status symbol will be entered and the condition recorded on the next open line in blocks 7, 16, and an appropriate remark in block 17. The person making the change then assumes full responsibility.

"2. Changing symbols. An **aviator** may, if he considers the condition more serious than presented, change the symbol in the same manner as 1 above. In this instance, only the **commanding officer**, as stated in (a) above [par. 2(a), page 4-2, TM 38-750], can change the status symbol back to the less serious status symbol."

Who can authorize one-time flights on aircraft placed in a red X condition? TM 38-750, page 4-2, par. 2(c), states: "Evacuation of equipment on an X status symbol. If the equipment on an X status symbol must be evacuated to a higher level maintenance activity, and a **one-time** flight or test flight prior to evacuation or operation is determined to be possible by temporary repair or with an acceptable degree of risk, then the commanding officer or his designated representative may authorize such action by placing his last name initial over the X status symbol and accomplishing the following entries:

"For aircraft. On the DA Form 2408-13, in block 18, enter the statement 'status symbol changed to circle red X, see entry below,' and place his signature in block 19, and his last name initial over the red X in block 16. In the next open line on the form, enter a circle red X in blocks 7 and 16; then enter in block 17 the statement 'aircraft cleared for **one-time flight** from ____ to ____ followed by the signature of the individual making the entry. If a maintenance test flight is required prior to the actual evacuation flight, substitute 'for maintenance test flight' in lieu of the location of the flight within the authorization statement. Upon completion of the one-time flight, the pilot will enter in block 18 'one-time flight completed, status symbol returned to red X, see entry below.' His signature will be placed in block 19 and his last name initial entered over the symbol in block 16. On the next open line, enter the red X status symbol in blocks 7 and 16, and describe the original red X fault(s) followed by his signature in block 17. (Do not precede entry with flight number.)" ■

Selected mishap briefs

uh1 **Class E mishaps** ☐ Right fuel boost pump light came on, and 14 psi fuel pressure was indicated on gauge. Caused by failure of boost pump. ☐ One-to-one vertical vibration during landing was caused by excessively worn trunnion. ☐ P1 bellows check during runup revealed 200 rpm sustained drop. Rpm was increased to 6600. Aircraft was picked up to hover, and pilot again noticed 200 rpm drop. Caused by broken shear pin in droop cam. ☐ IP and pilot smelled fumes in cockpit. Crewmembers became nauseous and complained of slight headache. Fuel-soaked rag was found in tool kit in cargo compartment. ☐ No. 2 hydraulic light came on. Caused by failure of pressure switch. ☐ Hydraulic light came on and feedback was felt through controls. Running landing was made. Caused by failure of irreversible valve.

ah1 **Class E mishaps** ☐ Engine quit during ground runup after 1 minute of operation of 70% N_1. Malfunction of fuel shutoff valve caused fuel starvation. ☐ Master caution and No. 1 hydraulics lights came on. Caused by corroded pressure switch. ☐ Excessive yaw channel feedback was felt during flight. Caused by malfunction of yaw channel amplifier.

ch47 **Class C mishaps** ☐ After pilot landed in LZ, piece of unsecured canvas was picked up by rotorwash and blown into forward rotor disc, damaging red and yellow blades. Supported unit failed to secure equipment in LZ. ☐ Pilot was hovering in a newly constructed confined area, maneuvering his aircraft to a suitable area to discharge his passengers. During slow right pedal turn, tree limbs flexed down into forward rotor blades, damaging blades. ☐ Loud bang was heard, followed by loss of power on No. 1 engine, during level flight at 2,500 feet, 650 pounds torque, and 135 knots airspeed. Engine stabilized at 70% N_1 and 800° C. egt. Engine was placed at flight idle, and single-engine flight was continued to airport. FOD to No. 1 engine was caused by ingestion of hose clamp for engine anti-ice hot air tube.

Class E mishap ☐ No. 2 engine would not beep up on final approach. Caused by failure of fuel control.

oh58 **Class E mishaps** ☐ Transmission oil pressure light came on. Caused by defective switch. ☐ IP noticed continuous shudder throughout airframe and feedback in controls during level flight. Vibrex test was conducted. Tail rotor drive shaft and four bearings were replaced. ☐ N_1 gauge gave no indication during start. Caused by broken wire in cannon plug connection to tachometer generator.

th55 **Class E mishaps** ☐ Rough-running engine was caused by deficient fuel servo. ☐ IP heard popping noise and felt vibrations coming from rear of cockpit. Upper "H" frame bearing was replaced. ☐ Engine and rotor needles split intermittently during runup. Caused by faulty clutch actuator switch and battery.

ov1 **Class E mishap** ☐ (D series) No. 2 prop auxiliary motor failed during prop feather test, and prop did not feather completely. Prop would not unfeather, and aircraft was landed.

c12 **Class E mishap** ☐ (A series) Outer layer of pilot's windshield cracked as aircraft was flying at 14,000 feet msl. Light rime icing conditions were present. Windshield heat was on for 20 minutes before cracks developed.

u21 **Class B mishap** ☐ (A series) Aircraft touched down right gear first. As left gear was being lowered, aircraft began to vibrate severely, and loud bang was heard from area of right gear. Aircraft began porpoising. Tower personnel told pilot one landing gear was gone. IP took control and initiated go-around. Another aircraft was launched to inspect the gear, and it was confirmed that right gear was missing. Strut was extended and would not retract. Gear-up landing was made on foamed runway.

Probably caused by failure of right main gear torque knee. 8027

Class E mishaps ☐ (A series) IP saw fuel streaming outboard of right wing attaching point. Aircraft was in light to moderate ice just before fuel leak. Fuel vent heater failed. Leak was found at fuel level transmitter. Some leaking was also found at wing and nacelle filler ports. ☐ (F series) During postflight inspection, pilots saw hydraulic fluid spraying from right shock strut retainer nut. Dirt caused abrasive damage to inner lower bearing packing area, producing leak. ☐ (H series) Fuel began to siphon from No. 1 engine nacelle fuel cap during climb. Two front fuel cell support fasteners had come loose, allowing front of fuel cell to collapse and causing break in seal at filler neck.

Maintenance

uh1 **Class E mishaps** ☐ Because of tactical emergency, pilot made very quick walk-around preflight inspection. Aircraft was hovered to point on airfield and shut down. Pilot inspected aircraft again and noticed excessive amount of oil around 42° gearbox. Further inspection revealed filler cap was not installed. Two days before, a crew chief not assigned to the aircraft pulled a service check, which included taking an oil sample from 42° gearbox. Filler cap was apparently not replaced. The next day, the aircraft's assigned crew chief made a daily inspection, but he did not pull a complete daily. ☐ Pilot noticed, during preflight inspection, that main transmission oil was overfilled. Crew chief drained oil to normal level and closed valve. During hover to take off, pilot saw transmission oil pressure falling through 30 psi. Inspection revealed transmission oil drain valve was in open position. Valve had been checked closed by two crew chiefs after servicing.

ah1 **Class E mishap** ☐ Master caution and No. 1 hydraulic lights came on. Pilot heard hydraulic system cavitating and made running landing. Hydraulic pump pressure line was ruptured due to chafing.

ch47 **Class E mishaps** ☐ Hydraulic fluid was seen spraying from around utility pump in aft pylon. No. 2 engine starter case drain line was crossed with air pressure line for No. 2 flight boost system. ☐ No. 2 engine oil light came on and oil pressure decreased. Caused by improperly installed oil filter.

u3 **Class E mishap** ☐ Engine crankcase vent oil seal failed in flight due to breather tube freezing, causing overpressure in crankcase. Crankcase vent tube was improperly installed. Modification was not made to allow relief of overpressure in system.

ov1 **Class E mishap** ☐ (D series) Light to moderate ice was encountered during flight. Anti-ice/deice systems functioned properly for awhile, but as flight continued, ice began to build up on No. 1 and No. 2 chin cowls. Pilot returned to airfield. Voltage regulator was out of adjustment.

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

Army aircraft mishap classification criteria

Class A
- A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
- An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or
- A fatality occurs as a result of Army operations.

Class B
- A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C
- A mishap in which the total cost of property damage is at least $300 but less than $50,000; or
- An injury or occupational illness resulted in a lost workday case involving days away from work.

Class D
- A mishap in which the resulting cost of property damage is less than $300; and
- An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays.

Class E
- A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
- There was no injury or occupational illness, or injury resulted in first aid only.

Do you have a red pencil?

PFC Smith removed a tire from a CH-47. Like the good mechanic he is, he recorded it on DA Form 2408-13, but discovered he didn't have a red pencil to enter the status symbol. So he entered the symbol in pencil and wrote the word "red" next to it. He then went to the motor pool to repair the tire he had just removed.

The unit TI, SGT Eagle Eye, was walking through the hangar and noticed the Chinook had a tire missing. "I bet those guys didn't even write it up again," he thought to himself. He grabbed the logbook and looked at the -13. "Hey, it's written up," he said aloud. "Maybe these guys are finally coming around." But he noticed something peculiar about the status symbol. His face got red, his lips began trembling, and you could see that the more he looked at it, the madder he got. Just then, PFC Smith came back to the aircraft. He had forgotten to secure his tools and toolbox.

SGT Eagle Eye shoved the logbook in PFC Smith's face and said, "What do you think you're doing? Don't you know status symbols have to be entered in red? TM 38-750 is very explicit about that."

PFC Smith said, "Yeah, but FM 55-41 says that if the status symbol is entered in other than a red pencil, the word 'red' must be written next to the symbol."

That really made SGT Eagle Eye mad. How could this PFC know more than him! "We'll just see about that," he said as he stomped off to his office to look at the manual for himself.

Well, PFC Smith was right. FM 55-41, page 3-18, par. 3-27, states: "For aircraft, these symbols are always entered in red. If they are entered in other than red pencil, the word 'red' must be entered next to the symbol."

But SGT Eagle Eye was also right. TM 38-750, page 1-4, par. 1-7(2), states: "Aircraft status symbols will be in red."

"A DA Form 2028 is in order," SGT Eagle Eye thinks to himself, and he submits one. He finds out that FM 55-41 is under revision and the statement about entering the word "red" next to the symbol will be deleted from the revised publication to prevent any confusion. In other words, FM 55-41 will soon read the same as TM 38-750.

Thanks to SFC Jimmy Kinzer, Maintenance Training Division, U.S. Army Training Center, Fort Rucker. ■

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Winter flying requires specialized techniques.
Awareness and training are two essential weapons in the battle against blowing snow whiteout mishaps.

Blowing snow whiteouts

Winter flying requires specialized techniques. Awareness and training are two essential weapons in the battle against whiteout mishaps.

There are many hazards to operations over snow-covered terrain and one of the problems ranking highest in severity and producing many of aviation's winter mishaps is that of rotor-induced whiteout.
Rotor-induced whiteout occurs during operations close to the ground, usually during takeoff or landing. When flight is performed over loose snow, severe disorientation can occur and you may have the sensation of moving in one direction when, in fact, you are stopped or moving in another direction. This can result in the wrong control input and possibly serious trouble.

Lack of experience or training in a snow environment is the biggest contributor to whiteout mishaps. Consider the following:

Whiteout mishaps

• When a UH-1 pilot, flying in a formation of five, tried to land in blowing snow, he became disoriented, lost control, and crashed. Neither the pilot nor copilot had received any unit training in operations in loose and blowing snow.

• As an OH-58 pilot was taxiing for takeoff, he hovered slowly at a 3-foot altitude over loose and falling snow. Rotorwash created a whiteout condition, and the pilot became disoriented, lost control, and crashed. The pilot had not received any instructions concerning whiteout conditions resulting from hovering too low and too slow over loose and falling snow.

• As an OH-58 PIC on a training flight to practice snowfield landings and takeoffs was terminating an approach, rotorwash-induced blowing snow caused loss of visual reference. The aircraft crashed when it was landed on a ridgeline. The PIC was not qualified as an IP for this type training mission and had not flown in snow operations for 5 months.

• A UH-1 pilot, approaching an LZ, flew into heavy blowing snow, lost control, and crashed. The pilot was not familiar with procedures in the operators manual and continued to land after encountering a whiteout condition. The crew was not adequately trained for snow environment operations.

Huey pilot, who had received no unit training in snow operations, became disoriented in blowing snow.

Know the snow

Knowing the condition of the snow will give you an idea of what to expect during the takeoff or landing phase of your mission. The condition of snow will vary from loose and dry to well packed. It may be crusted or melted and frozen to ice. Each condition will produce a different effect when overflying or landing. Use the following factors to determine the condition of snow:

• Where the temperature is -20° C. or below, fresh snow will be loose. Any time a wind of 10 knots or more exists, you can anticipate blowing snow. Open areas may be blown clean of fresh snow deposits. However, huge snowdrifts will develop when terrain features such as trees and crevasses block the flow of air.

Pilot hovered too low and too slow over loose and falling snow, and rotorwash created whiteout condition.

• Loose snow that has been exposed to the sun for 3 days or more will form a crust. The depth of this crust will depend on the time it has been exposed to the sun. Overcast conditions will not cause the snow to crust. The rotorwash of an OH-58 may not cause a breaking up of the crusted snow, while operation of a CH-47 over the same area could cause the crust to break up in pieces.

• Footprints of people or animals provide an indication of the snow condition. Deep prints indicate snow is loose and blowing snow will be encountered when landing. If a person is seen standing atop snow without sinking, you can anticipate crusted or frozen snow.

• A low, slow pass will give an indication of the snow condition. If the rotorwash creates a snow cloud, you must initiate the proper flight technique for a safe landing.

The following techniques are recommended for helicopter operations in a snow environment:

Taxiing in the snow

The helicopter produces the greatest amount of rotorwash when hovering. This creates a very hazardous condition for taxiing skid-mounted aircraft. This hazard is not as serious for aircraft with wheels. These aircraft can ground taxi safely to the takeoff point with only minimum pitch, thus reducing the force of the rotorwash.

If you must relocate a skid-mounted aircraft from the parking area to the takeoff point:

• Ground taxi the helicopter to a point where it can be flown to a hover and air taxied at a high taxi speed (approximately 10 knots to 15 knots). The reason for ground taxiing is to permit positive control of the aircraft when in close proximity to other aircraft and obstructions. At this low altitude, the rotorwash will produce an area within the snow cloud where forward visibility can be maintained with the ground. The type of aircraft being flown will determine the size of the clear area. The air taxi speed should be slightly below effective translational lift airspeed. This technique allows the aircraft to be flown forward of the snow cloud where visibility is not restricted by blowing snow.

• Avoid taxiing in the near vicinity of another aircraft that is running up or taxiing. Sufficient time should be allowed for the snow cloud produced by another aircraft to dissipate before taxiing through the area.

Blowing snow caused loss of visual reference as PIC was terminating approach.

Takeoff

The techniques used to take off from snow will vary depending on the type aircraft you are flying; however, the doctrine for this type of takeoff is common to all helicopters. The following takeoff techniques are recommended:

• Insure the skids are free from obstruction, e.g., tree roots and rocks, and not frozen to the ground. A visual inspection of the skids will reveal any obstruction that must be removed before takeoff. It may be necessary to get the aircraft light on the landing gear and apply small pedal pressure to insure the skids are not frozen to the ground. CAUTION: Avoid excessive antitorque control inputs.

• Where the snow is only a few inches thick, application of pitch to the blades before takeoff may blow most of the snow away from the takeoff point, thus reducing the density of snow that will be lifted on takeoff.

• After the above procedures have been accomplished, stabilize the aircraft on the ground until the snow cloud dissipates. When ready for takeoff, position the cyclic for takeoff. If there are no obstacles along the takeoff route, it should be positioned to achieve a maximum performance takeoff attitude. If the takeoff is to be made over an obstacle, a near vertical ascent should be made.

(Continued on next page)

Blowing snow

• When ready for takeoff, make a continuous application of torque. The aircraft should have no forward movement until clear of the ground. Sufficient torque should be applied to insure a positive rate of climb. As the aircraft begins to climb, blowing snow will increase and reference to the ground will be temporarily lost. Maintain heading and flight attitude by reference to the flight instruments. When clear of the snow cloud, adjust flight attitude and torque so as to achieve normal climb airspeed and rate of climb. Throughout the maneuver, the copilot should monitor the engine and transmission instruments.

• Before takeoff, you should discuss with the copilot what action will be taken in the event of an engine failure or rpm bleed-off while in the snow cloud. The normal procedure for single-engine aircraft is to maintain takeoff heading and to perform a hovering autorotation. The copilot's responsibility is to assist in identifying the failure and height above the ground during the descent. If flight is conducted in a multiengine aircraft, you must determine before takeoff if single-engine operation is possible based on gross weight. If it is determined the aircraft must be landed, the pilot should beep up the good engine to gain maximum power and position the aircraft in a landing attitude. Power is added during the descent to cushion the aircraft onto the ground.

Landing

When landing a helicopter to snow-covered terrain, you can anticipate being engulfed by a snow cloud unless the proper landing technique is used. This technique requires the aircraft be flown in front of the snow cloud until it makes contact with the ground. Although the specific technique will vary for each type of helicopter, the doctrine for snow landings is the same for all helicopters. Remember that no two snow landings are the same. You must always anticipate the unexpected and be prepared to cope with any condition that confronts you. Use the following techniques when landing to snow-covered terrain:

• Before initiating the approach, you should learn as much about the touchdown area as possible, e.g., condition of the snow, slope of the area, obstacles. If the landing is made to an improved landing site, some forward airspeed on touchdown is desirable. However, when landing to an unfamiliar tactical site, forward speed should be dissipated upon touchdown. The approach should be planned so that only minimum power is required to terminate. If there are no obstacles along the approach path, a shallow approach is recommended. If an approach angle greater than a normal approach is required to get into a confined area, it is preferable to terminate the approach out of ground effect above the touchdown point and hover vertically downward. The rate of descent will depend on the condition of the snow. In very loose snow, a slow descent will blow the snow away, allowing you to maintain visual reference with the ground. This procedure permits greater control when in the snow cloud.

• The initial position of an approach to the snow is the same as any other approach. The primary difference is in the last 50 feet. Instead of making the normal deceleration below effective translational lift airspeed, you must maintain this airspeed until just before touchdown. This technique allows you to keep the helicopter in front of the snow cloud until touchdown, after which the aircraft will become engulfed in the snow cloud. The approach angle of the last 50 feet deviates from the standard constant angle of descent. A slight leveling off is required to maintain airspeed. Forward cyclic must be applied to maintain speed. As the aircraft descends to an in-ground-effect attitude, blowing snow will develop to the rear of the aircraft. At this point, begin a deceleration. After the aircraft has begun to decelerate, it should be positioned in a landing attitude. If inadvertent ground contact is made due to poor depth perception, it will not be hard enough to damage the aircraft. Once contact is made, reduce torque until the aircraft is firmly on the ground. Never plan to terminate the approach to a hover as disorientation can occur easily in a snow cloud.

• The most difficult aspect of the approach is determining your height above the terrain. Trees or other terrain features located in the near vicinity of the landing area provide good ground reference. If none of these objects are available, it may be necessary to drop an object, e.g., tire, tree limb, or smoke grenade, near the touchdown point. A technique used by UH-1 pilots is to position the beam of the searchlight between the antitorque pedals on the pilot's side. The beam of light forms a good ground reference as you descend to make the landing. This technique is used during daylight only.

• The crew chief should conduct a walk-around inspection to insure the aircraft is positioned securely on the ground before shutdown. If on a slope, precautions must be taken to insure the aircraft will not slide downslope after shutdown.

• Night approaches to the snow are normally made to a reference point on the ground, e.g., tactical landing light or runway light. These devices provide a good reference for judging angle of descent and rate of closure. When executing a night approach to a tactical landing site with lights, always plan your approach to land short of the touchdown point. This technique insures that you will not overshoot and have to decelerate rapidly in a snow cloud. Additionally, by shooting short, it allows you to maintain airspeed after the level-off, thus keeping the aircraft in front of the snow cloud until touchdown. If the landing light or searchlight is used during the approach, position these lights so the beam is beneath the aircraft.

En route

In a nontactical environment, aircraft will normally be flown at an altitude and airspeed where the rotorwash will have no effect upon loose snow. In a tactical environment, however, you must fly at terrain flight altitudes to avoid destruction by threat weapons. Because terrain flight altitudes are so low to the ground, rotorwash creates a signature identifiable for several miles, particularly when conducting NOE flight. En route considerations of which you must be aware when conducting NOE flight over snow-covered terrain are:

• To minimize the effect of rotorwash on loose snow, maintain an airspeed of 40 knots or greater. At this airspeed the rotorwash is displaced horizontally. Little or no blowing snow will develop, even at NOE altitude.

• When flight is conducted below 40 knots, avoid flights over forested areas. Snow in the trees is more easily disturbed than snow on the ground. Also, the flight route can be easily detected by the signature left on the trees.

• Avoid flying close formation over the snow. Depending on the nature of the terrain and the condition of the snow, 5 seconds' to 10 seconds' (about 200 meters) separation should be maintained while en route. Separation should be extended to 15 seconds to 30 seconds (¼ to ½ mile) just before arriving in the landing zone to preclude the possibility of having to land in a snow cloud produced by other aircraft.

• When conducting multi-aircraft operations, avoid flying through narrow valleys or crevasses. Because of the limited maneuver area, aircraft must follow the same ground track, thus requiring trailing aircraft to fly through blowing snow. Also, the vibrations produced by helicopters are intensified in a small area and may cause avalances.

• Terrain features that served as good references for one mission may not be recognizable on the next flight. Snowstorms or winds can change the appearance of a snow-covered area in a matter of hours. An awareness of this phenomenon is essential to insure accurate navigation.

The specialized techniques listed above, along with much more valuable winter flying information, can be found in DA Training Circular 1-12 (Cold Weather Flying Sense). The time to learn these specialized techniques is now . . . before the first snowfall. ■

Selected mishap briefs

uh1 **Accident** ☐ Aircraft hit wires during NOE flight. 7976

Precautionary landings ☐ Several compressor stalls occurred during hover. Cracks exceeding limitations were found in hot end of engine. ☐ Aircraft had just been refueled. When throttle was advanced to full open position, engine failed. Caused by fuel contamination. About 25 gallons of water were drained from aircraft systems. ☐ Master caution light came on and transmission oil pressure dropped to zero. Warped transmission internal oil filter gasket cap caused gasket to fail. ☐ Squeal from hydraulic pump was heard on base leg. Stress crack caused hydraulic line to fail.

ah1 **Precautionary landings** ☐ Engine oil cooler bypass light came on during runup. Male connecting nipple above engine oil cooler drain cock was cracked, causing loss of oil. ☐ Seven AH-1s were landed in a field when low clouds were encountered.

ch47 **Precautionary landings** ☐ No. 1 engine chip detector light came on during runup. Caused by internal failure of engine. ☐ No. 2 engine chip detector light came on. Caused by internal failure of engine transmission. ☐ No. 1 engine fire light came on. Caused by fire element chafing on engine cowling.

oh58 **Precautionary landings** ☐ Governor increase-decrease switch was inadvertently decreased to flight idle during flight. ☐ Aircraft began to spin right during downwind hover. Pilot regained control after two revolutions. Torque reached 96 psi and TOT reached 780° C. Gusty winds were contributing factor. ☐ Master caution and d.c. generator lights came on and all electrical power was lost. Caused by failure of voltage regulator. ☐ While hovering rearward from POL area, crew felt sudden movement and landed. Broken grounding cable was found attached to skid. POL handler, fireguard, and three crewmembers did not check to insure grounding cable was removed before departing POL area. ☐ Aircraft without reverse flow fairings encountered unforecast blowing snow. Pilot landed at nearest safe landing area.

c12 **Precautionary landings** ☐ (C series) No. 1 engine oil pressure dropped to zero during takeoff. Caused by failure of oil pressure transmitter. ☐ (A series) Torque decreased to zero and N_1 decreased below 10% during descent for landing. Caused by failure of high pressure fuel pump. ☐ (A series) Pilot felt heavy vibration and saw fluid coming from No. 2 engine area. Caused by failure of air conditioner clutch.

ov1 **Precautionary landing** ☐ (D series) Failure of engine-driven fuel pump caused No. 2 engine to fail during flight.

t42 **Precautionary landing** ☐ Pilot was making ILS approach at night under IFR conditions of 500 feet broken, 1,000 feet overcast, 2½ miles visibility, light rain, and fog. Left flap of aircraft hit strobe light 315 feet from landing threshold. Aircraft was landed without further incident.

u21 **Precautionary landing** ☐ (A series) Fuel was seen siphoning from right nacelle tank during level-off check. Caused by improperly seated fuel cap.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

• After flying 6 hours, crew was assigned a routine night flight. Both pilots were slightly perturbed over having to make the flight. Pilot was known to be apprehensive in the past about night flights. As aircraft approached field, pilots asked that tower lights be turned off because they blinded them. Tower obliged, with the only remaining light coming from flashlight held by ground handler. Pilot continued approach without turning on landing lights or searchlight. Aircraft hit ground 75 to 100 yards short of touchdown point, appearing to fly into the ground in a normal descent attitude. Terrain elevation at impact site was 30 feet higher than the area at nearby control tower. Seconds before crash, crew chief heard copilot ask pilot if he wanted the landing lights or searchlights turned on. Pilot replied, "Yeah, I guess so."

Maintenance

uh1 **Precautionary landings** ☐ Master caution light and hydraulic light came on. Feedback through cyclic was followed by noise from hydraulic pump. Hydraulic pressure was lost and running landing was made. Hydraulic line from hydraulic pressure switch was cracked under B nut, apparently from overtorque. ☐ Crew heard loud metal clanging sound and landed. Chin bubble drain plug was banging against belly of aircraft. ☐ Hydraulic failure occurred during touchdown. Hydraulic line for collective was chafing on throttle push-pull tube. Line was routed incorrectly. Line chafed when collective was in up position only.

u8 **Precautionary landing** ☐ (F series) As power was being applied for takeoff, IP noticed oil running down from under right side of instrument panel onto his foot, pedal, and floorboard. Tube assembly for oil pressure line was leaking. Rubber tube was installed instead of metal tube.

Messages received

- Technical advisory message concerning P1 bellows problems with T53 engines (211500Z Sep 79, UH-1-79-22 and AH-1-79-20).

- Change to safety-of-flight message—one-time inspection of drive shaft (short shaft) assemblies (212112Z Sep 79, AH-1-79-21 and and UH-1-79-23).

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Strainer element for T63-A-700 engine

Strainer element, NSN 2915-00-924-7795, P/N 2523102, is being replaced by strainer element, NSN 2915-01-040-1138, P/N 2539508, which is usable on both the T63-A-700 and the T63-A-720 engines. To install NSN 2915-01-040-1138 on T63-A-700 engines, two additional parts are required: spring, NSN 5360-01-040-8334, P/N 2539437, 1 each, requisition from B17; and clip, NSN 5340-01-013-7812, P/N 2537776, 1 each, requisition from S9I.

References: TM 55-2840-231-24, 3 Mar 72, subject: Engine Assembly, Model T63-A-700; TM 55-2840-23-23P, 2 Nov 77, subject: Engine, Aircraft, Gas Turbine. Changes to referenced TMs are in process. ■

—from USATSARCOM Information Bulletin

T53 fuel control modification scheduled

To inform units of the plans and current status for the standardization of T53 fuel controls to the stainless steel bellows configurations, TSARCOM has issued technical advisory message 211500Z Sep 79, subject: Technical Advisory Message No. UH-1-79-22 and AH-1-79-20, P1 Bellows Problems With T53 Engines.

Elongation of the bronze P1 bellows causes fuel flow to be lean during normal acceleration schedules. To correct this deficiency, fuel control units will be modified by replacing the present bellows with one made of stainless steel. Complete modification requires the replacement of 16 parts. When modified, the fuel controls will be identified by P/N 100770A4, and conversion is scheduled to begin 1 May 1980.

Starting in June 1980, 76 conversions per month are planned. It is anticipated that by January 1981, the conversion rate will have increased to 200 units per month. The estimated completion date for the modification of all T53 fuel control units is January 1983. Issue of the modified fuel control units is to be controlled by unit priority as established in the Department of the Army Master Priority List (DAMPL).

Until the modified fuel controls are fielded, the following TSARCOM messages remain in effect:

- Safety-of-Flight Operational Message No. UH-1-79-5 and AH-1-79-4.

- Technical Information Message No. UH-1-79-6 and AH-1-79-5.

- Technical Advisory Message No. UH-1-79-11 and AH-1-79-13.

For more information, contact Mr. Robert Lawyer, TSARCOM, AUTOVON 693-0396 or commercial 314-253-0396. ■

UH-1C and M aviators note

Don't be misled when computing fuel load weight and balance. If you'll check chart 12-2A on page 12-6A of TM 55-1520-220-10, you'll see there is no gallons (GAL) column for 10- to 120-gallon loads. The chart should read as shown below. The correction will be reflected in a future change to the manual.

FUEL LOADING TABLE

CRASHWORTHY FUEL TANKS

GAL.	6.5LBS/GAL.	FUSELAGE STATION	MOMENT 100	GAL.	WEIGHT 6.5LBS/GAL.	FUSELAGE STATION	MOMENT 100
10	65	135.5	88	130	845	135.8	1148
20	130	135.6	176	140	910	135.8	1235
30	195	135.7	265	150	975	135.8	1324
40	260	135.7	353	160	1040	135.8	1412
50	325	135.7	441	170	1105	135.8	1501
60	390	135.7	529	180	1170	135.8	1589
70	455	135.7	617	190	1235	135.8	1677
80	520	135.7	706	200	1300	135.8	1765
90	585	135.7	791	210	1365	135.9	1855
100	650	135.7	882	220	1430	136.2	1948
110	715	135.7	970	225	1463	136.3	1994
120	780	135.7	1058	230	1495	136.4	2039

NOTE: Applicable to helicopters which have had MWO 55-1520-219-50/1 incorporated.

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Loss of engine and rotor rpm a problem in OH-58s

Loss of engine and rotor rpm a problem in OH-58s

During the past 12 months, the Army Safety Center has received PRAMs on 41 mishaps involving loss of engine rpm with subsequent loss of rotor rpm in flight. All of these mishaps were precautionary or forced landings, and one resulted in a class A mishap. These 41 cases were not caused by well known deficiencies such as loose fuel control to governor air lines, loose fittings, and loose B nuts. The reason for the loss of engine rpm was not identified even after extensive test flights. Loss of engine and rotor rpm had occurred twice before the final flight of the OH-58A involved in the class A mishap. **On none of these three occasions was the cause of rpm loss identified.**

The common characteristics of this phenomenon are a slow loss of N_1 and N_2 rpm with N_1 going as low as 85 percent with a corresponding loss of engine/rotor rpm. Reduction in collective pitch and maximum beep will cause rpm to recover slightly, but it will bleed off again when collective pitch is increased. Most pilots have been able to stabilize the engine at a power setting less than that required to maintain flight. The condition usually persists until the engine is shut down. Upon restart, the condition is not present and cannot be duplicated. If these aircraft are returned to service, the problem will recur until the N_2 governor is replaced.

At the first sign of power loss, put the aircraft down and leave it down (see "Put It Down; Leave It Down" in the 23 May 1979 FLIGHTFAX). Further flight should not be attempted until the aircraft is cleared by maintenance personnel. **Remember, your first responsibility is to get the aircraft safely on the ground.** However, if possible, pilots should make a quick mental note of engine instrument readings at the onset of the power loss, i.e., TOT, N_1, torque, oil temperature, oil pressure, etc.

PRAMs submitted on these mishaps should be as descriptive as possible and should contain all of the information outlined in the 20 February 1980 issue of FLIGHTFAX.

The Safety Center, in coordination with TSARCOM, is conducting a teardown analysis data collecting program to identify the exact causes of engine and rotor rpm loss and/or to detect defective parts. OH-58 unit maintenance officers who have aircraft that have been in mishaps involving loss of engine and rotor rpm and who have narrowed the cause to the governor should contact the Safety Center at AUTOVON 558-3901/3913 for a teardown analysis control number so the governor can be sent to Corpus Christi Army Depot for teardown. The teardown analysis program is explained in AR 95-5, page 10-6, par. 10-5.

Point of contact at the Army Safety Center is C.J. Carter, AUTOVON 558-3901/3913, commercial 205-255-3901/3913.

Put your attention on putting it down

The pilot of an OH-58 was flying at 60 knots and 150 feet agl when he noticed a decrease in engine noise, followed by a corresponding drop in turbine rpm and TOT. The aircraft yawed to the left and the engine-out light flickered on. N_1 rapidly decreased through 85%. The pilot closed the throttle and entered autorotation. The engine did not completely fail but stabilized at flight idle. The pilot did not have time to bring the engine back to operating rpm. Clearing 70-foot trees, he concentrated on completing his autorotation to a very small clearing. The aircraft was landed with no damage.

The most important consideration in an in-flight emergency is getting the aircraft safely on the ground. From such a low altitude, had the pilot divided his attention between his autorotation and attempts to regain rpm, his autorotation may well have been unsuccessful. Don't troubleshoot your aircraft all the way to a crash.

Mishap review

Synopsis

The crew of a CH-47 was taking off from a tactical field site during the early morning hours of darkness. There was ground fog in the local area. Immediately after takeoff was initiated, the aircraft crashed on a hillside in its takeoff path and was destroyed. Three crewmembers were killed and one sustained major injuries.

History of flight

The crew was participating in a field training exercise. The mission was to pick up and transport hot chow and a 500-gallon water trailer to a medical unit. There was no urgency associated with the mission.

About 0430, the pilot went to the operations tent and filed a VFR flight plan. The remainder of the crew used flashlights to make a walk-around inspection of the aircraft. A weather briefing was not provided, but the ground fog in the immediate area was discussed by the pilot and operations officer.

Before starting the engines, the searchlight was turned on and shined up the slope to determine extent and density of the fog. The searchlight was then repositioned and extinguished. Takeoff was made about 0515, with a pilot, copilot, crew chief, and flight engineer aboard the CH-47. About 20 seconds later, the aircraft crashed on a hillside 737 feet from and 90 feet higher than the point of departure.

Three members of the unit saw the aircraft take off and disappear into the fog. Several other people heard the crash and went immediately to the crash site, where the flight engineer was found walking around in a dazed condition.

All four occupants were thrown from the aircraft during the tumbling sequence following the initial impact. The pilot, in the left seat, was found still strapped to his seat, but outside the fuselage of the aircraft, with his shoulder harness inertia reel in the automatic lock position. The copilot was found outside the fuselage, but not in his seat. His seat was found with the lapbelt unbuckled and the shoulder harness inertia reel in the manual lock position. The copilot may have been flying unrestrained.

The crew chief was found outside the fuselage. He had been stationed, unrestrained, near the aft ramp on

the left side of the aircraft. That portion of the fuselage retained its structural integrity well and adequate liveable space was maintained. The crew chief did not survive because he was not restrained and was flung at least the length of the cargo compartment, ultimately coming to rest outside the forward section of the main fuselage.

The flight engineer was stationed on the right side of the aircraft looking out the window of the main cabin door when the takeoff began. He was unrestrained and was thrown from the aircraft through an opening in the fuselage early in the accident sequence.

Crewmember experience

The 36-year-old pilot had almost 2,000 rotary wing flight hours, with more than 900 in CH-47s. Review of training records failed to substantiate training in or evaluation of tactical instrument takeoffs or vertical helicopter instrument recovery procedures.

The 33-year-old copilot had more than 1,000 rotary wing flight hours, with more than 200 in CH-47s. The copilot's physical condition did not meet minimum class II criteria for retention on flight status. He was extremely overweight and did not have a waiver for a condition he had which was medically disqualifying.

Witness accounts

Witnesses reported no unusual noises or visual observations which might indicate a mechanical problem. According to the flight engineer, the pilot's intercommunication transmissions indicated all pre- and post-takeoff checks were satisfactory.

The flight engineer said that when they picked up there was light fog which they could see through, and then it seemed to get a little thicker. He thought they would have a good rate of ascent and climb over what ground fog there was, but instead the aircraft seemed to descend in a left turn.

One of the witnesses who went to the crash site said the fog was so dense he could just see the silhouette of the main fuselage from where the forward section was located.

Commentary

A review of wreckage distribution, inspection of flight components after wreckage recovery, eyewitness accounts, and recollections of the survivor indicate controlled flight into terrain. The aircraft hit the ground in a slightly nose-low attitude while in a very shallow left turn. Controlled flight into terrain was apparently the result of the pilot's unsuccessful attempt to maintain visual ground reference during the penetration of a shallow layer of dense fog.

The pilot's inability to maintain visual reference was complicated by five factors:

- Depth perception (height above ground level) was hindered by the uniform dark coloration of the terrain along the flight path.
- Seven percent ambient light available reduced horizontal reference as well as forward visibility.
- Use of the searchlight to scan the takeoff path may have reduced the quality of both aviators' night vision. It is not known what protective measures were used to retain night vision.
- Penetration of a shallow layer of dense fog reduced the total quantity of visual cues available to the pilot on which his judgment and reactions are based.
- Based on wreckage analysis, it is probable the copilot was not helping the pilot maintain visual clearance during takeoff.

Circumstances suggest too shallow a takeoff under terrain, light, and weather conditions that dictated a steeper angle of climb on takeoff with possible vertical helicopter instrument flight rules recovery continuation. As a result, the pilot lost visual contact with the ground and crashed while attempting transition to instrument flight. There was no indication that the pilot did any planning to assure obstacle clearance before takeoff under the adverse conditions. ■

Selected mishap briefs

uh1 Class A mishap

☐ Aircraft hit mound during hover and rolled over. 8028

Class C mishaps ☐ Pilot heard loud noise during ground run, and crew chief told pilot something had separated from aircraft. Pilot found splice cover missing from main rotor and damage to tail rotor blade. ☐ Crew heard loud bang in flight and aircraft rolled sharply to left and pitched nose high. Autorotation was made to highway. Tail rotor gearbox had separated. Suspect fatigue at 90° gearbox support mount on tail boom. ☐ Aircraft was flying low over snow-covered field because of poor weather conditions. Pilot slowed to make a turn, and tailwind condition caused snow from rotorwash to overrun aircraft. Whiteout occurred and aircraft landed hard during attempted setdown, damaging right skid and both cross tubes.

Class E mishaps ☐ Right cargo door opened during cruise flight. Because there was no crew chief on board, passenger tried to close door. Passenger opened jump door while trying to close cargo door. Pilot landed in open field and closed both doors. ☐ About 40 minutes into flight, pilot noticed engine oil temperature at 95°. Postflight inspection revealed crack in engine bleed air hose. ☐ IP was flying aircraft from left seat. Pilot, after completing level-off check, decided to smoke a cigarette. With his left hand he opened the ash tray located in the dash. When he pulled his hand back, the cuff of his glove caught on the governor switch and pulled it into the emergency position. Pilot immediately realized what had happened and placed switch back in automatic position. Master caution light came on and rpm increased less than 100. Total time from off position to on position was less than 2 seconds. Pilot did not have the cuffs of his gloves inside his Nomex jacket. ☐ Master caution and tail rotor gearbox lights came on during hover. Caused by failure of 90° gearbox. ☐ Binding tail rotor pedals during landing was caused by malfunction of tail rotor servo.

To keep your gloves from catching on aircraft controls, wear your gloves under your securely fastened Nomex sleeve.

uh60 Class E mishap

☐ Aircraft was on authorized terrain flight. Pilot saw wires and told copilot to go down. Copilot pulled up before going down. Crew suspected wire strike and landed. Tip caps of main rotor blades were damaged.

ah1 Class C mishap

☐ Main rotor blades hit tree during NOE flight. Aircraft was flying into sun, and canopy was dirty.

Class E mishaps ☐ Rpm warning light would not go off after runup. Caused by malfunction of warning control box. ☐ Fuel boost pump light came on. Caused by failure of fuel pump assembly. ☐ Engine oil pressure light came on. Caused by failure of pressure switch.

ch47 Class C mishap

☐ Pilot landed in LZ to unload 105 Howitzer. Gun crew let gun drift into side of aircraft while trying to unload gun, damaging former.

Class E mishaps ☐ Flight engineer saw oil leaking from No. 1 generator during takeoff. Caused by failure of garlock seal. ☐ No. 1 engine chip detector light came on. Inspection revealed numerous chips on plug. ☐ Fuel was seen coming from No. 2 engine during refueling operation. Fuel was leaking from reducer tube.

oh58 Class C mishap

☐ Preflight inspection revealed both tail rotor blades were damaged. Damage was not noticed during postflight or daily inspections, which were performed at night.

Class E mishaps ☐ Electrical fumes and smoke came from overhead console during climb. All electrical equipment except VHF radio and transponder was turned off, and power-on landing was made. Smoke stopped when switches were turned off. Wire to pilot's defog blower broke and fell into console, overloading defog system. Defog switch then did not open as it was supposed to. ☐ N_2 tachometer needles went to zero during runup. Caused by failure of tachometer generator.

Aviation-related ☐ OH-58 was being ground handled tail first from hangar. Another aircraft was parked adjacent to and facing OH-58. As four people began to move OH-58, its main rotor blades caught on the other aircraft. One blade had to be changed. ☐ As mechanic was balancing main rotor blade and hub assembly, workstand of balancing kit collapsed, causing main rotor blades and hub assembly to hit floor. Mishap was caused by malfunction of balancing kit. Stub leg, which appeared to be fully seated, did not seat itself when inserted into bore of heavy boss of stand table because of wear to locking device. This caused stub leg to slide down into hole of stub leg support.

Correction

The 6 February 1980 issue of FLIGHTFAX carried DA Form 2397 series reporting requirements for new mishap classifications. Under board requirements for Class C mishaps, change the first sentence to read: Yes—when more than 1 on board, president will be a commissioned officer.

c12 Class E mishaps ☐ (A series) When gear handle was placed in up position, gear came up but red light remained on. Gear would not cycle down. On downwind for landing, mechanic removed gear motor access panel and gear cycled down electrically. Landing gear motor and gearbox were replaced. ☐ (A series) No. 2 engine could not be restarted after it was secured in flight for training requirements. Single-engine landing was made. Caused by failure of igniter.

u21 Class E mishap ☐ (A series) Fuel was seen siphoning from left wing tank after takeoff. Caused by improperly seated fuel cap.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Tower told pilot to depart to the east, resulting in a downwind takeoff. No wind direction indicator was visible to pilot. As aircraft hovered off helipad, dust caused IMC. Pilot tried instrument takeoff, began to lose power gradually, and decided to land to insure not striking a barbed-wire inclosure known to be somewhere ahead in his flight path. Trying to make a level touchdown under the dusty conditions, pilot allowed aircraft to strike ground in a left bank, nose-low attitude.

(continued on next page)

Army aircraft mishap classification criteria

Class A
- A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
- An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or
- A fatality occurs as a result of Army operations.

Class B
- A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C
- A mishap in which the total cost of property damage is at least $300 but less than $50,000; or
- An injury or occupational illness resulted in a lost workday case involving days away from work.

Class D
- A mishap in which the resulting cost of property damage is less than $300; and
- An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays.

Class E
- A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
- There was no injury or occupational illness, or injury resulted in first aid only.

Mishap briefs

Maintenance

uh1 **Class E mishaps** ☐ When engine was started, aircraft began to rock severely. Inspection revealed about 10 ounces of ice in one blade tip cap. Tip cap was not prosealed, allowing water to enter tip of blade.
☐ Loadmeter fluctuated and smoke was seen coming from forward battery compartment. Aircraft had gone from cold climate to warm climate, and voltage regulator had not been readjusted for warm climate.

Ground mishap ☐ During ground tracking of main rotor blades, tracking flag was pulled up to cockpit to show maintenance officer. Mechanic then put flag on his shoulder to carry it from aircraft. Flag pivoted on his shoulder, and tip of flag entered rotor disk area and was struck by both blades. Mechanic was hit on head by tracking flag but was not seriously injured. Safety man was on location but could not respond quickly enough to prevent mishap.

ch47 **Class E mishap** ☐ All braking power was lost during taxi. Hydraulic fitting on right aft landing gear power steering unit was loose, allowing hydraulic fluid to leak overboard.

oh58 **Class C mishap** ☐ TOT exceeded 1,000° C. during start. Engine was removed for teardown analysis. Battery had static leak, and start derichment adjustment for cold weather and high altitude operations had not been performed.

Class E mishaps ☐ Hydraulic system failed during hover check. Inspection revealed T fitting on collective servo was too tight and crushed. ☐ N_2 rpm could not be decreased below 98%. Rpm was set 1% too high.

ov1 **Class E mishap** ☐ (D series) Fire detector lights on No. 1 and No. 2 engines came on simultaneously during climb. Fire detector system was wired improperly.

Messages received

- Maintenance advisory message on AH-1S aircraft concerning failure of the radio magnetic indicator in the gunner/copilot compartment (AH-1-80-01, 201500Z Feb 80).

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

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The aircraft is
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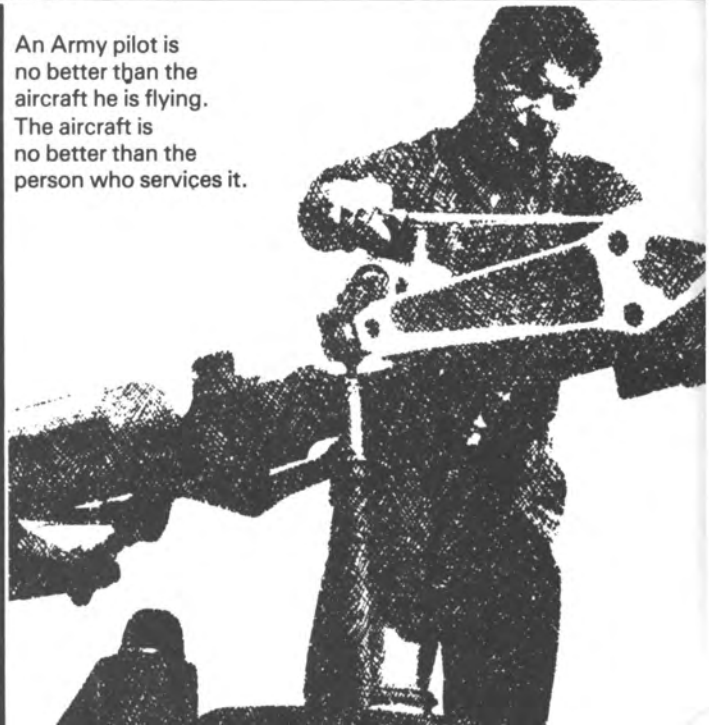

Questions and answers—new mishap classifications

Since we began our education program on the new DOD aviation mishap reporting criteria, to be implemented with publication of the revised AR 385-40, the Army Safety Center has been receiving a steady flow of requests for additional information. To help you, we have compiled a list of the questions most often asked us, along with our answers.

Q During an aviation rappelling/skydiving parachute operation, a soldier is fatally injured because of equipment (ropes/parachute) failure. Should this type of mishap be reported as a flight-related mishap, using appropriate DA Form 2397 series forms? Are mishaps such as this considered in the computation of aircraft mishap rates?

A The answer is "no" to both questions. Mishaps from these causes should not be interpreted as flight-related mishaps.

Q Who are considered to be "non-Army" personnel? How are their injury costs estimated?

A Non-Army personnel include off-duty Army civilians, persons employed by other federal agencies, and other civilians and foreign nationals not employed by the Army. Their injury costs are not calculated and are not reportable.

Q When a mishap occurs at a unit located in an isolated area where no commissioned Army aviators are assigned, is it permissible to allow a school-trained safety officer (who may be a warrant officer) assigned to the unit that incurred the mishap to investigate class C or lesser mishaps?

A The answer to this question as stated is "no." However, the final version of AR 385-40 will include the provision that warrant officers may serve on single-member mishap investigation boards provided they are senior to the individual involved in the mishap. Individuals appointed as board members will not be selected from the unit which incurred the mishap.

Q Are daily, preflight, and postflight inspections considered to be "periodic" or "scheduled" for the intent of AR 385-40 when cracks, breaks, wrinkles, or ruptures are found on rotor blades during such inspections?

A Yes. Daily, preflight, and postflight inspections are included in the intent of AR 385-40.

Q What is the status of AR 95-5? Has DA established an expected revision date for AR 95-5?

A Eventually, AR 95-5 will be rescinded. The target date for complete rescission and the publication date of a new AR 385-XX as a replacement are dependent on the final publication date of AR 385-40. No revision of AR 95-5 is contemplated as of this date.

Q What type reports/boards are required during investigation of mishaps that involve misappropriated aircraft? Do such mishaps figure in the aircraft mishap rate?

A Mishaps involving misappropriated aircraft are treated the same as other aircraft mishaps, i.e., reports and boards required depend entirely on mishap classification. Those classified as class A will be included in the computation of mishap rates.

Q If a unit sustains a flight mishap with one of its UH-1s, and maintenance personnel find extensive damage to the engine because of FOD but no damage to the aircraft, how should the mishap be reported?

A Use 17 percent of the engine cost listed in current aircraft cost tables for classification purposes, and report accordingly.

Q When personnel maintaining an organization's aircraft are a mixture of civilian and military, and are paid according to different pay scales for each category, what criteria should be used to compute the direct man-hour cost when a mishap occurs?

A The figure of $8.00 per direct man-hour should be used to report costs for repair of damage, regardless of the prevailing local wage rate or variances in military pay.

Q If unit personnel are cleaning a turbine engine installed in a UH-1, and a Dzus fastener becomes dislodged, damaging the internal section and necessitating its replacement, how should the mishap be reported?

A On DA Form 285. As there was no intent to fly, the rotor blades were not turning, and the engine was not started (the internal portions of turbine engines are moved by motoring during the cleaning process).

Q Please clarify requirements for reporting a dropped sling load, whether intentional or unintentional, when there is no damage to the aircraft. What type reports are required, who composes the investigation board, and is the mishap reflected in the aircraft mishap rate?

A The final version of AR 385-40 will include dropped sling loads, whether intentional or unintentional, as a flight-related mishap. As such, it will be classified in accordance with total cost criteria. Reporting and board requirements depend on mishap classification and will be as indicated in the matrix published in FLIGHTFAX. The Safety Center publishes only class A aircraft mishap rates.

Q If the engine of a T-42 should fail during flight, and inspection reveals the cause to be a broken piston rod, how should the mishap be reported if no other damage is sustained?

A Engine damage such as that described is attributed to fair wear and tear and cost should not be considered for mishap classification purposes. A PRAM will suffice for reporting purposes to the Safety Center.

For additional information, call Mr. A.F. Almquist, AUTOVON 558-6385/6510, commercial 205-255-6385/6510, or write: Commander, U.S. Army Safety Center, ATTN: PESC-Z, Mr. Almquist, Fort Rucker, AL 36362. ■

The continuing case for by-the-book maintenance

The following incident occurred during a recent field training exercise. Thanks to CW2 Richard A. Gallup, quality control officer, 701st Maintenance Battalion, Fort Riley, for sharing this information with our readers.

During an inspection of a UH-1H, a crack was found in the transmission case on the right ear of the lift link clevis. The crack extended horizontally 4 inches aft of the bolt hole and forward to the edge of the clevis. It had progressed to the point that it opened up when the transmission was lifted to relieve its weight in order to remove the lift link bolt.

Upon removal of the lift link bolt, it was discovered that bushing, P/N 204-040-118-1, was not installed on the bolt. This condition caused stress on the transmission case lift link clevis in two ways. Without the bushing installed, the head of the bolt contacted the left attachment ear of the clevis, allowing both ears to be pulled together against the lift link bearing, which caused a sideward stress on both sides of the clevis. Also, without the bushing installed, there is approximately a one-eighth-inch gap around the bolt on the head end (left side of clevis). This allowed the head of the bolt to move vertically during flight, which caused a bending stress on the right ear of the clevis, resulting in a crack.

Investigation of aircraft records revealed the following: The transmission was replaced 16 months before and the aircraft had flown 147 hours since then. No indication that the condition existed was reported until the crack was found. The aircraft underwent phase 3-1 79 aircraft hours after the transmission replacement with no discrepancies recorded, and the pylon mount check was found to be acceptable on the postphase test flight.

The problem with the above condition is that once the bolt is installed, visual inspection cannot verify that the bushing has been installed. TM 55-1520-210-23-1, par. 6-40d, gives very clear instructions as to what to do if the bushing is not bonded to the bolt. Evidently the individual installing the bolt did not follow the book, and the technical inspector was not experienced enough to ask the right questions when inspecting its installation.

It is imperative that commanders, pilots, supervisors, and TIs take steps to impress upon mechanics the importance of by-the-book maintenance, and that they also learn the right questions to ask those mechanics to determine if they have read and complied with the book. ■

Mission delay or termination?

Does an en route weather delay constitute a precautionary landing and require submission of a PRAM?

If, in the judgment of the pilot-in-command, the mission can continue to completion after waiting for the weather to abate, a PRAM would not be required. In those cases where weather is so severe the mission must be terminated at the point of landing, a PRAM should be submitted as required by AR 385-40. In any event, the final judgment rests with the commander of the aircrew.

The forthcoming revision to AR 385-40 will define a precautionary landing as a landing resulting from unplanned events while the aircraft is in flight that made further flight inadvisable. ■

New centrifugal droop stop spring design for CH-47s

To eliminate a potential source of chafing, a new centrifugal droop stop spring has been designed and released for use. Until the old springs, P/N 114R2079-1, are exhausted, they may be interchanged individually with the new springs, P/N 114R2079-2.

To assist in the identification of each type of spring, the differences in figure 1 should be used as a guide.

To use the new spring, P/N 114R2079-2, a new grommet, P/N 69009-0036, must also be used. The NSN assigned to the new spring is 5360-01-082-6803. The NSN assigned to the grommet is 5325-00-825-1743, Mfg Code 28499. The stack-up for the 114R2012-2 droop stop assembly using the new 114R2079-2 spring is shown in figure 2.

Differences	Old spring	New spring
Part number	114R2079-1	114R2079-2
Spring material	Beryllium copper	Cadmium plated steel wire
Wire diameter	.081 inch	.063 inch
Number of coils	30	18

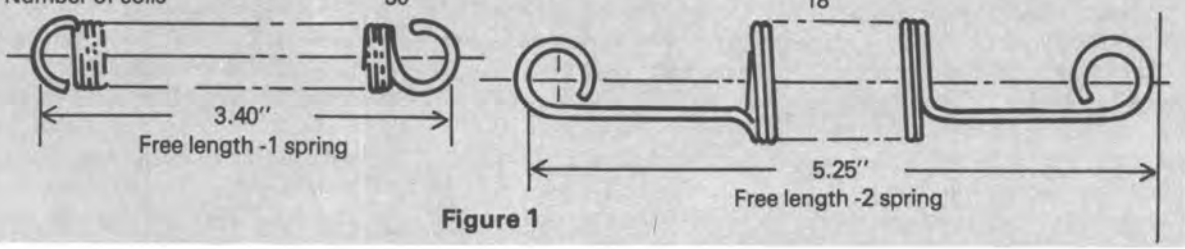

Figure 1

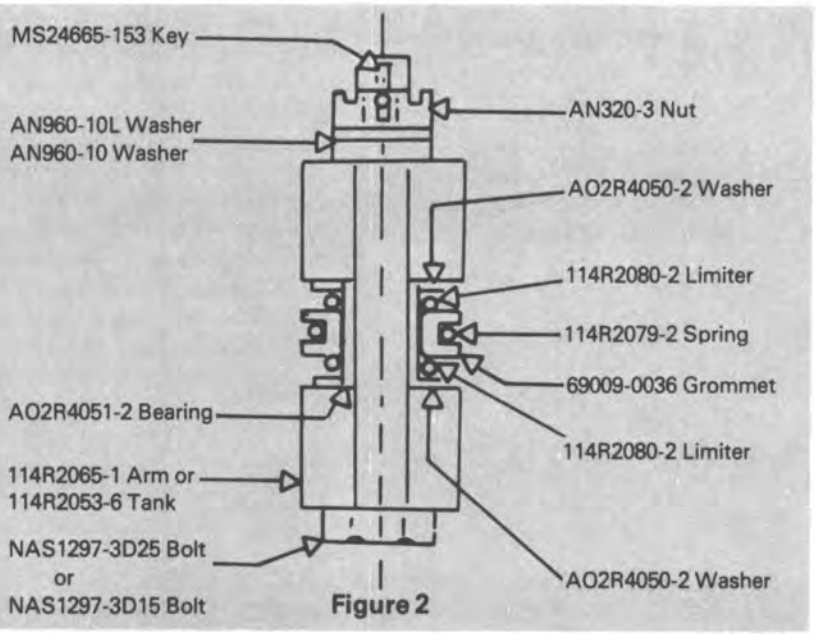

Figure 2

—from Boeing Vertol Service Note 114-0579 (R1)

Selected mishap briefs

uh1

Class C mishap ☐ During approach to LZ to pick up injured soldier, copilot saw wood chips on right side of aircraft. Pilot moved to clear area and landed. Main rotor blades had hit top 3 feet of a 30-foot tree.

Class E mishaps ☐ Vibration so severe instruments could not be read developed in flight. Autorotation was made, and postflight inspection revealed skin separation on red blade. Skin had come unbonded from top of main spar 2 feet from tip of blade and peeled back 4 inches from a section 18 inches long. Skin had also come unbonded from bottom of main spar 1 foot from blade tip in a section 4 inches long, but it did not peel back. ☐ Master caution and hydraulic lights came on, followed by feedback in all controls. Caused by failure of hydraulic line. ☐ Section of soundproofing flew out of aircraft during low-level autorotation. Inspection revealed no damage to tail rotor. ☐ Cyclic feedback in flight was caused by internal failure of right cyclic hydraulic servo. ☐ Crew preflighted aircraft, leaving blades at 90° position. Pilots returned to hangar for a moment, unaware that crew chief had loosely retied main rotor blades. When pilots returned to aircraft for start, they did not notice main rotor blades were secured. Pilots called out "clear" and received a "clear" response from the crew chief. During start, N_1 reached 12% and main rotor blades started to turn, breaking tiedown. N_1 reached 40% before pilots were alerted about tiedown. Aircraft was immediately shut down.

uh60

Class E mishap ☐ Collective and pedals became extremely stiff when collective was moved down during hover/taxi. Reset of boost switch eliminated problem for about 15 minutes, then stiffness reappeared. Caused by failure of pilot's assist module.

ah1

Class E mishaps ☐ Airspeed indicators failed during takeoff. Caused by crimped air static line. ☐ During postflight inspection, after operating NOE on gunnery range, pilot discovered missile command wires wrapped around mast and fuselage. Suspect rotorwash blew wires up from trees into rotating controls. Pilot did not detect unusual vibrations or control feedback. ☐ Illumination of master caution light was caused by faulty transmission oil temperature sensor.

ch47

Class A mishap ☐ In-flight breakup occurred during maintenance test flight. Five fatalities. 8029

Class C mishap ☐ Bird flew into forward rotor system, striking blade. Blade had to be changed.

Class E mishaps ☐ Fuel began venting from left main fuel cell during hover. Inspection revealed check valve in left main fuel tank was jammed open by dirt particle, causing fuel from auxiliary fuel cell to enter left main fuel cell. ☐ No. 2 engine went to 860° C. and fluctuated during start. Caused by internal short in egt gauge. ☐ No. 1 engine chip detector light came on during flight. Postlanding inspection revealed metal particles in engine.

oh58

Class E mishaps ☐ Master caution light and engine chip detector light came on just after takeoff from field strip. Pilot reversed course and landed at field strip about 500 meters away. Ten seconds after aircraft was set down, smoke was seen coming from rear of aircraft. Emergency shutdown was made, and pilot and passenger exited. When smoke stopped about 1 minute later, pilot returned to aircraft and turned off the rest of the switches. Puddle of oil was seen on ground under right side of aircraft. Upper chip detector was covered with metal particles. Engine oil sight gauge was also empty. ☐ Pilot overcontrolled during slope landing, and spike knock occurred. Inspection revealed no damage. ☐ Transmission oil pressure light did not go out during runup. Caused by failure of oil pressure switch.

th55 **Class C mishap** ☐ During first supervised solo, as student pilot came to a hover, he allowed aircraft to turn downwind. Aircraft was then turned back into wind and drifted rearward and to left off lane. Aircraft landed upslope on sod, bending tail skid. One tail rotor blade hit ground and was cracked.

Class E mishaps ☐ Engine chip detector light came on during landing. Small metal chips were found to be originating from a new No. 2 intake valve spring that had recently been installed. ☐ Heater muff hose came loose during hover. Caused by broken strap assembly. ☐ Rotor tachometer failed during autorotation. Drive cable was replaced.

c7 **Class C mishap** ☐ No. 2 engine began backfiring and running rough in flight. Engine was shut down and single-engine landing was made. Possibly caused by failure of link rod assembly in No. 8 cylinder.

c12 **Class E mishaps** ☐ (A series) Partial failure of hot brake system allowed outer left main gear to freeze, causing tire to blow out during takeoff. Aircraft had been parked in an area covered with snow and frozen rain. ☐ (A series) Left forward engine cowling came unlatched during climb. Cowling was not completely latched before takeoff.

ov1 **Class A mishap** ☐ (D series) Aircraft crashed in canyon. Possibly caused by unauthorized low-level flight combined with high airspeed, high gross weight, 6,500-foot DA, and steep bank angles. Two fatalities. 8030

Class E mishap ☐ (D series) No. 2 engine chip detector light and master caution light came on. Sealing compound on back of cannon plug deteriorated, decreasing wire support and allowing wire end to loosen.

t42 **Class E mishap** ☐ Landing gear would not extend electrically during approach. Caused by failure of gear motor.

u8 **Class E mishap** ☐ (F series) No. 2 engine lost power during landing. Caused by failure of propeller governor.

u21 **Class E mishaps** ☐ (D series) When flaps were lowered to full down, aircraft started immediate left roll. Aileron control was sufficient to stop roll. Pilot noticed that left outboard flap had not extended, and he tried to raise flaps. Flap motor circuit breaker popped and would not stay in when it was reset. Pilot landed with split flaps. Caused by failure of left outboard flap actuator which caused flap motor to overheat. ☐ (A series) Fuel was seen siphoning from filler cap on right wing. Caused by bent flange seat on nacelle fuel tank.

Army aircraft mishap classification criteria

Class A
- A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
- An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or
- A fatality occurs as a result of Army operations.

Class B
- A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C
- A mishap in which the total cost of property damage is at least $300 but less than $50,000; or
- An injury or occupational illness resulted in a lost workday case involving days away from work.

Class D
- A mishap in which the resulting cost of property damage is less than $300; and
- An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays.

Class E
- A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
- There was no injury or occupational illness, or injury resulted in first aid only.

Mishap briefs

Maintenance

uh1 **Class E mishaps**

☐ While on the ground, crew chief noticed oil on tail boom. Crew chief had failed to secure 42° gearbox filler cap after taking oil sample. ☐ Fire warning light came on during cruise flight. Caused by corrosion on cannon plug. ☐ When throttle was retarded to engine idle position during simulated forced landing, N_1 decreased below flight idle. Caused by improperly set solenoid clearance.

ov1 **Class E mishap**

☐ (D series) Smoke entered cockpit and No. 2 propeller rpm increased during flight. Single-engine landing was made. Propeller control magnetic plug unseated, allowing loss of hydraulic fluid which caused loss of propeller rpm control.

u21 **Class E mishaps**

☐ (F series) Immediately after takoff, pilot noticed No. 2 engine rpm and torque decreasing from 2200 to 2000 as aircraft accelerated through 110 knots and 50 feet. Pilot returned to runway and landed. Caused by loose seal on fuel control adapter. ☐ (A series) Smoke came from behind instrument panel during taxi to runup area and burning odor was noticed. Caused by loose grounding wire on heater overtemp switch, failure of vent blower, and failure of vent blower pressure switch.

Messages received

- Maintenance advisory message on AH-1S aircraft concerning universal turret fire volts cable vibrating loose and being torn loose during gun removal (AH-1-80-2, 251405Z Feb 80).
- Maintenance advisory message on AH-1S aircraft concerning disengagement of quick release pins due to vibration (AH-1-80-03, 251400Z Feb 80).
- Maintenance advisory message concerning increase in engine oil change interval for CH-47 aircraft (CH-47-80-1, 261940Z Feb 80).
- Maintenance information message concerning removal of cabin door safety chain on U-21/RU-21, JU-21, and U-8F aircraft (U-21-80-01, U-8-80-01, 281700Z Feb 80).

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

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Pilot was ordered to move aircraft from one parking spot to another to clear the area. He lifted aircraft to a high hover to avoid as much dust as possible and started flying circular pattern to new parking spot in construction area. He had difficulty maintaining visual contact with the ground as a result of dust and descended too rapidly. Aircraft crashed with excessive forward speed. ■

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A pilot flies his OH-58 at 80 to 90 knots through a valley, hits wires, and crashes. **2 fatalities** ☐ An AH-1 enters a left descending turn at 100 feet agl, hits trees, and crashes in a ravine. **2 fatalities** ☐ A Mohawk pilot, flying VFR under minimal ceilings, loses control during an in-flight emergency and crashes. **1 fatality** ☐ A pilot in a UH-1 channelizes his attention inside the cockpit after partial engine failure, the aircraft hits wires and crashes. **1 fatality** ☐ An OH-58 pilot enters IMC shortly after takeoff, becomes disoriented and loses control, then crashes. **3 fatalities** ☐ A Huey pilot becomes disoriented after entering IMC, his copilot is unable to recover, the aircraft hits trees and crashes. **1 fatality** ☐ A CH-47 breaks up in flight during a maintenance test flight. **5 fatalities** ☐ An OV-1 crashes in a canyon during low-level, high-speed flight. **2 fatalities** ☐ A UH-1 pilot, flying VFR under lowering ceiling at night, hits wires and crashes on a highway. **1 fatality** ☐ So far this fiscal year, **15 aircrewmembers and 3 passengers** have lost their lives in 9 class A mishaps. That's already as many as were killed during all of fiscal 79. If we continue to kill people and destroy aircraft at this rate, fiscal 80 may become a record year—**but nobody wants that kind of record.** Lives need not be lost nor aircraft wrecked. Both can be prevented . . . **if everyone cares enough.**

Wire strikes and high airspeed . . a deadly combination

Army aircraft have been involved in a wire strike mishap on an average of once every 2 weeks for the past 9 years. Thirty people have been killed and 46 more injured in wire strike mishaps over the past 5 years. So far this fiscal year, four lives have been lost in wire strike mishaps.

Let's review once again what we know about wires and wire strikes.

• **Human error is almost always involved in wire strikes.** Those rare mishaps that happen after some in-flight materiel-related emergency are the exception rather than the rule.

• Most wire strikes happen during cruise flight. **Most fatal wire strikes occur at airspeeds above 60 knots.** The one cause factor common to the vast majority of fatal wire strike mishaps is flying at cruise airspeed at low altitude.

• Slower airspeed not only makes wire detection and avoidance easier but also reduces the severity of injuries and aircraft damage if wires are hit.

• **Most wire strikes occur below 50 feet agl,** with few occurring above 150 feet.

The pilot of this Huey was killed when his aircraft hit powerlines 50 feet above a lake.

• **Pilots in units with strong command supervision to enforce SOPs dealing with flight discipline are less likely to become involved in wire strike mishaps.**

• An aerial reconnaissance over unfamiliar terrain is only partly effective in locating wires strung in the area. For all practical purposes, it is virtually impossible to insure all wires are noted during such a reconnaissance.

• Wire strikes seldom occur at takeoff and landing points when surrounding wires are marked.

• Even though wires may not be seen, their presence should be expected across rivers; along roads and railroad tracks; between hills, poles, structures; and between any pole and a structure. Even when only a single pole or building in open country is spotted, the possibility of wires exists.

• The position of the sun, types of wires, time of day, and existing atmospheric conditions can drastically affect the pilot'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 by towers can sometimes be difficult to see even on a perfectly clear day.

• Some types of wires such as those associated with missiles are almost impossible to see during flight. The danger posed by these is greatest during terrain flight over firing ranges and over trees and other foliage adjacent to such ranges.

• The more crewmembers actively engaged in spotting wire hazards on any given flight, the less the risk of wire strikes. Conversely, the possibility of a wire strike is greatest when lack of crew coordination diverts the pilot's attention from visually searching for wires.

How can wire strikes be prevented?

Through team effort, and the team must include the following people:

• **The commander** must continually enforce SOPs dealing with flight discipline. Breaches of flight discipline must meet with positive command action. Unit operating procedures for the types of missions to be flown must be clearly spelled out in the SOP, and these procedures should be reinforced regularly at aviation safety meetings.

OH-58 crashed nose-low after hitting several telephone wires strung across a river. The area had not been reconned for hazards, and the wires were not marked on the hazards map.

• **The operations officer** must schedule aircrews who are compatible and who have attained the desired state of training as weighed against the complexity of the mission. The operations officer must provide hazard maps and brief aviators on wire hazards.

• **The unit aviation safety officer** must contribute to a wire avoidance climate in the unit by promoting prevention awareness in safety meetings; by closely monitoring flight crew scheduling, briefings/debriefings, posting, use of, and availability of wire hazard maps; and, in the absence of a flight surgeon, by being aware of the psychological/physiological states of the aviators in the unit.

• **Unit instructor pilots** must practice, teach, and reinforce wire

(continued on next page)

This UH-1, flying VFR under lowering ceilings at night, hit wires and crashed on highway. The pilot was killed.

Wire strikes

strike prevention criteria and commonsense rules for detecting wires. IPs must place emphasis on slowing down when poor visibility conditions (flying into sun, rain, etc.) are encountered and stopping to reorient when disoriented.

• **Copilots and crew chiefs** must be assigned specific cockpit tasks and duties. Open lines of communication must exist between the pilot at the controls and those navigating and/or clearing the aircraft in all quadrants. A callout such as "wires (level, low, high) at (o'clock position)" should be used by aircrewmembers in the interest of brevity.

• **The aviator** must, as the "final authority," consistently and successfully combat the temptation to take shortcuts that may lead to a wire strike. Every Army helicopter pilot who flies in the wire environment (and that's just about everyone) must remain conscious of basic wire strike prevention measures and **think** wires constantly while flying in the terrain flight mode.

Everyone on the team shares the responsibility for wire strike mishaps, but final responsibility still belongs to the people in the cockpit. If every pilot on every terrain flight mission would plan properly, then fly the aircraft slower as he goes lower, the number of wire strikes as well as the number of lives lost would be reduced.

Remember, speed is still the main killer in wire strikes. Slow down and live. ■

Portions of this article were adapted from USAREUR Flight Safety Kit.

All on board were killed when pilot's attention was diverted and the Huey, flying at 90 knots, hit wires and crashed.

Seven steps for wire strike prevention

• Make certain unit SOPs cover terrain flight and clearly establish safe procedures for the types of missions to be flown.

• Insure that pilots adhere to established procedures, and commanders must take immediate and positive action regarding **any** violation of flight discipline.

• Make certain that thorough wire hazard and obstacle briefings are conducted before every terrain flight mission.

• Mark wires in the areas where you normally operate.

• Avoid contour flight unless required by the mission. Contour is the terrain flight mode where most wire strikes occur.

• Insure maximum crew coordination in searching for and calling out wires during terrain flights.

• Above all else, go slow when you go low. ■

Pipeline right-of-ways may contain wires

An OH-58 recently hit a wire strung along a pipeline right-of-way. The wire was about 150 feet above ground level. Right-of-ways are usually made for either powerlines or pipelines. Nobody would make a forced or precautionary landing to a powerline right-of-way, but a pipeline right-of-way would be very inviting.

The next time you are tempted to land in a right-of-way, keep in mind that although it may have been made for a pipeline, those infernal wires may also be there. ■

Mishap review

Synopsis

During level-off from descent at 660 feet agl, the UH-1H crew noticed a decrease in rotor rpm. The copilot took control from the pilot and autorotated to a soft, boggy area. The Huey touched down with more than 10 knots' forward airspeed, slid forward, and hit a berm before coming to rest in an upright position.

History of flight

The UH-1H was on a service mission. A passenger had been dropped off, and the crew was returning to home base. About 5 miles south of home base, the pilot placed the aircraft in a descent. When power was applied to level off, the aircraft continued to descend. The pilot and copilot noticed that the N_2 and rotor tachometers were decreasing and that the red rpm warning light had activated.

The more experienced copilot took control of the aircraft and lowered collective as the N_2 and rotor tachometer needles neared the 12 o'clock position on the rotor tachometer indicator. A cyclic flare was made to regain rotor rpm. The copilot continued the autorotation to a boggy area located to the left front of the aircraft. Deceleration was completed and the helicopter touched down, slid forward more than 100 feet, hit a berm, and came to rest in an upright position.

Shutdown procedures were completed and the three crewmembers exited the aircraft without difficulty. Examination of the aircraft revealed that one main rotor blade had struck and severed the tail rotor drive shaft and tail boom just forward of the 42° gearbox.

Crewmember experience

The 28-year-old pilot had more than 500 rotary wing flight hours, with more than 350 in UH-1s. The 52-year-old copilot had more than 7,000 rotary wing hours, with almost 3,500 hours in UH-1s.

Witness accounts

Neither the pilot nor the copilot recalled hearing the rpm audio warning system as rotor and engine rpm began to decrease or during autorotation. Neither remembered seeing the rotor tachometer needles split, although the copilot said the needles were joined at the 12 o'clock position when he assumed control. Both crewmembers said the copilot was successful in regaining rotor rpm after he took control and that rotor rpm was back in the low green area of the rotor tachometer indicator prior to landing.

Commentary

The cause of the reported engine failure/malfunction is undetermined. A thorough examination of the aircraft and its systems, including a complete teardown and analysis of the engine and fuel control governor, failed to reveal any corroborative findings.

The low altitude at which the copilot took control of the aircraft left him with no choice other than to autorotate to an area containing numerous low-lying obstacles. Although conditions dictated that the aircraft be landed with a minimum ground run, the copilot became validly concerned with the consequences of placing the aircraft in a decelerative attitude which may have caused tail rotor contact with an obstruction at the approach end of the intended landing area.

Neither the pilot's nor the copilot's recognition of the emergency was timely. As a result, the aircraft descended to an altitude that did not permit time to analyze the emergency or select a course of action other than an autorotation to unsuitable terrain. It is possible that the lack of timely recognition resulted from the subtle onset of the emergency and channelization of attention on the part of the pilot and copilot. The pilot was preoccupied with entering the traffic pattern and making a radio call for landing instructions, and the copilot was concentrating on tuning the radios.

It is also possible that a lack of premission coordination between the copilot and pilot regarding who would take control of the aircraft in case of an emergency may have led to a delay on the part of both crewmembers in responding. ■

Selected mishap briefs

uh1 **Class A mishap** ☐ Aircraft, flying VFR under lowering ceiling, hit wires at night and crashed on highway. One fatality and three injuries. 8031

Class C mishap ☐ Main rotor blades hit tree limb during NOE flight. Damage was discovered during postflight inspection.

Class E mishaps ☐ Crew heard noise from transmission area and landed. Quick disconnect on transmission drain line was loose. Caused by improperly performed daily and preflight inspections. ☐ As aircraft was hovering for takeoff, loud popping sound was heard. Brown paper shop towel was seen floating down to the right of the aircraft. Suspect towel was blown from ground and hit by main rotor blades. ☐ Loose sandbag was drawn into main rotor blade during landing. ☐ As pilot was following a river, looking for a missing person presumed to have drowned, aircraft hit a kite string. Assuming rotor blades had severed the string, crew continued back to home base. Postflight inspection revealed line wrapped around tail rotor pitch change links, crosshead, 90° gearbox drive shaft, and main rotor swashplate. ☐ N_2 rpm would not go over 6600 at full beep during runup. Pilot picked aircraft up to hover and rpm dropped 100 and started fluctuating. Caused by worn droop cam compensator. ☐ Engine rpm fluctuated between 6600 and 6400 at 32 pounds of torque during takeoff. Caused by malfunction of governor assembly. ☐ Pilot noticed excessive drop in fuel quantity and landed to investigate possible fuel leak. Problem was identified as faulty fuel quantity indicating system.

ah1 **Class C mishap** ☐ Aircraft was moving forward up a draw to move into covering position. When draw came to a dead end, 180° turn was made to maintain mask. Tail rotor blades hit tree branch during turn. Both blades were damaged.

Class E mishaps ☐ During hover, aircraft pitched laterally to left and then right 5° and continued through five cycles until pilot disengaged SCAS. SCAS hardover was caused by failure of roll channel SCAS. ☐ Engine failed when forward fuel boost pump circuit breaker was pulled. Caused by malfunction of fuel control. ☐ N_2 fluctuated during landing approach. Caused by failure of cam control.

ch47 **Class C mishap** ☐ Loud noise was heard, and master caution and "cargo hook open" lights came on. Pilots were told sling load had been jettisoned. Caused by internal failure of cargo hook.

Class E mishaps ☐ When IP pulled No. 2 engine trim circuit breaker to simulate static beep failure, circuit breaker broke, causing actual static beep failure. ☐ Vibration was felt through thrust lever and continued through control closet to forward head. Caused by defective dynamic absorber. ☐ Unusual vibration in instrument panel during landing was caused by cracked former.

oh58 **Class C mishaps** ☐ While at 2-foot hover, student bottomed collective without warning, resulting in hard landing. IP was unable to recover. ☐ During takeoff from field site, as aircraft approached trees, pilot increased torque to maximum. TOT remained in green and rpm was stable. Pilot elected to remain at max torque when contact with trees became imminent. Aircraft was landed with damage to both main rotor blades. ☐ Aircraft was moving forward between trees at about 5 knots' ground speed and 3 feet altitude while on zone recon mission. Crew heard loud noise and landed. Damage was found to tip cap of main rotor blade. Blade had hit tree with no foliage. Lighting conditions were poor to overcast. Water droplets on windshield further reduced and restricted pilot's vision. Moisture from vegetation was being whipped up and onto windshield by rotorwash.

Class E mishaps ☐ Starter generator light came on during flight. Caused by sheared starter generator shaft. ☐ Pilot felt high frequency vibration in tail rotor and heard unusual noise from rear of aircraft. Caused by worn bearing sleeve.

ch54 **Class C mishap** ☐ As pilot was taxiing to parking area at night, main rotor blades hit tail rotor blade of parked aircraft.

th55 **Class C mishap** ☐ Aircraft drifted left of center line during straight-in autorotation. Below 100 feet agl, student made abrupt correction with cyclic, followed by application of collective. IP attempted power recovery as aircraft hit lane. Main rotor blades severed tail boom.

Class E mishaps ☐ Fumes were detected in cockpit. Alternator had seized and belt was slipping. ☐ Fuel was seen leaking from boost pump after engine start. Caused by faulty pump. ☐ Strap clamp on exhaust system broke, resulting in fumes and smoke in cockpit.

u21 **Class C mishap** ☐ (G series) Aircraft porpoised on touchdown, extending the struts several times. At one point, tires left pavement. Power was applied with aft elevators to stop motion. Rollout was normal with no indications of damage until shutdown, when three propeller tips were found damaged on No. 1 engine.

Class E mishaps ☐ (F series) Pilot, during postflight inspection, noticed fuel leaking from right engine nacelle area. Fuel was coming from right nacelle tank. Leak was caused by failure of center top forward fuel cell retaining snap. Broken snap fell between fuel cell and bulkhead, and constant rubbing movement of fuel cell caused hole to be worn through it. ☐ (H series) When flap switch was placed in full-down position, right inboard flap panel stuck at 60%. Flap switch was placed in up position, and right inboard panel retracted, and the other three panels stayed in full-down position. Full left aileron was required to maintain wings level. Postlanding inspection revealed flap cable end was frayed, allowing cable to spin inside motor. Suspect right inboard actuator shaft failed at 60% extension. The other flaps went to full extension, causing fraying of the other cables. Inspection of the other RU-21H aircraft in the unit has so far revealed three other cables with some fraying. ☐ (A series) Pilot saw fuel siphoning from left inboard fuel cap. Caused by failure of preformed packing.

ov1 **Class E mishaps** ☐ (D series) No. 1 engine shut down during runup. Caused by failure of fuel control. ☐ (D series) Hydraulic leak on right brake during runup was caused by malfunction of cylinder.

t42 **Class C mishap** ☐ Crunching noise was heard when landing gear was retracted after takeoff. Postlanding inspection revealed bent main gear inboard door and slight sheetmetal damage. Indication is that gear was lowered above gear speed limitation, as shear pin in inboard door retract rod was sheared and no other materiel problems were found.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Aircraft was flying No. 2 slot during approach to field. Under instructions of flight leader, who was aware of dust at landing site, aircraft in formation tripled their normal spacing. Pilot brought aircraft to hover and went IMC in his own dust plus that caused by the first aircraft to land. Pilot of third aircraft decided to make a go-around, further adding to dust. Pilot of second aircraft reported, "When I couldn't see the ground, I pulled pitch so that I could make a go-around. I'm not sure how close I was to the ground or what sort of attitude I was in." Aircraft began to lose rpm and, while still IMC in dust, crashed.

☐ IP, assigned to transport personnel and to give pilot a check ride, was seen to make a seemingly hasty takeoff. Takeoff was downwind since IP misjudged wind direction by 180 degrees. UH-1 began to gradually lose power after clearing wires at end of field, and IP decided to land, encountering severe dust at 30 to 40 feet of altitude. Visibility was completely lost and tail began moving left. Right skid hit truck while tail was drifting left.

Mishap briefs

Maintenance

uh1 **Class E mishap** □ Both airspeed indicators fluctuated between 50 and 70 knots during climb. Crew chief had not been using a pitot tube cover. Left side was clear. Right side was blocked and air pressure cleared the blockage in a manner that foreign object could not be identified.

ch47 **Class E mishap** □ After completion of simulated single-engine landing, No. 2 engine would not respond to throttle applications. Bleed band was out of adjustment.

Safety-of-flight messages

. Message concerning flight of UH-60 aircraft in icing conditions (UH-60A-80-9, 051730Z Mar 80). Summary: Safety-of-flight message UH-60A-80-3 is rescinded and par. 5-33 of the operators manual is to be changed. Operation of Black Hawk aircraft in potential icing conditions is still prohibited, and the prohibition shall remain in effect until new valves are qualified and installed. Contact: Frank Hunleth, AUTOVON 693-1732, commercial 314-263-1732.

• Message concerning UH-60A aircraft life limited spindle assemblies (UH-60A-80-10, 042205Z Mar 80). Summary: Sikorsky has determined that reworked spindle assemblies should be life limited to 350 flight hours. Four spindle assemblies have been reworked and returned to supply as part of a zero-time rotor head. These assemblies have been installed on four aircraft. Records do not reflect 260 previous flight hours. Contact: John Guenther, AUTOVON 693-1732, commercial 314-263-1732.

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

Please! No more individual flight records

Because of changed requirements contained in AR 95-1, dated 1 January 1980, the U.S. Army Safety Center is no longer responsible for maintaining permanent record copies of individual flight records, DA Forms 759 and 759-1, nor with reconstituting these records when required.

The correct distribution of these prepared forms is shown in table 7-3 of AR 95-1.

Please, **do not send any more individual flight records to the Safety Center.** Instead, follow the instructions in AR 95-1.

All flight records currently on file at the Safety Center are being transferred to Records Holding. Consequently, should any records need to be reconstituted in the future, follow procedures outlined in AR 95-1. ■

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Mishap review

Synopsis

An AH-1S on a support mission was flying 10 feet above the ground. When the pilot looked down to tune his radio, the aircraft hit a sand dune, tearing off the skids. The Cobra was flown to home base, where it was landed on an improvised stand. A hydraulic jack failed during setdown, causing additional damage to the aircraft.

History of flight

The mission involved contour flight to avoid radar detection. The first portion of the flight was uneventful. After the AH-1 was refueled, the crew left the refueling point and climbed to 300 feet until they crossed 75-foot powerlines that paralleled a major highway. They then descended to 10 feet and flew at 40 to 50 knots in a loose trail behind another AH-1.

The pilot decided to retune his FM radio, took his left hand from the collective, and reached forward to the radio directly behind the cyclic. While he was doing this, he focused his eyes and attention inside the cockpit. The copilot was completely engrossed in reading his map. Because the pilot had to lean forward to tune the radio, he changed the position of his upper torso and inadvertently applied forward cyclic. This resulted in a shallow descent that was not immediately detected.

When the copilot glanced up and saw the aircraft was in a shallow dive headed toward a sand dune about 5 feet higher in elevation than the others, he told the pilot twice to pull up. The pilot responded after the second warning and was able to apply enough control input to avoid direct impact with the dune. The left skid glanced the dune, the aircraft ricocheted, and the right skid hit another sand dune. Both skids were torn off. The aircraft was then hovered while the crew of the other AH-1 inspected the damage, and it was decided they should fly to the airfield.

An emergency was declared, and a cradle consisting of a 12-ton hydraulic jack, sandbags, two maintenance stands, and mattresses was hastily constructed. The aircraft was ground guided into position. It settled on the cradle in a nose-low attitude, resulting in slight damage to fiberglass fairings in the turret area. An attempt was made to lower the tail boom by using the pressure release valve at the base of the jack. The jack was located at the aft jacking point, which is limited to 2,000 pounds of stress. The jack upper extension collapsed and punctured the fuselage skin.

The aircraft remained in an upright position, and both pilots exited.

Crewmember experience

The 32-year-old pilot had more than 2,000 rotary wing flight hours, with more than 50 in this series aircraft, including the qualifying phase.

Although he was qualified, discrepancies in the ATM folder made it difficult to determine if the mission was within his capability. The 24-year-old copilot had more than 700 rotary wing hours, with almost 80 hours in this series aircraft, including the qualification phase.

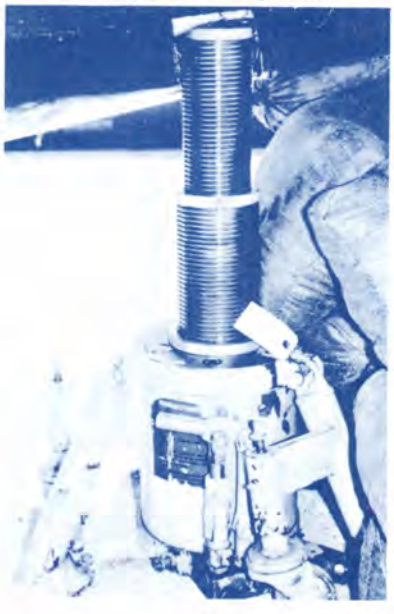
Commentary

The pilot should have coordinated his actions with the copilot when he started to tune the radio. Moments before the mishap, the pilot, flying at a higher altitude, had successfully tuned his radio without alerting the copilot. This time, however, the copilot was studying the map, and there was no altitude safety factor.

he pilot's actions were influenced by the lack of written procedures requiring the transfer of aircraft control or verbal crew coordination before transfer of attention. The intent of chapter 5, FM 1-5, is for the pilot to maintain undivided attention outside the aircraft. However, this publication addresses only navigational crew duties during terrain flight conditions and contains no provisions for radio frequency changes or other tasks which only the pilot can perform from the rear seat of the aircraft.

The pilot's actions were also influenced by the location of the FM radio which was mounted in the bottom center of the instrument panel. The pilot had to lean forward and reach around the cyclic control to operate the radio. This diverted his attention to the inside of the cockpit.

A mechanic improperly adjusted the 12-ton hydraulic jack while trying to position it under the rear of the aircraft. Wanting to lower the jack, he backed the top lock ring almost off the inner cylinder. When the pressure relief valve was opened, the inner cylinder came down, allowing the seal to go below the bottom of the middle cylinder and the hydraulic fluid to escape out the top of the cylinders. As the fluid escaped, the inner cylinder fell, knocking the lock ring off and allowing the inner cylinder to fall completely inside the jack fluid reservoir.



The mechanic's actions were influenced by the lack of published operating instructions and warnings on the hydraulic jack. He was not aware of the potential consequence of backing the top lock ring off too far on this type jack.

The design of the jack permitted the top lock ring to be backed off to the point where the inner cylinder exceeded normal travel and resulted in collapse of the jack. Other capacity jacks of this design also have the same potential failure mode.

Unit flight standardization boards should incorporate into their training evaluation and standardization programs increased emphasis on flight management. As part of this emphasis, crew coordination, task priority determination, and continuous external surveillance during terrain flight should be closely evaluated on all check flights.

Standardized operating instructions for the 12-ton hydraulic jack should be developed and included in publications to be made available at unit level. In the meantime, unit maintenance SOPs should include operating instructions for the jack. ■

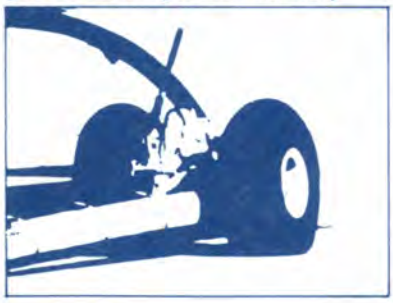
Selected mishap briefs

uh1

Class C mishap ☐ As aircraft was in low-level flight, several birds hit avionics compartment, damaging door and frame.

Class E mishaps ☐ N_1 reached 15 to 18 percent and egt was below 300° during engine start when crew noticed main rotor blade was still tied down. Start was immediately aborted. Crewmembers acknowledged that overfamiliarization and trust in each other contributed to the mishap. ☐ Unforecast ceiling and low visibility caused pilot to terminate mission and return to home base.

Aviation-related ☐ Mechanic was working on set of ground handling wheels that did not turn freely. He suspected bearing retaining nut was overtightened, but he was unable to loosen nut. Another mechanic offered to help, and together they were able to loosen nut one-half turn. This did not correct the binding wheel. Another mechanic was asked to help. Two mechanics held the ground handling wheel assembly



while the third mechanic removed the nut with an 18-inch adjustable wrench. When the nut was disengaged, the tire and wheel assembly (which was under pressure) was propelled from its seat, striking the head of the mechanic holding the wrench. Mechanic sustained a skull fracture. Investigation revealed that the three hub retaining bolts were not installed in the split hub assembly. The bearing retaining nut was holding the wheel hub together.

ah1

Class C mishaps ☐ Engine quit during level flight. Aircraft was autorotated to plowed field. Caused by failure of second-stage compressor blades. ☐ Engine surged during runup, and aircraft yawed to right. Left elevator assembly hit fender of pickup truck, damaging elevator assembly and scratching truck.

Class E mishaps ☐ No. 2 hydraulic light came on during hover. Caused by crack in hydraulic pressure line in turret. ☐ Engine oil pressure light came on. Caused by failure of oil pressure switch. ☐ After two attempts to start aircraft, crew checked engine compartment. Fuel leak was found, and TI found break in weld at 6 o'clock position of dump valve assembly.

Aviation-related ☐ AH-1 was scheduled for engine flush. Mechanic used a fire extinguisher which had been modified with a nipple tube for use on OH-58 aircraft. The original nozzle on the hose had been replaced with the nipple tube, which was secured to the hose by a common-type hose clamp. The extinguisher was filled with water and pressurized with a bicycle tire pump. As engine was being flushed, a noise was heard coming from the engine. Flushing was immediately stopped. The modified nozzle was missing from the hose. When the particle separator was removed, the nozzle was found lodged between the variable inlet guide vanes.

ch47

Class E mishaps ☐ As aircraft was in level flight, it pitched 10 to 15 degrees nose low. Caused by malfunctioning pitch stability augmentation system. ☐ Rpm fluctuated and noise was heard during runup. Inspection revealed riveted bolt on No. 2 engine drive shaft flex pack sheared at bolt head. ☐ During cruise flight in rain with windshield wipers on, copilot's windshield started to crack. By the time aircraft was landed, windshield had spider-webbed. Bleed air and windshield anti-ice were not on. ☐ Defective fuel booster pump caused No. 2 engine to leak fuel overboard through engine manifold drain line.

oh58

Class B mishap ☐ During takeoff, aircraft ran out of left pedal at 75 to 100 feet. When aircraft started to yaw to right, pilot lowered collective and made right turn to return to takeoff point. Aircraft hit ground without ground run, damaging tail boom, skids, and underside of fuselage. 8032

Class C mishap ☐ On landing, pilot noticed higher than normal TOT. Inspection revealed broken diffuser scroll elbow assembly. Engine had to be changed.

Class E mishaps ☐ Engine failed as aircraft was flying 200 feet agl. Autorotation was made to frozen pond. "B" nut had backed off line to double check valve. ☐ Engine oil pressure dropped rapidly during flight. Loss of engine oil was caused by failure of freewheeling unit aft seal. ☐ High frequency vibration was felt shortly after liftoff to hover. Caused by failure of tail rotor drive shaft hanger bearing.

th55 **Class C mishap** ☐ During straight-in autorotation, aircraft landed in right-skid-low attitude, causing aft cross beam to bend beyond limits.

Class E mishaps ☐ Fumes and smoke in cockpit were caused by broken strap clamp on exhaust system. ☐ Fuel was seen leaking from boost pump after engine start. Caused by faulty pump. ☐ Unusual vibrations were felt during hover. Three main rotor dampers were replaced.

c12 **Class C mishap** ☐ (A series) During takeoff roll, aircraft hit bird. Leading edge of right wing was damaged.

ov1 **Class E mishaps** ☐ (D series) Hydraulic pressure indicator went to zero when gear handle was placed in down position. Pilot activated emergency landing gear release and landed. Caused by ruptured hose assembly speed board actuator. ☐ (D series) Right oil temperature gauge needle began rotating 360° during flight. Caused by failure of oil temperature transmitter.

u21 **Class E mishaps** ☐ (A series) When landing gear was raised after takeoff, nose gear green light would not extinguish. Caused by failure of toggle switch. ☐ (A series) Crew noticed landing gear was bumping during taxi for takeoff. Loose gear wheel was caused by failure of outboard wheel bearing.

Maintenance

uh1 **Class E mishaps** ☐ Six muffled bangs were heard, and aircraft yawed left and right during hover for takeoff. Caused by out-of-adjustment bleed band. ☐ Master caution and hydraulic lights came on, and complete loss of hydraulics occurred. Chafing hydraulic line was not seen during previous inspections and maintenance. ☐ Low fuel light came on during runup, with 1,275 pounds of fuel indicated on gauge. Cover on sending unit was improperly installed, cutting "hot" wire to sending unit and causing light to illuminate. ☐ Pilot saw mist coming from battery vent during flight. Voltage regulator was set too high.

th55 **Class E mishap** ☐ Aircraft developed high frequency vibration in flight. Tail rotor blade cracked when trapped moisture froze, expanded, and caused skin separation. Maintenance did not position blades properly or install protective covers.

Messages received

- Safety-of-flight message concerning grounding of CH-47A, B and C aircraft (CH-47, 1980-03, 072300Z Mar 80). Summary: Materiel failure has been indicated in a CH-47C fatal accident. This message grounds all CH-47A, B, and C aircraft until further notice. Contact: Ron Desplinter or Bill Readhead, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

- Safety-of-flight message concerning one-time inspection of CH-47A/B/C combining transmission, CH-47-1980-4, 142300Z Mar 80. Summary: This message supersedes SOF message CH-47-1980-3. Investigation has revealed overstress of phasing arm bolt. A team using special equipment and replacement parts will inspect and repair transmissions as required. Contact: Ron Desplinter or Bill Readhead, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

- Maintenance information message concerning replacement of attaching screws in access doors of U-21, RU-21, and JU-21 aircraft, U-21-80-03, 111810Z Mar 80.

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

Does OH-6 have OH-58 problem?

The article in the 5 March 1980 issue of FLIGHTFAX on loss of engine and rotor rpm in OH-58s prompted many of you to ask if this is a problem in OH-6s. The answer is no. This has not been identified as a problem in the OH-6. ■

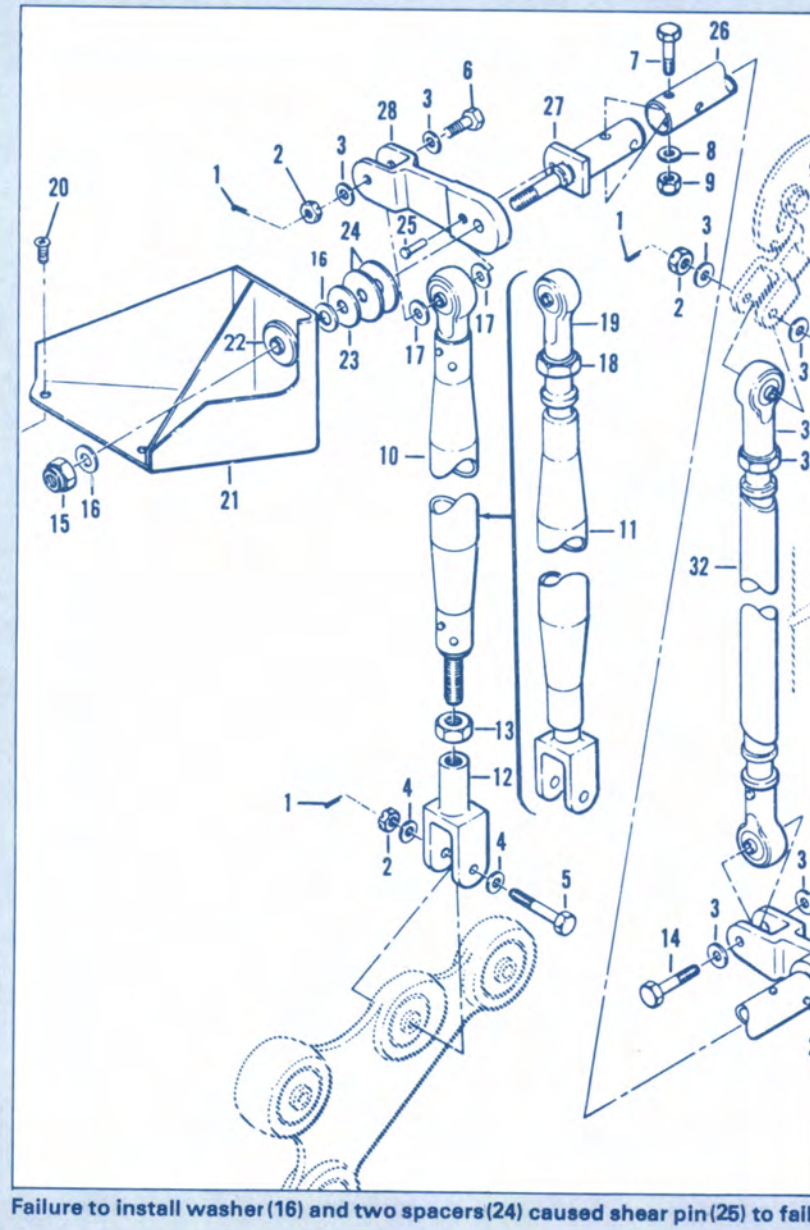
By-the-book maintenance essential

During a recent preflight inspection of a UH-1, the shear pin that transfers movement from the bellcrank (NSN 3040-00-181-3184, P/N 205-060-751-3) to the shear fitting (NSN 1560-00-968-4688, P/N 205-060-752-1) was found sheared.

The pin failed because of excessive clearance between the bellcrank and the shear fitting. Inspection of the assembly revealed that one washer (NSN 5310-00-141-1795, P/N AN 960-416) and the two required shims (NSN 5365-00-708-2255, P/N 204-060-751-1) were not installed. Consequently, abnormal loads imposed on the shear pin caused it to fail and prevent operation of the droop cam compensator.

Instructions contained in TM 55-1520-210-23-1 are both clear and specific as to proper hardware installation and clearance required. It is essential that supervisors and TIs impress mechanics with the need to perform all maintenance BY THE BOOK.

Thanks to SFC A.C. Starling, aviation safety NCO, Hq III Corps, Fort Hood, for sharing this information with our readers. ■



Failure to install washer (16) and two spacers (24) caused shear pin (25) to fail.

Stacom

Questions and answers

Question: If I meet all of the AAPART requirements as outlined in the Aircrew Training Manual (ATM), would I also meet all of the flight requirements for entitlement to flight pay?

Answer: If you think so, you may be in for a rude awakening. There are too many variables to the answer to address in a column of this size. Suffice it to say that the ATMs determine training requirements while the DOD Pay Manual determines eligibility for "flight pay" under the provisions of the Aviation Career Incentive Act of 1974. To be certain of your position, we strongly recommend that you see your Finance and Accounting Officer.

Question: I keep hearing reference to emergency procedures training and to nonstandard maneuvers. Is one term preferable to the other, or are the two interchangeable?

Answer: Inasmuch as emergency procedures training has been standardized, there should be no maneuver which could be classified as "nonstandard." The correct terminology is emergency procedures training. The two terms are not interchangeable. ■

Life and death courtesy

Department of the Army flight standardization SIPs have noticed that many Army aviators, while turning on communication radios, turn to the transmit and receive position, rather than transmit, receive and guard position. When asked why, the most common reply is "There's always so much garbage on guard that I don't monitor it."

Because of training and mission requirements, there are situations in which we may not wish to monitor guard. However, as a matter of course, not monitoring guard seriously hampers the purpose of the emergency frequencies. Due to the range, interference, and radio wave patterns inherent in current radios, it is possible that our aircraft may be the only station able to receive a call from an aircraft in distress; and, if we aren't monitoring guard, the resulting delay of a search and rescue effort could prove fatal.

Check your unit operational SOP to see if this area is covered. We encourage all aviators to accept the occasional discomfort of radio interference so the individual who has a real need to use his emergency frequency will know the frequency is being monitored. ■

UH-1H idle rpm

STACOMs #33, 18 October 1978, and #50, 28 November 1979, pointed out that the requirement for maintaining engine idle above 5500 rpm had been removed from the operators manual. The following CAUTION in Change 2, TM 55-1520-210-10, dated 27 December 1979, reintroduced the idle restriction during engine start and shutdown.

CAUTION

Maintain N_2 speed of 5500 rpm or greater when ground run time exceeds that required for normal checkout procedures.

Questions regarding the change should be directed to Mr. Frank Stevens, TSARCOM, AUTOVON 693-1764. ■

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.

Analysis or overhaul?

Recently, the engine of a UH-1 involved in a mishap was shipped to Corpus Christi Army Depot (CCAD) for teardown analysis. But the engine was never analyzed. Instead, it was overhauled—because it had been improperly labeled.

During FY 1979, approximately 15 exhibits submitted to CCAD for analysis underwent a similar fate. And for the same reason. Yet, AR 95-5, paragraph 10-5, teardown and analysis, clearly describes the procedures that must be followed when exhibits are submitted for analysis. When these procedures are not followed, time, effort, and money are wasted, and valuable information is lost.

The cure is simple. Stick to the procedures stipulated in AR 95-5 when shipping exhibits for analysis. This includes following instructions for properly preserving, tagging, and packaging exhibits to prevent further damage. Also, be sure to dispatch an after-the-fact multi-addressee message to the commander of TSARCOM; the commander of USASC; the applicable theater/command aviation safety officer; and the commander of CCAD, as required by AR 95-5.

If it's analysis—not overhaul—that you want, then heed the instructions in paragraph 10-5 of AR 95-5. And take the time to view training film, TF 46-4942, "Aircraft Accident Investigation—Teardown Analysis." That is the answer. ■

CDR, CORPUS CHRISTI ARMY DEPOT
CORPUS CHRISTI, TX 78419
TSARCOM SRA 5-3723
PURPOSE CODE A, CCF
ACFT ACCIDENT INVES EXHIBIT
SPECIAL HANDLING REQUIRED
EXPEDITE—AR 95-5
USASC CONTROL NO _____

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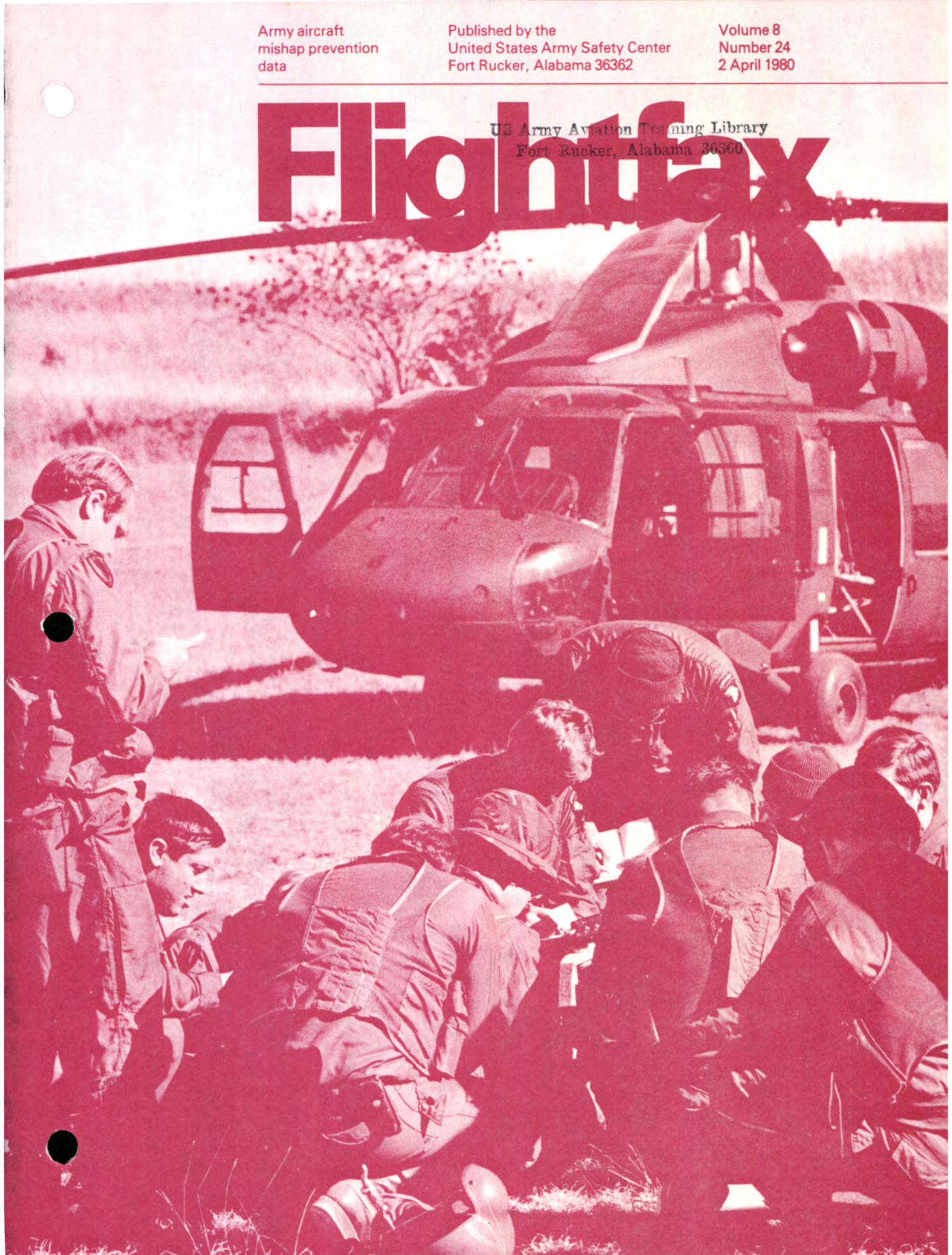

Followups

Additional information on mishap briefs previously published

uh1 **Class A mishap** in 22 August 79 issue (7964) ☐ Rpm warning light and low rpm audio activated during ground controlled approach. Pilot lowered collective and made low power approach to ground. Aircraft landed hard and bounced, and main rotor blades hit ground. Pilot was late in applying control inputs necessary to arrest aircraft's rate of descent and achieve near-level attitude upon touchdown.

Class A mishap in 22 August 79 issue (7963) ☐ During NOE deceleration maneuver, pilot slightly lowered collective while pulling aft cyclic abruptly, causing aircraft to pitch nose up and rotate around main rotor instead of tail rotor. Tail rotor hit ground and separated, and aircraft came to rest on its left side. IP allowed pilot to attempt NOE deceleration maneuver at an altitude which did not permit timely corrective action. Pilot had just completed two NOE decelerations using the proper technique, but allowed aircraft to unmask excessively.

Class A mishap in 31 October 79 issue (8003) ☐ During takeoff to hover from level ground, aircraft rolled over on right side and main rotor hit ground and separated. Aircraft came to rest inverted. Pilot did not detect abnormal roll rate because he tried to take off and clear the aircraft simultaneously. This resulted in inadequate visual cues and probably an inadvertent right lateral cyclic input when pilot turned his upper torso to the right to clear the aircraft. Pilot was not expecting a roll rate to develop because he was not aware that rollover could occur during normal takeoffs from level ground. Improper adjustment of tail rotor pitch change links resulted in a reduction of available right pedal, causing an increased right rolling moment with the right skid on the ground during takeoff.

7964

8003

7963

ch47 **Class A mishap** in 1 August 79 issue (7955) ☐ Aircraft was offloading equipment in drop zone and had just landed from hover when cargo parachute inflated to right rear of aircraft. Parachute was pulled into aft rotor system, causing rotor systems to dephase, resulting in blade meshing. Aircraft caught fire and was destroyed.

ch54 **Class A mishap** in 17 October 79 issue (7977) ☐ Main rotor blade separated from aircraft, and aircraft rolled right, caught fire, and crashed inverted. Failure of corroded horizontal hinge pin on main rotor head caused main rotor blade to separate.

7977

oh58 **Class A mishap** in 14 November 79 issue (8005) ☐ While flying aerial reconnaissance mission, aircraft hit two communication cables suspended about 150 feet agl across narrow valley and crashed through trees, coming to rest on slope. Pilot was apparently flying too low and too fast for the flight mode and surrounding terrain.

Class A mishap in 14 November 79 issue (8006) ☐ Pilot placed aircraft in out-of-ground-effect hover with left rear quartering tailwind. Wind force was sufficient to cause loss of tail rotor authority, resulting in right spin and subsequent crash. Low altitude did not permit recovery.

ov1 **Class A mishap** in 14 November 79 issue (8007) ☐ As aircraft was flying in moderate icing conditions, SIP saw flames coming from exhaust of No. 2 engine after aircraft had yawed to right. No. 2 engine was secured. About 30 seconds later, sparks were seen coming from No. 1 engine exhaust, and engine failed. Crew tried to restart No. 2 engine, without success. Crew ejected and aircraft crashed and burned. Failure of No. 2 engine first-stage compressor blades was caused by FOD (possibly ice). No. 1 engine power loss was caused by failure of primary planetary gear bearing.

ah1 **Class A mishap** in 19 September 79 issue (7974) ☐ Rated student pilot failed to maintain sufficient rotor rpm during turn to final, and aircraft hit trees and crashed. IP was late with corrective action and was unable to control direction of flight or make power recovery. ■

7974

Selected mishap briefs

uh1

Class C mishaps ☐ As aircraft was flying troop extraction mission 30 minutes after sunrise, chin bubble hit tree, cracking bubble. Suspect combination of airspeed (70-80 knots), altitude, visibility (overcast sky with intermittent rain), and treetops blending with background contributed to mishap. ☐ Aircraft was being hovered to parking spot marked by one sandbag for nose of aircraft. As pilot turned aircraft, it drifted rearward. Tail rotor tip hit power cable and multi-strand support cable 79 feet from sandbag. Pilot had inadvertently turned off intercom system by flipping switch down on C-1611 box. Transmit selector switch was set on No. 4, FM, eliminating internal crew communication. As a result, pilot did not hear warning from crew chief before hitting wires. ☐ Windshield cracked when buzzard flew into it while aircraft was in cruise flight.

Class E mishaps ☐ During terrain flight takeoff, as aircraft reached tree line, main rotor blade hit upper 3 feet of tree to left of pilot. Pilot did not use proper scanning technique and pay attention to detail during takeoff. ☐ Pilot tried to start aircraft with main rotor tiedown still attached. Tiedown weights hit tail rotor. ☐ Crew smelled smoke while flying in rain. Caused by failure of windshield wiper motor due to age and lack of use. ☐ Engine rpm fluctuated during hover. Caused by malfunction of fuel control. ☐ Master caution light came on during hover. Caused by failure of hydraulic pressure switch. ☐ Crew smelled fuel and landed. Aircraft had been refueled 15 minutes before. Fuel was being dumped overboard from auxiliary tank and was spreading along fuselage. Tank vented due to pressure altitude.

ah1

Class C mishaps ☐ Main rotor blade hit small tree as pilot was maneuvering aircraft into firing position. One rotor blade was damaged. ☐ One main rotor blade hit tree as pilot was hovering under powerlines.

Class E mishaps ☐ Pilot felt collective binding on final approach. Caused by crack in feather bearing race where it is bonded to main rotor grip. ☐ Loud popping sound was heard and aircraft yawed left 30° in flight. Caused by broken wires 2 inches from cannon plug on yaw SCAS actuator. ☐ Oil pressure went to 130 psi and then fluctuated to 150 psi. Caused by failure of engine oil pump. ☐ Rpm audio and light activated, and N_2 tachometer went to zero. Caused by sheared generator shaft. ☐ As aircraft was hovering in small valley, foward edge of pylon compartment hit wires. Poles supporting wires were hidden by vegetation on both ends.

ch47

Class E mishaps ☐ No. 1 engine high side beep trim failed during hover. N_2 control box was replaced. ☐ Crew chief informed pilots of leaking utility hydraulic pump. Smoke then filled aircraft. Caused by O-ring failure.

oh6

Class E mishap ☐ During engine runup, crew noticed no reading on torque gauge and break in torquemeter line. Suspect line was broken by logbook hitting line during removal from logbook holder after previous flight. Darkness may have made torque line hard to see during removal of logbook from holder and during postflight inspection after first flight.

oh58

Class B mishap ☐ Aircraft lost power at 150 feet and 30 knots. Pilot tried to make downwind landing on side of hill. Aircraft was landed with partial power and began sliding because of mud and steep slope. Pilot rolled off throttle, but aircraft continued to slide into trees. 8033

Class C mishap ☐ Aircraft was on multi-stop courier mission. Courier was strapped in aircraft in right rear seat. At one stop, courier opened the door to exchange packets, but did not exit aircraft. Courier unbuckled seatbelt at the stop and did not refasten it. Door was closed with seatbelt hanging outside. Pilot noticed damage to side of aircraft at the next stop. Pilot failed to check seatbelt in accordance with before-takeoff check.

Class E mishaps ☐ Nose of aircraft rose slightly during slope landing, and aircraft drifted to left. Left rear skid hit ground, and spike knock occurred about three times. IP took control and landed. ☐ During NOE dash at 50 knots, flock of birds flew up in front of aircraft. One bird hit OAT gauge probe, causing two cracks on pilot's windscreen. ☐ Master caution and fuel filter lights came on during pretakeoff check. Caused by failure of differential pressure sensing switch. ☐ Engine oil temperature gauge showed high reading. Temperature fluctuated between 70° and 140° F. and then peaked at 140° F. Caused by failure of gauge.

th55 **Class E mishaps** ☐ Grease was lost from rotor drive shaft during takeoff. Caused by failure of grease fittings. ☐ Clutch would not disengage during shutdown. Caused by malfunction of clutch actuator. ☐ Binding lateral cyclic movement during hover was caused by cyclic slider link deficiency.

c12 **Class E mishap** ☐ (C series) Loud noise was heard during climb. Altitude warning light came on, and pressurization controller showed rapid decompression of cabin. Postlanding inspection revealed failure of upper lock roller bearing pin. This allowed door to move outward enough so that door pneumatic seal was blown to outside of fuselage.

t42 **Class C mishap** ☐ During touchdown, IP was using differential power settings because of crosswind. Left wheel touched down first, and then right wheel touched down. Almost immediately, right wheel came back off ground slightly and then settled back down. There was no indication at any time that propeller had hit ground. Flight line attendant noticed curled propeller tips. Crosswinds, which varied greatly from those reported, raised right wing after touchdown and contributed to prop striking runway. **Note: Differential power is not an approved procedure for crosswind landings.**

Class E mishap ☐ Fluctuating fuel pressure on No. 1 engine was caused by malfunction of fuel distribution valve.

u21 **Class E mishaps** ☐ (A series) No. 1 engine was at high idle to start No. 2 engine during ground runup. When fuel control lever was reduced to low idle, No. 1 engine remained at 70%. Power lever was advanced to 80% and then reduced to idle. No. 1 engine N_1 slowly decreased to 72%. Caused by internal fuel control malfunction. ☐ (A series) Inverter failure during cruise flight was caused by electrical short circuit at pilot's attitude indicator. ☐ (H series) No. 1 engine was shut down in flight to check propeller for full feathering. Propeller feathered properly, but engine could not be restarted. Failure of No. 2 engine reverse current cutout diode caused No. 2 generator to drop off line, leaving insufficient voltage for restart.

(continued on next page)

Army aircraft mishap classification criteria

Class A
- A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
- An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or
- A fatality occurs as a result of Army operations.

Class B
- A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C
- A mishap in which the total cost of property damage is at least $300 but less than $50,000; or
- An injury or occupational illness resulted in a lost workday case involving days away from work.

Class D
- A mishap in which the resulting cost of property damage is less than $300; and
- An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays.

Class E
- A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
- There was no injury or occupational illness, or injury resulted in first aid only.

Mishap briefs

Maintenance

uh1 Class E mishaps

☐ Pilot noticed intermittent lateral surges in cyclic and pedals during flight. Postflight inspection revealed wire bundle chafing control tubes. ☐ Vapor from battery vent during landing was caused by improper adjustment of voltage regulator at time of battery installation. ☐ N_1, torque, and N_2 fluctuated during takeoff. Inspection revealed hose rubbing on inlet guide vane actuator rod, restricting movement of guide vanes. Variable inlet guide vanes were out of rig. ☐ Binding in antitorque pedals during landing was caused by out-of-adjustment tail rotor servo hydraulic line. ☐ Master caution light flickered continuously, with no segment light. About 6 months before, crew chief snipped off tip of wire because of fraying. Shortened wire rubbed on adjacent structure and shorted out. ☐ Compressor stalls and rpm fluctuation during hover were causd by out-of-adjustment bleed band. ☐ During runup, crew chief noticed hydraulic sight gauge was empty and saw hydraulic fluid leaking out through hellhole. O-rings on top and bottom fluid pressure line bolts on collective irreversible valve were not the correct size.

c12 Class E mishap

☐ Light in gear handle remained on when gear was lowered. Tower personnel said gear appeared to be down, and aircraft was landed. Light would not go out because one terminal on a diode on terminal board was bent slightly, allowing terminal to touch aircraft frame.

Messages received

• Safety-of-flight message concerning one-time inspection of attaching hardware of lever assembly (AH-1-80-04, UH-1-80-02, 192015Z Mar 80). Summary: The cause of a recent catastrophic mishap was attributed to the loss of a bolt connecting the vertical rigid connecting link, otherwise known as push-pull tube or tube assembly, to the lever assembly at the bottom of the lateral cyclic servo. This message provides revised inspection and attachment hardware criteria for the four attaching bolts/screws of the lever assembly used on the bottom of the fore and aft cyclic, lateral cyclic, and collective servos on all series AH-1 and UH-1 aircraft. Contact: Dick Moody, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Message concerning defective UH-1 window panels (141400Z Mar 80). Panels found defective because of inability to remove protective coating should be shipped to Corpus Christi Army Depot, marked for TSARCOM mission account.

• Maintenance advisory message concerning inspection of UH-60A tubeless tires (UH-60A-80-7, 051400Z Mar 80). Message contains maintenance criteria for rejection of a tire due to wear.

• Maintenance advisory message concerning UH-60A left relay panel (UH-60A-80-8, 111400Z Mar 80).

• Maintenance advisory message concerning special inspection for UH-60A main rotor spindle inner race and bonded liners (UH-60A-80-11, 221830Z Mar 80).

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

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Student pilots were on a night training mission to practice landing in a tactical zone under minimum lighting conditions. Pilots disregarded verbal orders and attempted an approach to the flarepot-illuminated field without establishing radio contact with ground personnel. Approach was made under bright moonlight conditions. Pilots misjudged aircraft altitude and flew far below proper glide angle. Aircraft hit wire 36 feet above ground about 2,700 feet short of field. Flight surgeon noted during examination of wreckage that FM radio was not set on correct frequency.

☐ Pilots had landed at dusty, unimproved field site. When ready for takeoff, pilot lifted aircraft to hover and gradual loss of rpm occurred. Pilot lost visual reference with ground due to dust, but was able to land aircraft. Pilot then decided to make another attempt at takeoff without lightening his load. The same conditions resulted again, and, as pilot tried to set aircraft down, rotor blades hit a truck parked nearby.

Recommended changes to pubs

Your responsibility!

A few months ago, an OH-58 pilot lost antitorque control of his aircraft when forward movement of the left pedal suddenly became restricted. The aircraft spun during descent, and the main rotor blades hit the ground, causing the aircraft to settle on its right side. This mishap resulted from improper maintenance procedures during replacement of the tail rotor pitch change control tube.

Recently, OH-58 pilots at one Army installation experienced a rash of engine problems. In some instances, engines lost power; in others, engine flameouts occurred. Investigation revealed clogged fuel filters. However, in none of these instances did the fuel filter caution light come on to alert the pilot before the emergency.

A check showed the fuel filter pressure switch in each of the affected aircraft was not working properly. Yet, these switches are supposed to be functionally tested every 300 hours of flight. Why, then, weren't the defective ones identified and replaced? Again the problem appears to be the result of improper maintenance.

But don't be too hasty in pointing an accusing finger at the mechanics involved. The truth of the matter is that the TM instructions in both of the above maintenance areas were found to be either inadequate or improper—and confusing, to say the least.

Following prescribed TM procedures would **not** have resulted in **correct** removal and replacement of the control tube (with the assembly installed on the aircraft). Change 9, dated 13 December 1979, to TM 55-1520-228-23-1 has since corrected this TM discrepancy.

However, the fuel filter pressure switch problem area has not yet been resolved in the TM. In this case, the procedure for functionally checking the switch, paragraph 9-156b, page 9-47, TM 55-1520-228-23-1, is **correct**. The problem arises in locating the switch. A mechanic who is inexperienced on the OH-58 and tries to follow the instructions in paragraph 9-155 will find himself checking the boost pump fuel pressure switch—not the fuel filter pressure switch which is located at the lower firewall beneath the engine. This switch is correctly depicted as item 7, figure 4-1, page 4-1, TM 55-1520-228-23-1.

Yet, while mechanics, TIs, supervisors, OH-58 maintenance instructors, and others had to be aware of these discrepancies in the current TM, no one bothered to submit a DA Form 2028 (Recommended Changes to Publications and Blank Forms) or a DA Form 2028-2 (Recommended Changes to Equipment Technical Manuals). These forms are both readily available and simple to complete.

Every aviation unit has, or should have, an ample supply of DA Forms 2028. But if your unit should be temporarily out, no sweat. Check your TMs. For example, in the front portion of TM 55-1520-228-23-1 (page i), you will find instructions for reporting errors and recommending improvements as well as the address to which these reports are to be mailed. In back of the TM—next to the rear cover—you will find blank copies of DA Form 2028-2, along with a sample form. These forms are preaddressed and need only to be completed, folded, and mailed.

Already one class A mishap and several in-flight emergencies have occurred because no one took the initiative to report known errors contained in a maintenance manual. Undoubtedly, other errors exist in this and other TMs. If you are aware of any, take the time to let the right folks know. Submit either a DA Form 2028 or a 2028-2. ■

OH-58 fuel filter pressure switch check

Recently, OH-58 pilots in one Army aviation unit experienced a rash of in-flight emergencies. All involved the engine. In some instances, engines lost power; in others, flameouts occurred.

The cause was traced to clogged fuel filters. However, in none of these instances did the fuel filter caution light come on to warn the pilot. Inspection revealed the fuel filter pressure switches involved were not working properly, despite the fact that they are supposed to be functionally checked every 300 hours of flight.

The problem stems, in part, from inexperienced mechanics following **prescribed** TM procedures. While the procedures are correct, instructions for locating the **fuel filter pressure switch** are **wrong** (yes, our maintenance "bibles" sometimes do contain errors). Consequently, a mechanic following the instructions outlined in the current TM 55-1520-228-23-1 for checking the fuel **filter** pressure switch may very well find himself testing the fuel **boost pump** pressure switch instead.

More specifically, the procedure for functionally checking the fuel filter pressure switch, paragraph 9-156b, page 9-47, TM 55-1520-228-23-1, is **correct**. However, the instructions in paragraph 9-155 for locating this switch are in error. This switch is located at the lower firewall beneath the engine and is **correctly** shown as item 7, figure 4-1, page 4-1 of the manual.

A change will soon be published to correct this TM discrepancy. Meanwhile, make sure all your OH-58 mechanics are aware of the problem and know the cure. ■

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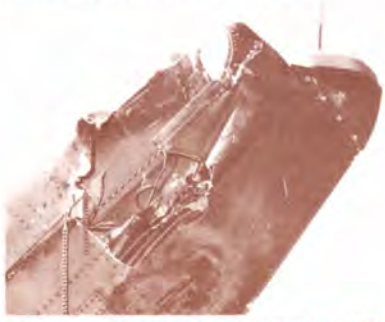
Recordkeeping . . . anything but a ho-hum job

We all know what the results can be when mechanics fail to follow TM procedures during maintenance. Or when inspections are not thorough. Or where a lack of supervision exists in a unit. Consequently, we concentrate our efforts in these and other areas that are obvious threats to safe operations. However, few of us give much thought to another phase of operations—a phase that can affect safety just as critically as any of the above. We call it recordkeeping.

As a recordkeeper, your job may seem routine and unimportant, lulling you into a complacent, ho-hum attitude. But, actually, your job is anything but a menial task. Why? Because whether you realize it or not, poor recordkeeping has a direct impact on flight safety.

As remote as this possibility may seem, failure to maintain accurate records has resulted in serious mishaps, some of them catastrophic. To give you a glimpse of the importance of keeping good records, let's review the results of only a few cases involving record errors.



Because of poor recordkeeping, IP was not aware that helicopter was out of c.g. Vertical fin was damaged and 90-degree gearbox separated when tail rotor hit ground.

• A Chinook pilot was on approach to a runway about 1 ½ miles away when the transmission light flickered. Fortunately, instead of continuing the approach, he immediately made a precautionary landing. As the helicopter touched down, the combining transmission exploded and the helicopter caught fire. All occupants exited without injuries.

This mishap was caused by failure of the combining transmission assembly from fatigue cracking in the spiral bevel gear. There is some indication that the cause of the fatigue was fretting corrosion which resulted from improper design of the bevel gear connection to the gear shaft flange. However, an indepth investigation revealed an error in the aircraft historical records. The DA Form 2408-16 showed that the transmission had one overhaul and was due a 400-hour depot inspection. Yet, a check of other records revealed that the transmission had never been overhauled and was 20.4 hours past the overhaul schedule, exceeding the maximum allowable operating time. Although this error did not directly contribute to the materiel failure, it is highly probable that had the error not been made in the records, the mishap would never have occurred, as the time between overhaul would not have been exceeded.

• A UH-1 pilot and IP were on a training flight when the tail rotor hit the ground during an NOE deceleration. This mishap occurred because the pilot applied too much aft cyclic for the amount of collective pitch and failed to maintain enough altitude for the tail rotor to clear the ground.

During the investigation, several noncontributing factors were found in the unit's recordkeeping procedures. For instance, the unit had removed the armored seats weighing 260 pounds and had replaced them with lightweight seats and ballast weighing 224 pounds. This seat change was not entered on the records, and when the aircraft crashed it was not within c.g. limits.

Several discrepancies were found in the unit's maintenance records. Unauthorized personnel were performing aircraft ground operational checks and the nonrated maintenance officer was not school-trained in aircraft test procedures. Neither of the two assigned technical inspectors was school-trained. In addition, many errors were found in the 2408 series forms.

Several discrepancies were also found in the pilot's and IP's training records. The IP had not completed NOE ground training as required by FM 1-1, and numerous required entries were missing on the major command's individual aviators' training records. Furthermore, the unit training records did not reflect

necessary changes as required by Change 2 to TC 1-135.

• The cause of a recent CH-47 ground mishap was attributed to dephasing of the combining transmission. This same transmission had been installed earlier in another CH-47 which was also involved in a phasing-related ground mishap. The first mishap was not caused by a failure of the combining transmission but resulted from improper maintenance procedures when phasing the rotor system.

After the first mishap, the transmission was removed from the aircraft and sent to the overhaul facility through normal supply channels. This was appropriate except for one thing—the transmission was not identified on the historical record (DA Form 2408-16) or any of the accompanying paperwork as having been involved in an accident, and it was not coded as accident damage on DA Form 2410. The transmission was only 5 hours out of a previous overhaul so there appeared to be no reason to completely overhaul it. Therefore, the overhaul facility upgraded the transmission to a -8 in accordance with current work orders, completed a functional operational check, and sent it back to the field where it was installed in another aircraft with a broken bolt in the phasing lock handle of the transmission.

The second mishap occurred during the 30-minute ground run maintenance operational check (MOC) for the replacement of the transmission. During this MOC, the combining transmission dephased, causing the main rotor blades to mesh. Furthermore, the aft transmission of the aircraft involved in the first mishap was later found in another aircraft and was removed before another mishap could occur.

This mishap was the direct result of inadequate historical records. Combining transmission was removed from one damaged aircraft and installed in this one. Transmission dephased, causing main rotor blades to mesh.

As you've seen, inaccurate recordkeeping is a threat to flight safety. The sad fact is that these types of errors usually do not show up until after a mishap occurs.

Although recordkeepers have the prime responsibility of seeing that entries are accurate, the buck does not stop on their desks. Keeping accurate records requires a concentrated effort on the part of technical inspectors, supervisors, ASOs, and maintenance officers. They must get involved and insure that recordkeepers realize the importance of their jobs by stressing the fact that a seemingly insignificant error can create a life or death situation for aircrews. Recordkeepers must be made to realize that their jobs are just as important to safety as those of maintenance personnel or aircrews.

As a beginning, each unit would do well to see that this article is widely circulated among recordkeepers. And, perhaps, a prime question recordkeepers should ask themselves is: "Could I face myself if I knew that an error on my part caused a mishap and/or loss of lives?" ■

T53 fuel control—to grease or not to grease?

Recently, the No. 2 engine of an OV-1 failed during a training flight. Because of high density altitude coupled with an aircraft gross weight of 16,500 pounds, the aircraft could not maintain altitude during single-engine operation. Consequently, the pilot jettisoned the external fuel tanks and returned to his home station where he made an uneventful landing.

In another instance, the engine of a UH-1 failed as the pilot pulled pitch to perform a HIT check. Again, no injuries or aircraft damage resulted.

However, two other pilots were not as fortunate. They were flying over a wooded area when the engine of their UH-1 failed without warning. The aircraft was landed in the trees and came to rest on its left side, with substantial damage to all components. Both pilots escaped with minor injuries.

In all three instances, the cause of engine failure was the same—failure of the engine-driven fuel pump as a result of inadequate lubrication of the fuel control drive shaft.

Inadequate lubrication resulted from the application of grease to the drive shaft gears and mating splines when the fuel control units were installed on accessory drive gearboxes that were intended to be internally lubricated with **engine** oil. In each instance, the grease hardened and clogged the oil ports, restricting lubrication of the shaft, causing wear. The wear particles mixing with the grease further aggravated the situation by forming a grinding compound, increasing wear while further restricting oil flow to the shaft. The end result was worn and stripped gears and splines—and, ultimately, engine failure.

Yet, the solution to the problem is a simple one. It begins with the identification of accessory drive gearboxes installed on the engines to determine whether or not they are internally lubricated by engine oil.

When installing fuel control units on accessory drive gearboxes that are **not** internally lubricated, the male splines of the drive shaft should be coated with either Plastilube Moly No. 3 or Multi-Fax EP2. In addition, the accessory drive gearbox fuel control drive gear shaft mating splines should be packed two-thirds full with the same lubricant.

Grease on gears and splines of fuel control units installed on internally lubricated gearboxes resulted in clogged oil ports, wear, and engine failures.

However, when accessory drive gearbox 1-080-250-13, -14, or -16 is installed, **neither** of the above lubricants should be used on the fuel control drive shaft or on the female splines. This applies to **all** T53 engines regardless of series. These gearboxes are internally lubricated by engine oil and no type of grease is to be used on the gear splines. In addition to the identifying number on their respective data plates, these gearboxes can be readily identified by the additional dowel pin on the fuel regulator mount pad. This pin, by the way, must **not** be removed.

In short, heed the following:

CAUTION

Do **not** use Plasti-Lube Moly No. 3 or Multi-Fax EP2 or **any** hand-applied lubricant on splines of fuel regulator drive shaft and accessory drive gearbox fuel regulator drive gear shaft mating splines when accessory drive gearbox 1-800-250-13, -14, or -16 is installed. Fuel regulators installed on these gearboxes must be installed with clean, dry splines.

It's been said that the primary purpose of propellers and rotor blades is not to provide thrust but to keep the pilots cool—just let them stop and watch the pilots sweat. So, if you want to keep these airfoils churning under power and the temperature in the cockpit low, make sure your maintenance is up to par. ■

Update on engin fuel controls

The T53-L-13B engine fuel controls, model TA-2S, are used on UH-1H/M, EH-1H, AH-1G, and TH-1G helicopters. TSARCOM has imposed operational restrictions and special inspections as a result of problems with the fuel controls. The following messages apply:

• Safety-of-flight message, operational number UH-1-79-5 and AH-1-79-4, for UH-1H/M, EH-1H, and AH-1G/TH-1G aircraft (131830Z Apr 79).

• Technical information message UH-1-79-6 and AH-1-79-5 for UH-1H/M, EH-1H, and AH-1G/TH-1G aircraft (270003Z Apr 79).

• Technical advisory message UH-1-79-11 and AH-1-79-13 for UH-1H/M, EH-1H, and AH-1G/TH-1G aircraft (231355Z Jul 79).

The problem which made these messages necessary is elongation of the P1 bellows. The elongation is caused by hydrogen gas generated by a chemical reaction of silicone oil inside the bellows with solder flux used to attach the bellows to the base plate. The P1 multiplier assembly of which the bellows is a part provides barometric pressure compensation to bias fuel flow to the engine for altitude and pressure variations. When the bellows elongates it causes a lean metered fuel flow during acceleration schedules. This can cause partial power loss or flameout.

The procedures and restrictions prescribed in the safety-of-flight/advisory messages will insure that the bronze P1 bellows is operating properly. Units should continue to follow this guidance until a long-term solution is available and the messages are cancelled.

The long-term solution is to change the bellows material from bronze to stainless steel. In addition, other parts will be installed to convert the model TA-2S to the TA-7 (P/N 100770A4) fuel control during depot overhaul at CCAD. The model TA-7 fuel control is now used on the T53-L-703 engines.

The depot conversion program will start in May 1980. Deliveries will start in June 1980 at an initial output of 76. The output rate will build up to 200 per month by January 1981. All fuel controls will be standardized to the TA-7 configuration by January 1983. Issue of the new fuel controls will be controlled on a basis of priorities established at DA.

In the meantime, we cannot emphasize too strongly how important it is to follow the TSARCOM messages listed above.

Point of contact at TSARCOM is Mr. Lawyer, AUTOVON 693-0396. Point of contact at the Safety Center is Mr. Jack Carter, AUTOVON 558-3913. ■

—from USATSARCOM Information Bulletin

OHR reveals maintenance problem

An Operational Hazard Report brought the following maintenance problem to our attention:

During preflight of a UH-1H, it was found that the IR suppressor shield for the oil cooling fan was missing. It is the belief of the safety officer that the shield separated in flight. An inspection of other aircraft in the organization revealed inconsistencies concerning the type of fastening devices used to secure the suppressor shield.

TM 55-1520-210-23 P1, page 529, figure 107A, items 1, 2, and 3, gives the correct installation of the oil cooler fan IR suppressor shield. The correct fasteners for installing the oil cooler shield assembly are:

• Bolt, machine: NSN 5306-00-274-2119
• Washer, flat: NSN 5310-00-167-0753
• Nut, self-locking: NSN 5310-00-807-1474

There are no substitutes.

ASOs and maintenance officers, check your fleet of UH-1H aircraft to see if they have the correct fasteners on the oil fan IR suppressor shield. You may prevent a mishap. ■

Selected mishap briefs

uh1

Class C mishaps ☐ Aircraft hit tree during contour flight at 90 knots. Left chin bubble was broken. Aircraft was flying into rising sun, resulting in reduced visibility. Pilot was flying too low and too fast for existing conditions. ☐ Helicopter was hovering on taxiway. After passing Cessna 172, it continued forward for about 200 feet to land. Strong winds with gusts carried rotorwash back to Cessna and tipped Cessna on its right wing.

Class E mishaps ☐ Postflight inspection revealed dents in main rotor blades. Aircraft had been operating in confined areas. Suspect tree strike. ☐ Pilot heard low rpm audio, lowered collective, selected landing area, and established autorotation with power still full on. Cross reference of instruments indicated N_2 tachometer failure. Pilot continued to landing site and terminated with power. Caused by failure of N_2 tachometer generator. ☐ Unforecast snowstorm forced six UH-1s to land. Flight continued the next day. ☐ Hydraulic light came on, and complete loss of hydraulics occurred. Postlanding inspection revealed teflon on clamp was worn, allowing metal on clamp to chafe hose. ☐ Aircraft vibrated severely when power was reduced on base leg for landing. Control inputs were difficult to impossible, requiring assistance of crew chief in pedal stabilization. Cyclic inputs required two hands. After aircraft was landed, it was discovered that red main rotor blade had separated about 5 feet from outboard end. ☐ While on night cross-country flight, aircraft encountered weather conditions below VFR minimums and landed. Mission was continued after 7 hours on the ground.

uh60

Class C mishap ☐ As aircraft was hovering over landing area, small stone hit pilot's windscreen, causing large crack.

ah1

Class E mishaps ☐ Engine oil pressure light came on during runup. Caused by failure of pressure switch. ☐ Unusual main rotor blade vibration developed in flight. Pylon transducer was replaced. ☐ Master caution light came on. Caused by malfunction of master caution panel. ☐ Engine chip detector light came on during hover. Oil samples revealed excessive metal. Engine was replaced. ☐ Engine oil pressure light came on. Caused by failure of oil pressure gauge.

ch47

Class E mishaps ☐ Pilot, making a system check in flight, noticed that transmission temperature gauge, when put in mixing position, was reading -70 ° C. Maintenance inspection revealed water in cannon plug connected to combining transmission. ☐ Negative rotor rpm indicator was found to be inoperative during hover/taxi check. Rotor tachometer generator was replaced. ☐ Master caution and transmission oil hot lights came on. Caused by broken wire at cannon plug.

ch54

Class C mishap ☐ As aircraft was making third approach to pick up rangers for paradrop, plywood panel marker placed by pathfinder was blown by rotorwash, hitting paratrooper. There was no indication of injury until termination of flight. After aircraft landed, paratrooper collapsed while walking away from aircraft.

Class E mishap ☐ Hydraulic leak developed during takeoff. Nut on hydraulic line from hoist takeup reservoir to hydraulic manifold had backed off.

oh58

Class C mishap ☐ As pilot was taxiing from parking area to taxiway for departure, aircraft began to act erratically, making two nose-high 360° turns to left. Tail skid hit ground and aircraft landed upright. Possibly caused by human error.

Class E mishaps ☐ N_2 rpm decayed from 103% to 101.5%. Rpm could not be beeped up. Pilot flew aircraft back to airfield 5 minutes away instead of landing at first available safe landing area. Rpm decay was caused by linear actuator failure. ☐ Rotorwash picked up a few pieces of some clear plastic bags. Some of the pieces flew into the rotor blades and hung on blade tips. Aircraft was shut down and pieces of plastic removed from leading edge of blades. ☐ Flight of seven OH-58s landed when forecast scattered snowshowers became extensive snowstorm. Flight continued the next day.

oh6 **Class E mishaps** ☐ Engine-out light and audio activated. Caused by defective engine-out warning system. ☐ Loud noise was heard immediately after takeoff. Aircraft yawed right, then left. After touchdown, main rotor was turning but tail rotor was not. Suspect internal failure of main transmission.

u8 **Class E mishaps** ☐ (F series) Engine stopped when No. 1 engine left magneto was grounded during high mag check. When magneto was removed to install new points, magneto drive shaft bushing was found to be damaged. ☐ (F series) When landing gear was cycled down, unsafe nose gear indication was received. Gear was recycled several times, with the same result. Low pass was made by tower, and tower personnel said gear appeared to be down. Successful landing was made. It is suspected that as aircraft gained altitude, moisture (slush) on gear froze, preventing normal opration of nose gear.

u21 **Class E mishap** ☐ (A series) Fuel pressure fluctuated during flight. Caused by failure of fuel boost pump.

Maintenance

uh1 **Class E mishap** ☐ Oil was seen leaking from 42° gearbox during hover. Vented oil cap had been installed on 42° gearbox. Cap was properly marked with a black dot and was the proper NSN and part number, but it was manufactured wrong.

oh58 **Class E mishap** ☐ Airspeed indicator stuck at 60 knots on takeoff. Pitot tube cover was missing. Aircraft had been parked in rain and wind for 8 days, and water entered pitot system.

u21 **Class E mishap** ☐ (A series) When gear was lowered for landing, right main indicator light remained off and red light in gear handle remained on. Gear was manually extended, with safe indication. Caused by out-of-adjustment gear indicator microswitch.

Messages received

- Technical information message concerning UH-1H/M, EH-1H, AH-1G, and TH-1G P1 bellows check (UH-1-80-04 and AH-1-80-05, 281610Z Mar 80).
- Maintenance advisory message concerning OH-58C fuel pump and fuel control filter elements (OH-58-80-04, 241605Z Mar 80).
- Operational advisory message concerning OH-58C TOT limit for starting (OH-58-80-05, 281610Z Mar 80).

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

Army aircraft mishap classification criteria

Class A
- A mishap in which the resulting total cost of property damage, injury, and occupational illness is $200,000 or greater; or
- An Army aircraft is missing, abandoned (recovery is impossible or impractical), or destroyed (uneconomically repairable, total loss); or
- A fatality occurs as a result of Army operations.

Class B
- A mishap in which the resulting cost of property damage, injury, and occupational illness is at least $50,000 but less than $200,000.

Class C
- A mishap in which the total cost of property damage is at least $300 but less than $50,000; or
- An injury or occupational illness resulted in a lost workday case involving days away from work.

Class D
- A mishap in which the resulting cost of property damage is less than $300; and
- An injury or occupational illness resulted in a lost workday case involving days of restricted work activity or a nonfatal case without lost workdays.

Class E
- A high-mishap-potential event in which the resulting cost of property damage is less than $300; and
- There was no injury or occupational illness, or injury resulted in first aid only.

Use correct adhesives when repairing helmets

It is imperative that you use the proper adhesive when repairing certain components of the SPH-4 flyer's helmet. Failure to do so will result in damage to the helmet as well as a potential safety hazard. Do not attempt to use an adhesive for an application other than that for which it is intended or substitute one adhesive for another. Repair of the following components should be accomplished only with the proper adhesive. This information is reiterated in TM 10-8415-206-13.

Component	Adhesive used in repair
Helmet liner	Synthetic adhesive, NSN 8040-00-753-4800
Rubber beading	Synthetic rubber adhesive, NSN 8040-00-832-6173
Earcup cushion inserts	Adhesive, NSN 8040-01-023-4173 and NSN 8040-01-023-4172

Spot test an application of adhesive on a small area to be repaired for 10 to 15 seconds before applying the adhesive to a larger area. If the wrong adhesive has been applied to the surface, the deteriorating effects will be visible within this time.

For additional information, write Commander, U.S. Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MFT(1), 4300 Goodfellow Boulevard, St. Louis, MO 63120. Point of contact is Marie Kilz, AUTOVON 693-2614. ■

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Topsy-turvy

It's a topsy-turvy world . . ." so goes the song. And it really can be, at least for helicopter pilots, as evidenced by the accompanying photo. Fortunately, all three crewmembers of this UH-1 escaped without injury except for a bit of embarrassment and a possible bruised ego—both the result of dynamic rollover during takeoff from **level** ground.

Impossible! Not so, and the pilot was no fledgling. He was highly skilled, proficient, and thoroughly experienced in this type aircraft. As a matter of fact, had he been fresh out of flight school, this accident most likely would have never occurred. Let's see why.

The mission was a limited maintenance test flight following adjustments made to the tail rotor pitch change links. The crew consisted of the pilot, the crew chief, and a technical observer undergoing on-the-job training.

Following takeoff, the pilot performed a HIT check and all hover checks; then, while on the downwind leg for landing, he noted that the right pedal was about 2 ½ inches forward of the left one. He requested permission to execute an autorotation to the autorotation lane. Permission was granted and he performed the autorotation, terminating it at a hover. He then landed the aircraft on a sod area near the runway where he and the crew chief discussed the adjustments made to the tail rotor pitch change links. After the crew chief explained the corrective action he had taken to correct a "right pedal out of rig" writeup, pointing out that the procedure followed was the one stipulated in the TM, the pilot decided to hover the aircraft to the parking ramp and seek additional assistance concerning the pedal problem.

UH-1 assumed this unconventional attitude following dynamic rollover during takeoff from level ground.

As he applied collective to lift off, he turned to the right to check the clearance between his aircraft and one taxiing about 250 to 300 feet behind him. As the aircraft became light on its skids, it began a roll to the right, pivoting about the right skid. Both main rotor blades struck the ground, and the rotor separated from the aircraft. The UH-1 continued to roll until it came to rest inverted.

It became apparent that the pilot had used an improper takeoff procedure (TC 1-35, task 2001) in that he attempted to take off and simultaneously clear the aircraft. In addition, it was determined that the tail rotor pitch change links were improperly adjusted because the TM procedure the crew chief had followed was incorrect. This resulted in reduced available right pedal and may possibly have contributed to an increased right rolling moment during takeoff to a hover, with the right skid on the ground.

The pilot failed to detect the rolling motion because his attention was diverted to the right and right rear of the aircraft during takeoff. This action resulted in inadequate visual cues and probably in an inadvertent right lateral cyclic input when he turned his upper body to the right, allowing the right skid to remain on the ground.

Further, seated in the right seat, he received inadequate warning sensations as the aircraft began to roll. When the left skid rose to a height of about 14 inches (8-degree roll), the pilot pivoted only about 4 inches. As the left skid reached a height of about 27 inches, his body moved only about 8 inches. Yet, at this point, the aircraft was at the critical angle of 15 degrees—the point of no return—when a rollover becomes inevitable. As a matter of fact, with the right skid on the ground, this critical rollover angle is reduced. Since dynamic rollover to the right can occur in a UH-1 in less than 2 seconds, the pilot's inattention during takeoff resulted in his detecting the rolling motion too late to effect recovery.

Curiously, an interesting fact that surfaced during the investigation was that the pilot was not fully aware that rollover could occur during a normal takeoff from level ground—a belief that contributed to his delayed reaction. Yet, as pointed out, the pilot was highly experienced, having logged more than 3,200 hours of flight time, 1,765 of which were in the UH-1. At the time of the accident, he was serving as unit operations officer, IFE, and SIP, as well as maintenance test pilot. Pursuing the matter further, it was found that this belief concerning dynamic rollovers is shared by a substantial percentage of experienced aviators.

It appears that pilots seem to associate dynamic rollover primarily with slope landings and takeoffs, particularly under crosswind conditions. In doing so, they tend to discount the possibility of rollovers during normal flight from level ground. As this accident proves, dynamic rollovers are not confined to slope operations. And the best preventive medicine is concentration.

Basically, the pilot involved in this accident attempted to perform two tasks simultaneously, each of which demanded concentration. While the human body is capable of mechanically performing more than one action at the same time, the human mind tends to be distracted by what appears to be the more critical task. This is precisely why this type of accident is more apt to involve an experienced aviator. An inexperienced pilot, knowing his limitations, would have leaned toward caution. He may even have been overly cautious, but he would have cleared the aircraft first so that he could devote his full attention to the takeoff. Consequently, he would have concentrated on one task at a time. While this accident illustrates that experience alone does not guarantee safety, investigation uncovered other significant facts that can affect safety.

Although the pilot involved in this accident was qualified to perform maintenance test flights, he did not possess an extensive maintenance background as recommended by TM 55-1520-328-25, par. 3-3a. Other maintenance test pilots with extensive maintenance experience were available to perform test flights on the unit's aircraft. Considering that the pilot who conducted the test flight also had the responsibilities of operations officer, unit IP, and instrument flight examiner, possibly he should not have been burdened with the additional responsibilities of maintenance test pilot. *(continued on next page)*

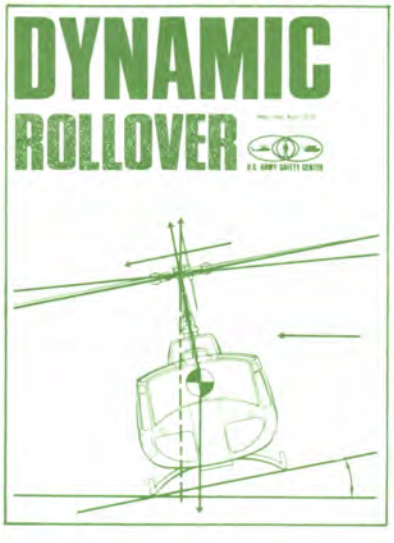
Topsy-turvy

The crew chief improperly adjusted the tail rotor pitch change links by extending them to correct an excessive right pedal condition. He did so because the instructions in TM 55-1520-210-23-2, par. 11-110b, were wrong. An urgent change to this TM has since been sent to the field, correcting this discrepancy. However, the point is this: Anyone who finds an error in a TM has authority—in fact, responsibility—for submitting a DA Form 2028 (Recommended Changes to Publications and Blank Forms) or a DA Form 2028-2 (Recommended Changes to Equipment Technical Manuals). This is our principal means for getting rid of any errors in our manuals. Considering the number of UH-1 aircraft being maintained by Army and civilian personnel, it is hard to believe that corrective action was not effected before this accident occurred. While most errors found in TMs may be inconsequential, some can result in mishaps.

Additionally, the symbol assigned the writeup, "tail rotor out of rig," was a red diagonal instead of a red X. This error was compounded by the crew chief who entered the corrective action as "tail rotor pitch change links removed/tail rotor pitch change links replaced." As a result, the TI insured only that the pitch change links had been properly installed, and did not inspect the tail rotor rigging.

In the past, use of a wrong status symbol has resulted in catastrophic accidents. In one instance, a red diagonal was used instead of the required red X to denote the status of a U-8. This permitted the aircraft to be flown. The result was an in-flight engine fire and subsequent loss of a wing. It goes without saying that all maintenance personnel should be thoroughly knowledgeable in the use of proper status symbols as well as in accurately describing any corrective actions accomplished.

Finally, during a test conducted after the aircraft had been recovered to the unit's hangar, the pilot's door jettison mechanism failed to release the door. Inspection revealed the top pin was rusted in its hinge. Although inspection of door jettison mechanisms is performed every 100 hours of flight, corrosion was not detected because aircraft in this unit might be operated 6 months to a year before accumulating 100 hours of flight. Considering these aircraft are operating in a high humidity environment, the solution lies in regulating inspection frequency on a calendar basis as well as on the number of hours flown. In short, unit commanders in similar situations should initiate a local corrosion prevention program specifically tailored to meet their unit and environmental needs as outlined in TM 43-0105, par. 2-9d.



The world may not always look rosy, but, at least, it looks best when viewed right side up. So, when it comes to dynamic rollovers, every helicopter pilot should thoroughly understand not only what causes them, but most important, how to prevent them.

The U.S. Army Safety Center has prepared a pamphlet entitled "Dynamic Rollover." Units and individuals desiring copies may obtain them by calling AUTOVON 558-4479 (commercial 205-255-4479) or by writing to Commander, U.S. Army Safety Center, ATTN: PESC-CA, Fort Rucker, AL 36362. ■

Selected mishap briefs

uh1 **Class E mishaps** ☐ Engine quit during runup. Caused by failure of fuel control. ☐ Crew heard loud whistling sound during runup. White main rotor blade had separated in a one-half-inch strip from bottom side tip inboard 4 inches. ☐ Compressor stall occurred when power was reduced in cruise flight. Fuel control malfunction caused improper VIGV setting for power demand. ☐ Postflight inspection revealed fuel leak at overspeed governor. Caused by deteriorated preformed packing on fuel line on top side of overspeed governor.

uh60 **Class E mishaps** ☐ Engine-out audio was heard just before takeoff. Caused by failure of power takeoff shaft. ☐ No. 2 generator and master caution lights came on during takeoff. Wire clamp on generator is too small for wire bundle. Two other aircraft have been found with chafing wires. ☐ Aircraft vibrated during descent. Caused by moisture in SAS cannon plugs.

ah1 **Class E mishaps** ☐ Engine oil pressure light came on. Caused by failure of pressure switch. ☐ Two AH-1s were forced to land when unforecast snowshowers restricted visibility. ☐ During takeoff, while practicing ATM evasive maneuvers, pilot made sharp left bank and overtorqued aircraft.

oh58 **Class A mishap** ☐ While at 50-foot OGE hover, aircraft entered uncontrollable right spin and crashed. Main transmission separated and tail boom was severed. 8034

Class E mishaps ☐ Ninety-degree gearbox was covered with an engine exhaust stack cover to keep water out during heavy rains. Pilot did not remove cover during preflight. About 5 minutes after aircraft was picked up to hover, cover was blown into tail rotor, causing severe vibration. ☐ Collective was increased to stop slight descent. N_2 and rotor rpm began to deteriorate, and level flight could not be maintained. Aircraft was landed with partial power. Caused by failure of governor. ☐ Linear actuator failed when N_2 was beeped up to 104%. ☐ Rapid rise of TOT during engine start was caused by malfunction of main turbine fuel control.

oh6 **Class E mishap** ☐ Engine oil bypass light came on. Oil hose from oil tank to oil cooler ruptured, causing loss of 2½ quarts of engine oil.

ch47 **Class C mishap** ☐ During runup, copilot dropped his sunglasses onto chin bubble and was unable to reach them. Crew chief leaned over console to retrieve glasses and apparently hit emergency beep, causing overspeed.

Class E mishap ☐ Flight engineer noticed hydraulic fluid spraying from aft transmission area during takeoff. Caused by cracked hydraulic line on oil cooler fan assembly.

c12 **Class E mishap** ☐ (A series) After shutdown, copilot noticed oil leaking from No. 2 engine cowling. Entire engine was covered with oil and was 2 quarts low. Oil was coming from pin hole in oil scavenger pump housing.

ov1 **Class E mishaps** ☐ (D series) Pilot noticed unusual fuel quantity indications during flight. Caused by failure of fuel quantity indicator. ☐ (D series) No. 1 and No. 2 fire warning lights came on during climb. Caused by water in detection system. ☐ (D series) Unsafe landing gear light came on. Pilot initiated emergency blowdown system and landed. Plunger on microswitch was not secured internally.

u3 **Class E mishap** ☐ Loud popping noise was heard from No. 1 engine after level-off from descent. Rpm dropped and then returned to normal. Black smoke began emitting from exhaust. Postlanding inspection revealed separation of No. 2 cylinder on No. 1 engine, causing loss of engine oil.

(continued on next page)

Mishap briefs

u21 **Class E mishaps** ☐ (H series) Heater quit during flight and could not be restarted. Crew landed because of extreme cold. Caused by fouled heater igniter plug. ☐ (A series) Passenger noticed fuel siphoning from No. 1 engine nacelle fuel cap. Aircraft was landed and fuel cap secured.

u8 **Class E mishap** ☐ (F series) Crew noticed No. 2 engine was missing slightly during climbout. A few minutes later, IAS dropped to 120 knots. After aircraft was landed and engine shut down, oil leak was found around No. 2 cylinder.

Maintenance

uh1 **Class E mishaps** ☐ Master caution and hydraulic pressure lights came on during runup. Controls became stiff and collective began to rise. Caused by pinched O-ring during installation of irreversible valve. ☐ During preflight, pilot found oil level of 42° gearbox to be low. Crew chief added oil. After completion of mission, filler cap was found hanging by retention chain. Gearbox was very hot and no oil was present. Crew did not insure filler cap was secure after servicing gearbox. ☐ Master caution and hydraulic lights came on. Pilot felt feedback in controls and heard hydraulic pump squeal. Postlanding investigation revealed locking nut had been overtorqued and developed fatigue on outer edge, causing hydraulic failure. ☐ Oil pressure gauge dropped to zero during landing. Cause by incorrectly installed engine oil pressure cannon plug. ☐ Master caution and hydraulic lights came on, and popping sounds were heard from transmission compartment. Hydraulic control was lost and regained several times during approach, and hydraulics-off landing was made. Inspection of hydraulic system revealed several incorrectly installed components.

ah1 **Class E mishaps** ☐ Ammeter gradually increased in excess of 300 amps. Corrosion was found around terminals, and electrolyte was low and escaping through vent. ☐ Engine failed during runup. Main fuel line on top of fuel filter was improperly tightened, allowing air to enter system.

ch47 **Class E mishap** ☐ Transmission fluid was seen leaking from combining transmission area during flight. Two oil line fittings on transmission oil cooler were cracked. Suspect fittings were overtorqued during transmission change.

Messages received

- Maintenance advisory message concerning U-21 T74-CP-700 engine performance checks (U-21-80-05, 021400Z Apr 80).
- Maintenance advisory message concerning use of nonstandard/locally manufactured heavy-duty skid shoes on UH-1/AH-1 aircraft (UH-1-80-03, AH-1-80-06, 311610Z Mar 80).
- Operational advisory message to lift flight restrictions imposed on AH-1S aircraft (AH-1-80-07, 311605Z Mar 80).
- Maintenance advisory message concerning amendments to TM 38-750 (GEN-80-05, 031610Z Apr 80).
- Maintenance information message concerning installed life extension of OV-1/RV-1 ejection seat drogue gun (OV-1-80-03, 041610Z Apr 80).
- Maintenance advisory message concerning incorrect information in Change 2 to TM 55-1680-308-24 (OV-1-80-04, 041615Z Apr 80).

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

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	9 Chapter	Basic Manual	Last Change	Basic Checklist	Last Change	New Type CL
201-10/4	U-8D/G	Yes					No
	RU-8D		3 Apr 78		Jul 78		
201-10/5	U-8F	Yes	21 Mar 78	1, 18 Dec 78	Jul 78		No
204-10/3	OV-1B	Yes	9 Mar 79	1,14 Jan 80	Feb 79		Yes
204-10/4	OV-1C	Yes	10 Apr 79	2, 14 Jan 80	Apr 79		Yes
208-10	T-42A	Yes	27 Feb 79		Feb 79		Yes
209-10	U-21A	Yes	25 Mar 77	4, 11 Oct 78	Feb 77	4, 16 Aug 78	No
209-10-1	RU-21A/D	Yes	28 Feb 77	4, 17 Jul 78	Mar 77	2, 23 Aug 78	No
213-10	OV-1D/RV-1D	Yes	4 Aug 78	2, 16 Jan 80	Nov 78		Yes
214-10	RU-21B/C	Yes	15 Mar 77	5, Undated	Apr 77	3, 5 Oct 78	No
215-10	U-21G	Yes	11 Mar 77	3, 16 Jan 78	Apr 77	2, 9 Jan 78	No
215-10-2	RU-21H(GR-V)	Yes	29 Dec 78		Dec 78		Yes
216-10	U-3A/B	Yes	11 Dec 78		Dec 78		Yes
	C-12A	No	15 Aug 77	1, 7 Dec 78	Dec 78		Yes
	C-12C	No	1 Dec 78		Jan 79		Yes
Rotary Wing TM 55-1520	**Aircraft**	**9 Chapter**	**Basic Manual**	**Last Change**	**Basic Checklist**	**Last Change**	**New Type CL**
209-10	CH-47A	Yes	9 Jan 79		Dec 78	1, 2 Feb 79	Yes
210-10	UH-1D/H	Yes	18 May 79	2, 27 Dec 79	Feb 79	1, 26 Jul 79	Yes
214-10	OH-6A	Yes	17 Dec 76	7, 3 Apr 79	Dec 76	2, 3 Apr 79	No
217-10-1	CH-54A	Yes	8 Apr 77	1, 9 Jan 78	Mar 77	1, 13 May 77	No
217-10-2	CH-54B	Yes	15 Apr 77	2, 10 Oct 79	Mar 77	2, 22 Aug 79	No
219-10	UH-1B	No	16 Jan 69	16, 10 Sep 79	Dec 68	8, 11 Apr 79	No
220-10	UH-1C/M	No	Nov 68	20, 10 Jan 80	Jul 71	8, 13 Apr 79	No
221-10	AH-1G	No	12 Dec 75	7, 5 Sep 78	Mar 80		Yes*
227-10-1	CH-47B	Yes	23 Aug 78	2, 10 Oct 79	Dec 78	2, 22 Aug 79	Yes
227-10-2	CH-47C	Yes	23 Aug 78	3, 1 Nov 79	Nov 79		Yes
228-10	OH-58A	Yes	7 Apr 78	4, 23 Mar 79	Jul 78	1, 27 Nov 78	No
233-10	TH-55A	Yes	30 Sep 76	2, 14 Jul 78	Oct 76	4, 17 Oct 78	No
234-10	AH-1S (MOD)	Yes	17 Nov 76	9, 12 Dec 79	Nov 76	3, 3 Nov 79	No
235-10	OH-58C	Yes	7 Apr 78	8, 20 Jun 79	Jul 78	1, 10 Oct 78	No
236-10	AH-1S (PROD)	Yes	11 Jan 80		Jan 80		Yes
237-10	UH-60A	Yes	21 May 79	6, 7 Feb 80	Dec 78	6, 7 Feb 80	Yes
239-10	AH-1S (MC)	Yes	11 Jan 80		Jan 80		Yes

*Revised checklist should not be used until the corresponding revised operators manual is received.

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.

Instructor pilot's handbook

The latest USAAVNC Instructor Pilot's Handbook (Fundamentals of Instruction) is dated March 1978. IPs desiring copies of the latest version should submit their request to: Commanding General, U.S. Army Aviation Center, Dept of Acad Tng, ATTN: ATZQ-T-AT-E, Tng Lit Mgt Br, Fort Rucker, AL 36362. ■

Drug alert

Several recent aircraft mishaps involved aviators taking drugs which may have caused or contributed to those mishaps. Other instances are known where aviators took drugs which could easily have led to a mishap. In some cases, the aviator apparently took the drug on his own. In others, physicians who were not knowledgeable in the specialty of aviation medicine may have prescribed the drugs but failed to initiate a medical restriction from flying.

Every aircrewmember is cautioned to avoid the use of **any** drug, including those available without prescription, except on approval of a flight surgeon. AR 40-8 **requires** that medical treatment of all aircrewmembers be under the supervision of a flight surgeon and that aircrewmembers tell their flight surgeon when they have received treatment following which flying restrictions may be appropriate.

Your life depends upon you, the aviator, **knowing** your health-related responsibilities and exercising sound judgment concerning your need to consult a flight surgeon, even if only by telephone where a flight surgeon is not locally available. Some of the mishaps referred to above resulted in fatalities. Let's eliminate any further unnecessary loss of life and property by being responsible in matters pertaining to health and aeromedical safety. ■

No more PRC-90 radios

According to the item manager at CERCOM, Fort Monmouth, further funding for the PRC-90 radio was deferred in October 1979. This decision was made because of recurring problems with the radio and because the money could be better spent on the forthcoming PRC-112. Back orders on more than 4,000 PRC-90 radios will not be filled. There are approximately 400 radios at depot for repair. ■

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Army aircraft mishap prevention data

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No room
for prima donna performers
in a top-flight aviation unit

The not-so-secret secret to success

One widely held belief in the world of sports is that a manager or coach is no better that his material. But the truth is that some managers and some coaches are better than others. Super Bowl records show this.

Ask any successful manager or coach what goes into good coaching techniques and he will probably tell you that it is a smooth blend of planning, unrelenting hard work, applied psychology, discipline, sympathetic understanding of a person's problems, and attention to detail. Maybe coaches don't end up with lumps and bruises and cleat wounds after a game. That doesn't mean they don't work about twice as hard as anybody on the field, day in and day out.

The result of all this concentrated effort is a team—a highly coordinated and well-oiled piece of human machinery made up of two or three dozen highly skilled and often temperamental athletes. When it is working the way it is supposed to it is a joy to behold. The points go up on the scoreboard, and everybody is happy except the people on the other side who are taking the clobbering.

What has all this got to do with Army aviation?

Professionals

Football players and Army aviators all wear helmets and uniforms. The resemblence doesn't stop there, not by a long shot. To a man, the players and the flyers are professionals, operating in the rarified air of the big leagues where the pressures are tight and never relax. They are all key components of units in which there is no margin for error and no room for prima donna performers. All the people in a topflight aviation unit know their roles and are conscious of their responsibilities toward themselves and the people around them. And the points go up on the scoreboard, which is one way of saying that the mishap rate goes down. In aviation terms it amounts to the same thing.

But it doesn't just happen, any more than a pro football team makes it to the Super Bowl because everybody on the squad carries rabbits' feet and was born under a lucky star. Somebody has to furnish the players with the drive, know-how, and determination they need to become champions. Somebody has to weld them together into a team and pump them full of the pride they need to stay that way.

It starts at the top. It's an endless job, too. Maybe **you** think the football season comes to an end when the last fan files out of the Super Bowl stadium. For the coaches it is a 7-day-a-week, year-around job. If you don't believe it, ask their wives.

What's extra good about this kind of dedication is that it is as catching as the German measles. When the man at the top has a full appreciation of the problems and what's at stake and keeps on the ball on an around-the-clock full alert, it doesn't take long before everybody in the outfit gets the same idea.

When that happens, you've got a team—a team which can make it to the top and stay there.

If this sounds like a lot of hard work, it is. In fact, it is even a lot harder than it sounds. But it pays off, and in Army aviation that isn't just so many points on the scoreboard . . . it's lives and equipment saved.

Sure, professional football players play for keeps. Army aviators aren't exactly horsing around themselves. It's their own necks they are laying on the line and not only on Sunday afternoons, either.

What's the secret, if any, of a smooth-working and successful mishap prevention program? Sound management.

View from the top

When it comes to aviation mishap prevention, management is nothing more than **command emphasis** on a **constant** and **coordinated** program to eliminate any substandard performance which can be remotely considered eliminatable. If you want to call it gentle arm-twisting, go ahead. Whatever its name, it is designed to establish and enforce procedures which, in combat or out, will keep performance values up to maximum levels.

Naturally it has to start at the top. The process begins with a long, honest look at the unit's problem areas. And, as long as we are being so honest, we might as well change that to its shortcomings. You can pretty up a shortcoming by calling it a problem area if you want, but it is still a shortcoming. Suppose there have been several wire strikes while the unit just down the road hasn't had any. Or foreign object damage is high. Or too many engine failures. One thing's for sure. They aren't just happening for no reason at all. Something is causing the trouble and will keep on causing it, until it is rooted out.

And this takes thinking. Thinking and constructive action. A sound mishap prevention program, based on this kind of constructive approach, isn't a crash, gung ho affair. It's well rounded and once it is started it keeps going.

A lot goes into the mixture that fuels it.

- Training and more training, even under difficult, realistic conditions.
- Discipline, pilot qualifications and flying proficiency.
- By-the-book maintenance procedures.
- Elimination of unnecessary hazards.
- Adequate medical and psychiatric supervision.
- Maximum crew rest possible.
- Persistent, uncompromising supervision.
- Encouragement of unit pride in accident-free performance.

That's enough for a starter and it's no small order, either.

When there's a resourceful management program going full blast, everything is kept within reasonable physical and mechanical limits. No commander orders a pilot to overload an aircraft in high D.A. conditions simply because he sees an empty seat. Restrictions imposed by load, distance, weather, terrain, the individual aircraft and its maintenance status, and the physical and mental state of the aircrew are understood and obeyed.

You can't, for instance, take a 20-year-old warrant officer fresh from Rucker and expect him to perform with the proficiency of a thousand-hour seasoned veteran. Sure, he'll give it the old college try when he's assigned a task which is over his head. Nobody is going to find fault with him for that. And an aggressive, flaming desire to win is one of the first things all coaches look for in a player. They are realists enough, though, to know that all the desire in the world isn't going to turn a man who weighs only 150 pounds into the middle linebacker for the Steelers. He might have a go at it if he had a coach dumb enough to use him, but he wouldn't be around after the first play from scrimmage.

In Army aviation, when the limits are exceeded for either men or machines because of lack of good management practices, any number of things can happen, all of them bad. They not only **can**, they probably **will**.

An aviation commander who is as fussy as a mother hen about standard procedures for maintenance, foreign object damage, aircrew proficiency, mission planning, and all the rest of management's bag of tricks may not

(continued on next page)

Secret to success

at first be appreciated by his people for the simple reason that attention to detail is hard work. No matter. The good aviation manager's overriding concern is to see that the people and machines in his outfit stay whole and healthy. If circumstances seemed to call for the use of branding irons and thumbscrews he might give the matter serious thought. Sooner rather than later, when the outfit wakes up to the fact that the mishap rate is sinking like a Chinook in autorotation, they'll appreciate what he is doing for them.

One good thing about a program stressing fundamentals is that there's nothing very complicated about it. It is nothing more than a combination of by-the-book procedures and good, resourceful commonsense.

All together

Sound management produces good teamwork and good teamwork produces team spirit, or high morale, or unit pride, or whatever you want to call it. Whatever the tag, it's the opposite of the glooms, that down-in-the-mouth attitude anybody can acquire if he gets the idea he is being badly handled and generally put-upon. A person likes to deliver his level best, but he has to be given an opportunity to show what he can do. He can quickly get discouraged if he doesn't.

It's also all too true that experience can sometimes be spread as thin as the soup in a second-rate boarding house. Maybe there'll never be a time when everybody in Army aviation has all the experience he can use. This is something any good manager, whether he's running a supermarket, a maintenance detachment, or an aviation or ground unit, keeps under advisement.

What it comes to is that maximum use can be made of what experience there is by resourceful, fixed, continuing, and planned management programs, using by-the-book procedures which remove all possible hazards and which do not violate the physical limits beyond which men and machines cannot—repeat, **cannot**—safely be asked to go.

Eight hours of sleep, a hot meal, and a loving letter from home aren't going to turn a 300-hour pilot into a 2,000-hour pilot, but he is going to perform a danged sight better than if he had to go without. And maybe a young mechanic still hasn't acquired the knowledge of the old hand who helped Wilbur and Orville bolt together what started it all down at Kitty Hawk. But the youngster will do okay if he has good, understanding supervision and knows the vital part that he and his tools play in keeping a helicopter in the air instead of sitting over in a corner of the field with its blades drooping and its tongue hanging out. Or worse, in the top of a tree about 20 miles the other side of nowhere.

A sound aviation management program is a do-it-yourself affair and there aren't any handy-dandy kits to do it with, either.

Planning, remember? Planning and a lot of serious thought.

Maybe today would be a good time to start, while the sun is still shining. ■

Selected mishap briefs

uh1 **Class E mishaps** ☐ Pilot heard rumbling noise and felt stiffness in cyclic and pedals. Master caution and hydraulic lights came on. Caused by failure of tube assembly. ☐ Preparing for engine start, copilot noticed binding of antitorque pedals. Examination of roller chain assembly revealed chain did not mesh properly with sprocket. New roller chain and sprocket assembly was installed the day before. Suspect roller chain was defective before installation. ☐ When pilot tried to start engine, voltage dropped to 3 volts and black smoke came from engine exhaust. Failure of seal allowed oil to seep into starter generator, causing it to foul. ☐ On short final to LZ with external load of empty water trailer, pilot pulled 52 pounds of torque in an attempt to hover. Load was heavier than anticipated. Pilot had not made an actual check of load weight before takeoff. ☐ Cyclic binding occurred 50 feet agl during takeoff. Dirt was found between rod end bearing and close tolerance bolt. ☐ Aircraft was refueled at civilian airfield. After normal start, engine flamed out. About 60 gallons of the 146 gallons pumped into fuel tank was water. ☐ Transmission oil pressure light came on. Output line on center fuel cell vent tube was ruptured.

Aviation-related ☐ Tug operator was backing tug to connect to a tow bar on UH-1 parked in hangar. When tug was about 1 foot from tow bar, operator stepped on brake. Because of adjustment of brakes, brake pedal was depressed lower than accelerator pedal before engaging. Operator's foot was depressing both the brake and accelerator. The result was acceleration. Tow bar broke and tug hit aircraft. Tug seat hit nose of aircraft and bent forward, pinning operator against steering wheel. Aircraft was pushed backwards and to side, and tail hit another UH-1. Person standing nearby pulled operator's foot off pedals and tug stopped.

ah1 **Class E mishaps** ☐ Main inverter would not come on line during start. Caused by broken wire in inverter overload relay. ☐ Aircraft was on cross-country flight. About 12 miles from destination, low fuel light came on. Pilot continued to destination. While at hover on parking ramp, pilot had to land because of low fuel state. Headwinds were stronger than forecast. ☐ After rocket was fired, aircraft developed severe vibration and left yaw. Stabilizing fin had separated from rocket and hit tail rotor blade. ☐ Squealing sound was heard and No. 2 hydraulic light came on. Cyclic control became stiff and running landing was made. After shutdown, large amount of hydraulic fluid was found under transmission and No. 2 hydraulic pump. Caused by defective servo.

Aviation-related ☐ Tug operator misjudged clearance, and tug hit missile launcher. ☐ During ground handling of AH-1, wheel was jacked beyond center line. After moving aircraft, crew tried to lower wheel. Block of wood was used 3 feet forward of wheel to relieve weight. Personnel then started to kick wheel. When this did not lower wheel, tail was rotated and wheel released. Wood was still under skid tube, and tube was bent.

ch47 **Class E mishaps** ☐ Transmission oil hot light came on with temperature indication of 130° C. Caused by failure of temperature indicator. ☐ Pilot smelled strong fuel fumes after landing. Caused by failure of fuel supply line. ☐ Electrical short circuit caused illumination of transmission oil hot light.

oh58 **Class E mishaps** ☐ As throttle was advanced from engine idle to full open position during engine runup, TOT and N_1 decreased and engine failed. ☐ On shutdown, battery switch was placed in off position to note decrease in amp gauge. No

(continued on next page)

Mishap briefs

decrease was noted and battery switch was returned to on position. Engine was shut down and as rotor coasted down all electrical power was lost. Battery was totally discharged and aircraft could not be restarted. Caused by internal failure of battery. ☐ After hot refueling, oil leak was found in area of free-wheeling unit. Unit was replaced.

th55 **Class E mishaps** ☐ Pedals suddenly became inoperative during hover, and aircraft spun right 360°. IP took control, closed throttle, and made hovering autorotation. Caused by broken tail rotor control cable. ☐ Crew smelled strong fumes during hover. Caused by malfunction of fuel shutoff valve. ☐ Power was insufficient to maintain 3-foot hover. Manifold gauge plugs were replaced.

uv20 **Class C mishap** ☐ Aircraft drifted to right during touchdown for landing. Power was applied, right wing came up, and left wing dropped down, touching runway with wing tip and aileron. Elevator electric trim stuck in full down position, causing rearward application of control to be extremely difficult.

c12 **Class E mishaps** ☐ (A series) Pilot's windshield cracked in center portion, with numerous cracks extending vertically and horizontally. Windshield heat had been normal for about 20 minutes. Aircraft was at 8,000 feet, flying in light rain and snow. Temperature was -8°C. ☐ (A series) Malfunction of printed circuit board caused illumination of No. 1 fire pull handle.

ov1 **Class E mishaps** ☐ (D series) No. 1 torquemeter failed, followed by illumination of No. 1 chip detector light. Caused by failure of primary display board. ☐ (D series) No. 2 hydraulic pressure went to zero. Caused by failure of auxiliary motor. ☐ (D series) Fluctuation of right engine N_1 gauge was caused by failure of tachometer generator.

t42 **Class E mishap** ☐ Pilot was landing aircraft with a reported 90° right crosswind of 12 knots. Aircraft touched down in nose-low attitude, with nose gear hitting runway before main gear. This caused aircraft to bounce into the air and set up a porpoising effect. Aircraft again settled to runway in left-wing, nose-low attitude and bounced into air. Pilot then initiated go-around and landed on same runway. About 2 inches of left propeller blade tips and nose wheel rim were bent. Crew said winds were gusty and stronger than reported by tower. Gusts were estimated at about 25 knots. Pilot did not use correct crosswind landing techniques.

u21 **Class E mishaps** ☐ (A series) Landing gear would not fully retract during stall recovery training. Gear would not recycle and circuit breaker popped. Gear was lowered manually and aircraft landed. Washer became lodged in control relay, shorting it out. ☐ (J series) As throttle was advanced, right engine would not advance above 1850 pounds of torque. Oil pressure slowly decreased. Engine was shut down and prop feathered. Postlanding inspection revealed right engine oil system was full of metal shavings, and chip detector was covered with metal shavings.

Maintenance

uh1 **Class E mishaps** ☐ Pilot saw steam coming from battery vent during landing. Battery cell caps were clogged. ☐ Low rotor rpm during autorotation was caused by out-of-adjustment pitch change links. ☐ IP smelled fuel during landing. When fuel flow switch was installed, hexagon nut was not safetied in accordance with TM instructions. Nut backed off, allowing fuel leakage. ☐ Forty-two-degree gearbox magnetic plug came out in flight and all oil was lost.

ah1 **Class E mishap** ☐ Engine flamed out during start. B and B 3100 (engine flush compound) and a water solution had been mistakenly injected into fuel cell by maintenance NCO. He was trying to unstop hydraulic drain line that was plugged. Aircraft had been recently repainted with IR suppressive paint, and drain line decals had not been replaced. Also, pilot did not take a fuel sample during preflight.

ov1 **Class E mishap** ☐ (D series) In cruise flight pilot tried to turn aircraft to a southerly course. Aircraft turned north instead. When pilot tried to disengage autopilot with master release switch, roll mode did not completely disengage. Pilot returned to base while overriding roll mode of autopilot and landed. Inspection revealed switch in navigation coupler was hanging up and shear pin in roll actuator was improperly installed.

Messages received

• Safety-of-flight message concerning inspection of tail rotor drive shaft clamp nuts (AH-1-80-08, UH-1-80-05, 072035Z Apr 80). Summary: An undetermined number of nuts not approved by the Army which have questionable friction torque strength have been issued. This message authorizes continuous use of such nuts with a daily inspection to insure friction torque until acceptable nuts can be procured. Contact: W.W. Lake, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Maintenance advisory message concerning tail rotor assembly link configurations (OH-6A-80-02, 091410Z Apr 80).

• Maintenance advisory message concerning accidental servicing of automotive engine oil into aircraft turbine engines (GEN-80-06, 091420Z Apr 80).

• Safety-of-flight message concerning one-time inspection of UH-60A push rod (UH-60A-80-12, 112130Z Apr 80). Summary: It was recently discovered that some push rods have been drilled off center. These rods must be checked for eccentricity and O.D. and I.D. finish. Contact: Denise Bouchard, AVRADCOM, AUTOVON 693-1732, commercial 314-263-1732.

• Technical information message concerning UH-60 stabilator actuator tie rods (UH-60A-80-13, 111540Z Apr 80).

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

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ UH-1 copilot approached landing site, intending to set down behind another UH-1. As aircraft was on final approach, the other UH-1 took off, raising a large dust cloud. Copilot asked pilot if he should continue or make a go-around. Pilot told him to continue. Aircraft entered dusty area. Crew chief saw parked van below and told copilot not to go down. Copilot applied power, resulting in large dust cloud surrounding aircraft. Pilot came on controls with aircraft turning 60 degrees undetected. Pilot saw treetop above dust cloud and tried to set aircraft down. Aircraft drifted left and main rotor hit parked aircraft.

☐ Six aircraft returning to home base encountered deteriorating weather, with flight leader given 500 feet overcast at field. Flight leader told the rest of the flight to remain at altitude until he checked out the ceiling. Either this command was not heard or misunderstood since the first two aircraft followed the lead aircraft into the clouds at 1,500 feet. About the time the lead aircraft broke out at 70 to 80 feet of altitude, operations told the flight not to penetrate the clouds. Flight leader passed these instructions on to the other five aircraft. The No. 2 aircraft, piloted by aviators who had not logged any instrument time since training, then changed from a 1,500 feet-per-minute descent to a climbing right turn into the clouds, finally losing control and crashing.

Another split rim mishap

The following mishap emphasizes once again the potential hazard associated with maintenance of landing gear wheels, use of undue force on aircraft components, and the urgency often associated with meeting maintenance schedules.

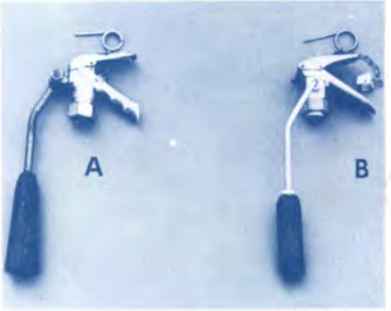
Before disassembly of an OV-1 main landing gear wheel (8.50x10 split rim type, recommended air pressure 100 psi), the valve stem was removed and deflation begun. The mechanic walked away and returned several minutes later and began disassembly. Three of the eight bolts (P/N MS20005-34) were removed. The fourth bolt was hard to remove, and a hammer and chisel were used to cut the nut from the bolt. When the nut was cut, the other four bolts were sheared by the remaining tire pressure, causing the two wheel halves to separate from the tire. The wheel halves under pressure became projectiles, striking the mechanic's right hand, left hand, left forearm, and chest, and inflicting serious injuries.

Investigation revealed an obstruction had blocked the valve port which had initially allowed for a brief deflation prior to blockage. The tire appeared to have been filled with a "stop leak" liquid commonly used to stop slow leaks. Over a period of time, the liquid had begun to harden and created the blockage during deflation.

A local policy was implemented, requiring the insertion of a locally manufactured wheel valve safety after deflation and before removal of the wheel from the landing gear and further disassembly. The valve safety should prevent recurrence of this type mishap. ■

Operation of fire extinguishers

The aluminum head variety of fire extinguisher (B) is still installed in many Army aircraft. To operate this fire extinguisher, pull the pin and remove the metal block. The handle can then be squeezed. The brass head extinguisher (A) requires only the pulling of the pin before squeezing the handle. ■



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Army aircraft mishap prevention data

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Eight 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.

Eight aviators received the Army Aviation Broken Wing Award from January through March 1980.

• **Captain Harold C. Cobb, Florida Army National Guard, Jacksonville, Florida.** CPT Cobb was returning to his home field from a night training flight. Eight miles south of the field, he heard a grinding noise, followed by a loud bang and continued grinding. The master caution and main generator lights came on. Cobb, fearing he had transmission problems, placed the UH-1M in a powered descent. At about 500 feet msl, Cobb perceived a lack of aircraft response to left pedal input as he was unable to arrest a right turn. Recognizing he could not keep the helicopter in the air because of the loss of directional control and altitude, Cobb turned on his landing light, maintained a controlled descent until 50 to 100 feet above the trees, rolled off throttle, shut off fuel, and autorotated into the trees. The heavily forested terrain that prevailed throughout the area virtually eliminated the chances of immediately landing without damage. The emergency was caused by failure of the input bevel gear of the 42° gearbox. Although the aircraft was destroyed, it is felt that Cobb's knowledge, skill, and judgment in handling the emergency prevented loss of life and injuries.

• **CW3 John B. Cole, C Troop, 3d Squadron, 5th Cavalry, Fort Lewis.** CW3 Cole was flying 700 feet agl when his OH-58A engine failed. Searching for a landing area, Cole called for the checklist and confirmed the emergency. He was over a service station, an elementary school, an interstate highway, and powerlines. Although his intended landing area was large and flat, it was difficult to reach. On final, Cole extended his glide, clearing the powerlines and landing in the only available area. Maintenance inspection revealed that the fuel pressure differential switch had vibrated loose during flight, causing air to enter the system and restricting fuel flow.

• **CW2 Raymond B. Fosdick, General Support Company, 7th Aviation Battalion, Fort Ord.** CW2 Fosdick was flying at 50 feet and 40 knots on a low-level reconnaissance mission when his OH-58A engine failed with no warning. Fosdick partially reduced collective pitch, turned about 30 degrees to align with his selected touchdown point, and cushioned the landing with remaining collective pitch. The landing area was surrounded by trees about 20 feet high and trucks and armored personnel carriers, and it was full of holes.

• **Captain Hugh M. Bryan, 9th Aviation Battalion, 9th Infantry Division, Fort Lewis.** CPT Bryan was on a UH-1H maintenance test flight. A rapid series of severe compressor stalls occurred, and Bryan was forced to enter autorotation. Attempts to regain partial power resulted in compressor stalls becoming more violent. A 180-degree turn was required to successfully complete the landing with no damage to the aircraft. The landing area was a plowed field which sloped downward with 100-foot trees on two sides and mounds of dirt throughout the area.

• **CW3 Jeff D. Alley, Troop E (Air), 1st Cavalry, 172d Infantry Brigade, Fort Wainwright.** CW3 Alley was on an AH-1G training flight. During an OGE right hovering turn at 75 feet agl, the left pedal could not be moved more than 1 inch to stop the turn. A link in the tail rotor silent chain had broken and jammed in the chain guard. The aircraft was flown into a normal attitude with the pedal held lightly against the stop. Alley flew to Fort Wainwright and made a running landing. Ice fog on the approach end of the runway held visibility down to about 100 meters.

• **CW2 Edwin Dale Dawson, B Company, 8th Combat Aviation Battalion, 8th Infantry Division, APO New York.** CW2 Dawson, on a night orientation flight in an AH-1S at an altitude of 1,000 feet agl, heard a loud metallic bang from the engine compartment, followed by a grinding noise and complete loss of power. Dawson entered autorotation and transmitted a Mayday call. The night was overcast, with haze and snow further decreasing visibility. With the searchlight on, Dawson could not see the ground until 50 to 60 feet agl. He successfully completed the emergency autorotation to a freshly plowed field.

• **WO1 Wesley D. Parker, Company A, 229th Attack Helicopter Battalion, 101st Airborne Division, Fort Campbell.** WO1 Parker was the PIC of an OH-58C on a cross-country training flight. With the copilot at the controls, the aircraft yawed sharply and suddenly to the left, with a corresponding drop in rotor, engine, and gas producer rpm. Parker assumed control and began to follow engine failure emergency procedures. The only available landing area within autorotational range was a field about 100 meters by 300 meters, surrounded by fences and densely wooded hills. Parker banked the aircraft to the left, aligning it into the wind with the long axis of his selected landing area. He skillfully avoided two houses and a barn at the northwest corner of the field, cleared all surrounding fences and a creek running the length of the intended landing area, and set the aircraft in the center of the clearing without injury or damage.

• **WO1 Danny L. Scaturro, 163d Aviation Company, 101st Airborne Division, Fort Campbell.** WO1 Scaturro was flying an OH-58A at terrain flight altitudes over heavily wooded areas when he noticed a sudden reduction in engine noise, accompanied by a significant loss of rpm and temporary activation of the engine-out light and audio. Scaturro immediately began a turn to the only available landing area, reduced throttle, and adjusted collective to establish a controlled descent to the landing area. Realizing the area was too far away to complete a normal autorotation, Scaturro used his rotor rpm to extend his glide. This resulted in low rotor rpm, which he remedied by applying enough deceleration to regain sufficient rpm. He maneuvered the aircraft into a tiny, rough, sloping, and vegetated area at near maximum gross weight and landed with no damage. ■

CW2 Edwin Dale Dawson successfully landed this AH-1S after complete power loss during night flight.

Followups

Additional information on mishap briefs previously published

ah1 **Class B mishap** in 30 January 80 issue (8018) ☐ Aircraft was being flown NOE when ground troops were seen 90 degrees to left of aircraft. Crewmember in rear seat, who was flying the aircraft, engaged troops with the turret weapons system. During the engagement, tail rotor struck tree and antitorque control was lost. As aircraft began to turn right and descend, throttle was rolled to flight idle. Aircraft landed hard. Pilot-in-command, who was in the front seat, had been using turret weapons system just before the tail rotor strike. Crewmember in rear seat had 56 hours in design and 30 hours in series at time of mishap.

8018

oh58 **Class B mishap** in 9 January 80 issue (8014) ☐ Pilot, flying over an OH-58 that had made a precautionary landing, allowed his aircraft to descend below a safe altitude while making left turn. Maneuver was performed at night in light to moderate rainshowers. Pilot reduced collective pitch and applied aft cyclic as he entered a 20- to 30-degree left bank. This maneuver, which was performed to slow the aircraft and turn about a ground reference (the downed OH-58), caused aircraft to begin a descent. Pilot failed to detect the descent because he was trying to reestablish a reference with the horizon and ground. Aircraft hit three trees and was flown to an airfield and landed. The left side of the aircraft was damaged and both windscreens were broken.

8014

uh1 **Class A mishap** in 21 November 79 issue (8008) ☐ As aircraft was in straight-and-level flight, input bevel gear of 42° gearbox failed because of overstress resulting from progressive fatigue. Failure was accompanied by grinding noise, followed by loud bang, further grinding, and activation of master caution and main generator lights. Pilot placed aircraft in powered descent while copilot recycled master caution panel. At about 500 feet msl, master caution and transmission/gearbox chip detector lights came on, and pilot perceived a lack of aircraft response to left pedal input. Aircraft was in slow right descending turn at this time, which persisted regardless of left pedal input. As aircraft neared tree-covered terrain, pilot shut off fuel, rolled off throttle, reduced forward airspeed to near zero, and autorotated into treetops. Aircraft came to rest on its left side. By shutting off the engine, pilot eliminated all torque effect. As a result, when he pulled collective at termination of autorotation, there was no noticeable yawing of the aircraft. The heavily forested terrain that prevailed throughout the area over which the emergency occurred virtually eliminated the chances of landing the aircraft without damage.

8008

Class A mishap in 21 November 79 issue (8009) ☐ Aircraft on terrain flight crossed a set of wires, turned, and began to fly parallel to them. Copilot, who was on the controls, saw another set of powerlines in his flight path and lowered collective. The main rotor blades hit the wires, and the aircraft continued forward about 275 yards and crashed. The flight was being conducted during the late afternoon when long shadows were present and when poles and wires tended to blend into the dark background of freshly plowed fields. Because of these environmental conditions, copilot failed to see wires soon enough to take evasive action. ■

8009

Selected mishap briefs

uh1 **Class E mishaps** ☐ Cockpit on copilot's side of aircraft filled with smoke and fire. Inverters were switched to standby. Hydraulics failed during landing. Caused by cracked housing on hydraulic pump. ☐ Low rpm light and audio came on. Caused by failure of tachometer generator. ☐ Copilot noticed rapid fluctuation of engine oil pressure gauge. Following shutdown, engine oil reservoir was found to be empty. Failure of engine nose seal allowed oil to escape. ☐ Pilot noticed high frequency vibration and grinding noise from rear of aircraft. As engine was being shut down, No. 4 hanger bearing seized and disintegrated. ☐ When IP tried to take manual control of throttle for antitorque maneuver, three rapid compressor stalls occurred. Engine rpm increased and torque fluctuated. Caused by broken bearing on variable inlet guide vane actuator control rod at fuel control end. ☐ Master caution and transmission oil hot lights came on after takeoff. There had been continuous rain for 12 hours. Moisture seeped into electrical connection to temperature sensor sending unit.

ah1 **Class C mishap** ☐ Postflight inspection revealed vertical fin drive shaft cover was destroyed. Both pilots said cowling was fastened prior to flight.

Class E mishaps ☐ Master caution light came on during landing. Caused by failure of engine oil pressure switch. ☐ Dual tiedowns were being used. Forward main rotor tiedown was not removed prior to start. As aircraft was started, tiedown hook came off and flew into tail rotor blade. There were no indications of a problem or damage until postflight inspection.

ch47 **Class E mishaps** ☐ At 300 feet agl and 95 knots, with a 10,000-pound sling load, aircraft lurched upward and rpm increased. Flight engineer told pilot that load had dropped. Caused by failure of metal ring cemented to top of load. ☐ Control pedals became stiff during takeoff. Caused by failure of magnetic brake. ☐ During descent, cyclic started to bind in pitch axis. On final, cyclic would not move forward past 50 knots airspeed. Just before touchdown, controls became free and stick positioner indicator showed 4 inches forward cyclic regardless of cyclic position. Caused by failure of cable and tube assembly. ☐ No. 2 engine oil pressure gauge showed gradual drop in pressure to 32 psi. Caused by internal failure of No. 2 engine oil lubricating pump.

oh6 **Class C mishap** ☐ At termination of standard sod touchdown autorotation, front part of skids dug into sod. Aircraft rocked forward and bounced, and main rotor blades hit and severed tail boom.

oh58 **Class C mishaps** ☐ On takeoff from LZ, pilot did not see wires ahead of him because of dust and because he was watching for personnel and vehicles in the area. When he saw the wires it was too late to miss them. Pilot tried to go under wires, breaking two solid copper strands. Aircraft was landed with damage to main rotor blade. Wires were marked on pilot's hazard map. Passenger in left seat, who was a qualified OH-58 pilot, did not see wires until just before impact. ☐ Main rotor blade hit tree limb during NOE training flight. ☐ Aircraft drifted right into tree during NOE hover, damaging main rotor blades.

Class E mishaps ☐ Cyclic control binding during runup was caused by malfunction of force gradient assembly. ☐ Loud banging sound at termination of autorotation was caused by spike knock. ☐ On postflight inspection, right rear passenger seatbelt was found hanging out of aircraft. Closer inspection revealed two small holes in fuselage.

ov1 **Class E mishaps** ☐ (D series) Right drop tank would not transfer fuel in flight. Caused by failure of fuel transfer pump. ☐ (D series) Egt rose, aircraft yawed, and loud banging sound was heard during flight. Internal engine failure was caused by failure of No. 2 bearing pack. ☐ (D series) No. 1 egt went to maximum on analog display, and digital readout went to 990°. No. 1 engine was reduced to flight idle and egt returned to normal. Caused by failure of signal data converter of VIDS. ☐ (D series) Aft fuel boost pump light came on and circuit breaker popped. Failure of sealing compound in main fuel cell caused boost pump to fail.

t42 **Class E mishap** ☐ No. 1 engine would not accelerate beyond 2200 rpm on takeoff. Caused by failure of fuel control.

u21 **Class C mishap** ☐ (D series) During practice obstacle clearance approach/minimum run landing, aircraft landed gear up, damaging underside of fuselage, wing flaps, and propellers.

Maintenance

uh1 **Class E mishaps** ☐ Pilot noticed feedback in controls during hover. Identification tag had chafed through hydraulic pressure line and was not discovered during phase maintenance because tag covered chafed area. ☐ Fluctuation of transmission oil pressure gauge was caused by loose cannon plug to gauge. ☐ Engine oil pressure gauge fluctuated. Caused by improperly secured cannon plug.

ah1 **Class E mishap** ☐ Master caution and engine oil pressure lights came on. Caused by loose cannon plug.

ch47 **Class C mishap** ☐ While beeping to 245 rpm for APU start, rpm rose to 250 and stabilized. When pilot tried to beep down, rpm climbed to 270 before emergency beep could be used. Loose wire was found in copilot's thrust control to No. 1 and 2 beep switch. Both rotor heads had to be replaced.

oh58 **Class E mishaps** ☐ Battery exploded when engine was started. Suspect cells were overfilled, causing excessive gas buildup. ☐ High frequency vibration in airframe was caused by improper washer stackup on tail rotor pitch horn. ☐ Fuel gauge fluctuated from 275 to 600 pounds, intermittently sticking at 600 pounds. Caused by loose cannon plug.

(continued on next page)

Mishap briefs

u21 **Class E mishaps** ☐ (A series) Crew smelled fuel fumes during flight. Caused by loose fitting on heater fuel pressure relief valve in left center wing. ☐ (A series) Damage to both right gear doors and linkage was found during preflight. Improper rigging of inboard gear door caused tire to hit gear during retraction, damaging linkage to both doors on previous flight. Because of linkage damage, right gear door did not completely close on retraction. When gear was extended, gear door was damaged by gear.

Messages received

- Maintenance information message concerning UH-60 cracking of main rotor spindle bearing inner race and scoring of bonded liner (UH-60A-80-14, 151615Z Apr 80).
- Maintenance information message concerning replacement of droop stop bushing in UH-60 aircraft (UH-60A-80-15, 162020Z Apr 80).
- Maintenance advisory message concerning AH-1S rotor blades (AH-1-80-09, 151610Z Apr 80).

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Aircraft was assigned a mission that required additional fuel. As pilot hovered aircraft toward refueling site, located in an extremely dusty area, swirling dust caused IMC. When pilot couldn't establish visual contact with ground by looking down through chin bubble, he began a steep climbout. Pilot later stated that while still in the dust, ". . . it felt as if I was moving backwards and I knew that I was moving forward and I had not applied any rearward pressure on the cyclic." At this time, rotor rpm began to decrease, and pilot told copilot, "I've got vertigo." Copilot took over and attempted to set aircraft down through dust cloud, experiencing diving right sensation. Aircraft hit level, bouncing 10 to 15 feet.

☐ After refueling, pilot lifted aircraft to low hover and began sideways hover toward takeoff site. Aviator in nearby aircraft saw accident aircraft begin a slow drift downward while still hovering sideways. Neither pilot nor copilot detected the descent. About 60 feet from initial hover site, right skid hit ground, and aircraft bounced into air and rolled over inverted.

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

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Mishap review

Synopsis

When the rpm warning light and audio activated as the UH-1H was making a ground controlled approach to the airfield, the pilot lowered the collective and began a left turn towards a forced landing area. The aircraft approached the ground in a nose-high attitude with about 20 knots of forward airspeed. After a hard touchdown, collective was increased. The Huey became airborne again and pitched forward. The main rotor blades hit the ground with enough force to cause the transmission to be displaced.

History of flight

The mission was to fly to a post about 55 minutes away, pick up passengers, and return to home base. While the pilot planned the flight, the copilot preflighted the aircraft. A fuel sample was not taken, and the aircraft was overdue an engine runup and daily inspection.

Although required by current directives, there was no premission coordination between the crewmembers concerning duties in the event of an emergency.

The first leg of the mission was flown as planned and, except for a slight fluctuation in egt, aircraft performance was satisfactory. The copilot, allegedly to reduce fuel consumption, decreased engine rpm to about 6400-6500.

The Huey was refueled at the passenger pickup point. The return flight was delayed more than 2 hours awaiting arrival of the passengers. Departure was made without a passenger briefing or use of the dash 10 checklist.

A VFR flight plan was filed. Weather at destination was 800 feet overcast with 10 miles visibility. Fourteen miles east of destination, a ground controlled approach was requested. The aircraft was 10 miles out in level flight at 4,000 feet when the pilot took the controls and began instrument flight. The ground controlled approach was initiated, and the aircraft entered a layer of clouds at 1,800 feet. At this point, a prelanding check was made, and the landing light was extended but not turned on.

As the aircraft cleared the bottom of the cloud layer, the rpm warning system activated. N_2 rpm and rotor rpm dropped to 6000 and 300 (needles joined). The pilot lowered the collective without rolling the throttle off and began a left turn toward a forced landing area. The pilot then made a Mayday call and decided to try to increase engine rpm

using the increase/decrease switch. Simultaneously, the copilot moved the fuel control governor switch to the emergency position. The resulting engine overspeed was in excess of 7000 rpm, and the rotor overspeed was in excess of 400 rpm.

The aircraft responded with an immediate nose-up attitude and right yaw. The pilot increased collective pitch and retarded the throttle to decrease engine and rotor rpm. Without waiting for acknowledgement from the pilot, the copilot returned the governor switch to the automatic position. Engine and rotor rpm decreased and was stabilized at 6000 rpm and 300 rpm with the collective full down and throttle full on.

About 300 to 400 feet above the ground, airspeed was 40 knots and decreasing. The pilot lowered the nose of the aircraft and the airspeed stabilized at 40 knots. About 20 to 30 feet above the ground, the pilot decelerated but did not apply power until ground contact was made. The aircraft approached the ground in a nose-high attitude with about 20 knots of forward airspeed. Touchdown was hard. Collective was increased, and the aircraft became airborne again, then pitched forward. The main rotor blades hit the ground three times, and the transmission was displaced. The aircraft came to rest in an upright position.

Crewmember experience

The 28-year-old pilot had almost 800 rotary wing flight hours. More than 700 of these were in UH-1Hs. The 22-year-old copilot had almost 300 rotary wing flight hours, with more than 200 in UH-1Hs.

The performance of both aviators was satisfactory during their postaccident flight evaluations. However, both aviators displayed weaknesses in the knowledge of dash 10 emergency procedures, use of the dash 10 checklist, and the performance of autorotations. Neither aviator knew the correct procedure for manual operation of the throttle with the governor switch in the emergency position although their ATM records reflected task completion.

Commentary

The pilot permitted the copilot to beep N_2 down to considerably less than 6600 allegedly to conserve fuel. The aircraft had been refueled before start of the return leg of the mission and estimated time en route was 1 hour. The need for fuel/range management was irrelevant to safe accomplishment of the mission. A further beepdown of N_2 may have inadvertently occurred later in the flight, causing the rpm warning system to activate. There was no evidence to confirm a materiel malfunction.

An approach with low power was made because the pilot and copilot incorrectly assessed a low engine/rotor rpm indication as a low-side governor failure and failed to respond to the suspected emergency correctly. Following the onset of the emergency, the pilot began to remedy the condition by beeping up N_2. The copilot placed the governor switch in the emergency position while the throttle was in the full-on position without telling the pilot. When the pilot tried to compensate for the resulting engine/rotor overspeed by adding collective and rolling off the throttle, the copilot returned the governor switch to the automatic position, causing further confusion.

(continued on next page)

Mishap review

The cumulative effect of these actions may have overloaded the pilot to such a degree that he was unable to complete the approach and landing without damaging the aircraft. The pilot initiated the deceleration phase of the approach at too low an altitude (about 25 feet agl) to fully realize an appreciable reduction in forward speed and sink rate before touchdown was imminent. As a result, he was late in applying control inputs necessary to arrest the rate of descent and achieve a near-level attitude on landing.

Although the copilot cannot be faulted for misinterpreting a probable beeped down N_2 condition as a low-side governor failure, he should not have cycled the governor switch into and out of the emergency position without the pilot's knowledge. The pilot did not brief the copilot before the flight regarding duties and responsibilities in the event of an emergency. Also, when the pilot began to remedy what he thought was a beeped down N_2 condition, he did not coordinate his actions with the copilot.

Adequate written guidance was made available to members of the unit. However, compliance with Army, MACOM, and local regulations, policy letters, and the unit SOP was not being enforced.

- No fuel samples were taken during the mission.
- The pilot did not brief crewmembers concerning duties in case of an emergency.
- Passenger briefings were not given.
- The aircraft was started and shut down without use of the checklist.

The commander had an excellent training program in writing; however, it was not being enforced. Training in the use of appropriate publications, weather, emergency procedures, and other flight-related subjects was not provided on a regular basis.

Stress and its relationship to crewmember performance, as well as the types of errors that lead to creation of a high stress situation, should be discussed at unit safety meetings.

Commanders must insure assigned personnel are ready to perform jobs assigned. Less experienced aviators must be continually monitored, evaluated, and trained as necessary to insure they are capable of coping with in-flight emergencies. Aviator judgment should be evaluated as an area of special interest during standardization evaluations and unit training flights.

Commanders should emphasize to their aviators the importance of crewmember briefings prior to flight, proper crew coordination, and aviator professionalism in general. ■

New butane lighters may be deficient

A Quality Deficiency Report recently received from the field indicates that a potential hazard may exist with the new butane lighter fire starter, NSN 9920-00-999-6753, a component of the SRU-21/P survival vest. The new lighter can be identified by the screw-on cap and waterproofing O-ring. During the first scheduled quarterly inspection after issue, the cap from a lighter blew off in the inspector's hand when it was unscrewed. This was caused by gas escaping from the needle valve, accumulating under the cap, and building up pressure. Upon further inspection, it was determined that metal turnings from the original machining of the needle valve had worked their way under the flat spring retainer of the valve and would not allow it to seat completely, even though the valve control knob had been turned completely clockwise and the valve appeared closed. This same deficiency was found on all nine lighters inspected.

It is recommended that all new type butane lighters be inspected for the presence of metal turnings around the needle valve and that inspectors insure all valve control knobs are turned completely clockwise and off prior to cap installation. ■

Selected mishap briefs

uh1

Class C mishap ☐ Dents were found in both main rotor blades after landing. Suspect dents were caused by tree strike on final approach.

Class E mishaps ☐ Aircraft was fifth in flight of six on approach to LZ. Approach was being made downwind with wind from left rear quadrant. On short final, aircraft developed high sink rate and copilot increased power. Pilot noticed torque was 52 pounds. Caused by pilot allowing inexperienced copilot to continue downwind approach which terminated with overtorque. ☐ Crew saw bird about 500 feet in front of and 200 feet above aircraft. As aircraft was passing to left and below bird, it dived into main rotor. Aircraft was landed and inspected, and flight continued. ☐ As copilot was opening door of aircraft, gust of wind caught door and tore it off. Winds were 18 knots gusting to 26 knots. ☐ Needles did not split during simulated forced landing from altitude. At 5500 rpm, SIP initiated power recovery after four or five sharp noises. Caused by sprag clutch failure. ☐ At flight idle, IP noticed unusual noise coming from rotor system. Bonding on upper side of main rotor blade had begun to separate from honeycomb at tip of blade. ☐ Engine quit during hover. Caused by failure of fuel control.

uh60

Class E mishaps ☐ Lateral vibration in flight was caused by failure of No. 3 main rotor blade spindle assembly. ☐ Torque split occurred during cruise flight. Caused by malfunction of electronic control unit. ☐ All 10 hydraulic lights came on and aircraft was landed with control feedback. No. 1 hydraulic reservoir was empty, No. 2 system was very low, and backup was overfilled. No leaks were found. Reservoirs were serviced, and ground run of 30 minutes could not duplicate problem.

ah1

Class A mishap ☐ Power was lost, and aircraft bounced during attempted landing. Main rotor hit tail rotor drive shaft, and tail boom and transmission were damaged. 8035

Class C mishap ☐ During hydraulics-off landing, aircraft touched down 575 feet from landing threshold on center line at 50 knots IAS. Aircraft slid 627 feet, yawed right, slid 467 feet, and hit some raised asphalt around a light on right side of lane. Sudden deceleration caused by striking asphalt caused cross tubes to roll aft in their mounts, as both skids separated. As aircraft settled to lane, VHF/UHF antenna separated. IP took control and brought aircraft to hover. Aircraft was then flown to airfield where it was lowered to ground while pallets were placed under wing pylon.

Class E mishaps ☐ During cruise flight on NOE course, pilot suspected wire strike. Wires were posted on NOE map, and pilot was aware of their approximate location but did not see them until they appeared under nose of aircraft. New foliage in the area hampered visual acuity. Airspeed was about 25 knots at time of suspected wire strike. Inspection revealed gun turret fairing was slightly scratched. ☐ Engine oil pressure and master caution lights came on during runup. Caused by failure of engine oil pressure switch. ☐ N_2 fluctuated 200 rpm with movement of collective pitch. Caused by failure of overspeed governor.

ch47

Class E mishaps ☐ No. 2 engine chip detector light came on, followed by loss of oil pressure and increase in oil temperature. Postlanding inspection revealed No. 2 engine transmission oil filter was clogged, engine was completely oil-soaked, and transmission had lost all its oil through input shaft seal between engine and engine transmission. Engine transmission and drive shaft were replaced. ☐ Pilot started losing visibility in heavy rain. VMC could not be regained, and pilot initiated vertical helicopter instrument recovery procedures and returned to home station. Low ambient light conditions prevented identification of unforecast heavy rainshowers. ☐ Loud bang was

(continued on next page)

Mishap briefs

heard in vicinity of No. 2 engine, and torque dropped to zero. Inspection revealed engine compressor had ingested inlet guide vanes. ☐ Rpm increased and then beep remained static on No. 2 engine while aircraft was carrying external load. Engine could not be controlled using d.c. beep trim. Caused by failure of actuator.

oh6 **Class E mishap** ☐ Pilot, trying to contact ATC, determined that UHF radio was malfunctioning. As pilot was consulting IFR supplement for additional frequency information, light turbulence was encountered, and IFR supplement fell into chin bubble and became lodged under antitorque control bellcrank, restricting left pedal inputs. Running landing was made at home station.

oh58 **Class E mishaps** ☐ Oil pressure fluctuated and TOT exceeded limits of 927° C. Caused by failure of threads in diffuser scroll where fittings and air line from heater enter scroll. ☐ Snapping sound was heard when engine was started. Passenger noticed tiedown was connected. Engine was shut down and halfway through rotor coastdown, tiedown strap hit top of vertical fin, puncturing hole in fiberglass. ☐ Tail stinger hit ground during quick stop. Pilot felt vibration in pedals and landed. No damage was found. ☐ Engine chip detector light came on. Metal particles were found on plug and oil filter.

c12 **Class E mishaps** ☐ (A series) During descent, pilot saw fluid coming from exhaust stack on No. 1 engine. Single-engine landing was made. Caused by failure of O-ring. ☐ (A series) After practicing maximum rate descent, airspeed was reduced to 160 knots, and gear handle was placed in up position. Gear retracted about 75 percent of full up and then stopped. Gear was extended by emergency handle and aircraft was landed. Caused by failure of landing gear motor. ☐ (A series) Right main gear shock strut was found collapsed after preflight runup. Severed lower bearing outer packing caused oil leakage.

t42 **Class E mishap** ☐ Pilot heard unusual noise at end of gear retraction cycle. Postlanding inspection revealed left inboard gear door was not fully closed and was dented. Caused by sheared actuator rod shear pin. Aluminum pin was used instead of steel pin.

u8 **Class E mishap** ☐ (F series) Three minutes after level-off, No. 1 engine quit. Throttle was retracted and engine restarted and continued to run with partial power. Two spark plugs on different cylinders had broken electrodes.

u21 **Class E mishap** ☐ (A series) Smoke entered cockpit from copilot's fuse and circuit breaker panel. Caused by failure of circuit breaker and overheated motor.

ov1 **Class B mishap** ☐ (D series) Aircraft was run up to empty fuel from main fuel tank because both forward and aft boost pumps were inoperative, and aircraft was at a remote site where defueling capability was not available. Pilot decided to run engines at a higher than idle setting to decrease time required to deplete fuel. Parking ramp was extremely icy, so pilot decided not to unfeather props. Torque gauge had been giving erratic and erroneous readings. After engine was started, torque inverter circuit breakers were pushed in. Both needles indicated well over 140 pounds. Pilot and crew chief both agreed that gauge was inaccurate. Torque inverter circuit breakers were then pulled. Fuel was exhausted and boost pump was changed. After MOC, when engines were started, No. 1 engine hung at 20% N_1 for three start attempts, then started on the fourth attempt. No. 1 and No. 2 engines spewed out white smoke. Engines were then shut down. Both engines had to be overhauled because of overtorque, at a cost of $126,000.

Class E mishap ☐ (D series) After full power was achieved and aircraft had moved 1,000 feet down runway, right engine torque dropped to 20 pounds. Takeoff run was aborted. Bleed air valve blew out gasket because of deterioration.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Aircraft made normal climbout to 800 feet, and then engine failed. Pilot relieved copilot at controls and placed aircraft in autorotation. While in descent, pilot was able to maintain rotor rpm well within the normal autorotation range. As aircraft was flared, the rotor raised a large, thick cloud of red dust. With visibility almost IFR, pilot pulled pitch at an altitude estimated to be 3 to 5 feet. Aircraft hit ground, with heels of both skids causing main rotor to sever tail boom.

☐ Ground unit requested night medevac of patient they classified as priority. When medevac requested postponement because of bad weather, patient classification was changed to urgent. En route to pickup site, medevac flight encountered bad weather, including rain. When over pickup site, pilot requested flares since he could not see the field lights. Soon afterward, pilot reported heavy turbulence. Aircraft hit ground in near-level attitude, with full power and an estimated airspeed of 90 knots. Radio transmissions indicated pilots were having extreme difficulty controlling aircraft and fighting over controls. Last transmissions received were a continuous series of prayers by one aviator, occasionally interrupted by the other aviator telling the first to get off the controls.

Maintenance

uh1 **Class C mishap** ☐ During takeoff from field site with sling load (tow mule), sling hook shear pin sheared, allowing manual release to open. Tow mule fell to ground and was destroyed. Inspection revealed hole for shear pin was elongated. Excessive yoke and space sleeve clearance allowed shear pin to absorb thrust loads it was not designed to absorb.

Class E mishaps ☐ Transmission oil pressure light came on and gauge indicated between 30 and 40 psi. Oil drain valve was stuck partially open because of trash inside valve, allowing oil to seep out. ☐ Cyclic feedback occurred during approach, and noise was heard from transmission area. Crew chief removed forward transmission inspection panel and saw that left cyclic servo lower retainer cap, NSN 1650-00-944-4436, was within one-half turn of coming completely off. Caused by improper installation of tab lock washer, NSN 5310-00-932-7732. ☐ Transmission oil pressure fluctuated and crew smelled unusual odor. Postlanding inspection revealed transmission oil return hose had chafed against bulkhead bracket, causing hole in line and subsequent loss of some of the transmission oil. ☐ Five miles from airport, IP noticed liquid streaming across windscreen. Battery switch was turned off and approach initiated. About 100 feet agl, smoke was seen escaping from both battery vents, and fumes were in cockpit. Caused by voltage regulator being set too high. ☐ During takeoff, pilot felt cyclic binding in forward and aft modes. Built-in friction of synchronized elevator was set too high.

ch47 **Class E mishaps** ☐ During climb, crew chief saw oil dripping off combining transmission. Chip of paint was lodged in O-ring on wafer filter, causing leak. ☐ Ramp check after takeoff revealed hydraulic leak from utility pump area. Hydraulic fluid was coming from chafed line on upper case drain fitting of utility pump. Line was visible only by removal of inspection panel.

oh58 **Class E mishap** ☐ Cyclic binding occurred when left cyclic was applied after takeoff. Cyclic lever assembly had been painted with zinc chromate after maintenance was performed. Overspray got into bearing and shim, causing cyclic binding.

u8 **Class E mishap** ☐ (F series) Left main gear indicated unsafe during landing approach. Gear was manually lowered. Caused by out-of-adjustment actuator assembly.

(continued on next page)

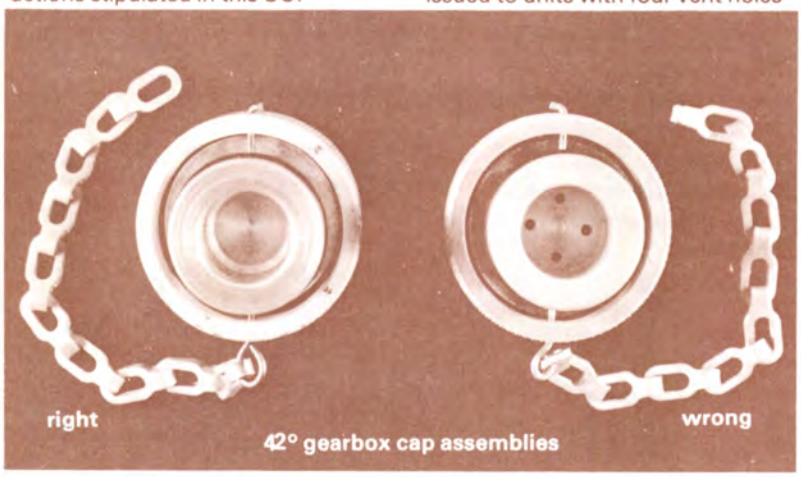
Mishap briefs

Messages received

• Safety-of-flight message concerning one-time inspection for UH-60A main rotor spindle assemblies (UH-60A-80-18, 241600Z Apr 80). Summary: Preliminary analysis of recently conducted ground tests indicate possible fatigue damage to spindle assemblies following slippage of spindle bearing inner race. Until further testing can be conducted and impact of fatigue life determined, precautionary actions stipulated in this SOF message will be followed. Contact: John Guenther, AVRADCOM, AUTOVON 693-1732.

• Maintenance advisory message concerning UH-60A cargo door handles coming loose and falling from aircraft (UH-60A-80-19, 281505Z Apr 80).

• Maintenance advisory message concerning 42° gearbox cap assemblies (UH-1-80-07, AH-1-80-10, 222010Z Apr 80). Caps have been issued to units with four vent holes drilled in center section. Units should immediately inspect all UH-1/AH-1 aircraft for discrepant caps. Caps with vent holes should be removed immediately and replaced with nonvented caps. ■



42° gearbox cap assemblies

Outdated medication found in survival kits

During inspection of seven individual tropical survival kits, NSN 6545-00-782-6412, a component of the SRU-21/P survival vest, two kits were found to contain 12 each Doxycycline Hyclate tablets, dated July 1971. This medication, if used after the expiration date, could result in kidney damage or failure. Identified under FSN 6505-142-9140, this item was deleted from stock in April 1971 and should have been removed from all survival kits.

It is recommended that all individual tropical survival kits be inspected for the presence of this medication and that it be removed and disposed of if found. ■

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Army aircraft mishap prevention data

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Getting the job done

The worldwide accident rate for FY 79 was 5.2 per 100,000 flying hours, the lowest in the history of Army aviation. Seventy-five accidents and 18 fatalities were recorded for the year, compared to 90 accidents, 57 fatalities, and a 6.2 accident rate for FY 78. Hours flown were about the same each year, 1.4 million.

This is a particularly impressive improvement considering that it was achieved during greater involvement in extensive field training exercises, flying under difficult, realistic conditions.

All of you in Army aviation are to be commended for a difficult job well done. With a concerted effort and continued professionalism, an equally impressive gain can be made in FY 80.

"Tell it like it is" PRAMs

One Friday morning last May at Marshall AAF, Fort Riley, maintenance test pilot WO1 Dan Shank was running up an OH-58A. With the engine idling at 63% N_1, he turned the battery switch on. The battery exploded! The aircraft was immediately shut down.

Investigation revealed that the wrong size screw had been used on a terminal link inside the battery case. This left a gap which created electrical arcing. All OH-58s at Fort Riley were grounded for a one-time inspection. Three more were found with the same problem. Major (then Captain) Ray Schaefer, aviation safety officer, 1st Aviation Battalion, called the Army Safety Center, then dispatched a detailed Preliminary Report of Aircraft Mishap (PRAM).

Part of the problem was two screws of different lengths with the same National Stock Number. The Safety Center's LOH system manager coordinated with Communications-Electronics Readiness Command (CERCOM) and Troop Support and Aviation Materiel Readiness Command (TSARCOM) to find a solution. The result was an OH-58 safety-of-flight message, a FLIGHTFAX article, a recommended change to AR 385-40 to improve identification of failed parts, and recommendations to better identify all parts by part number.

One well-written PRAM had started actions which eliminated an aviation hazard with catastrophic potential.

There are other cases in which one PRAM has led to the identification of and solution to a worldwide problem. But sometimes it takes more than one to establish a trend or define the magnitude of a problem. The point is that the PRAM is one of the most important tools available for identifying and solving aviation problems before they kill somebody.

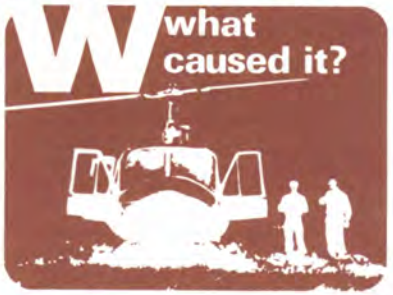
Most PRAMs report precautionary landings (this classification includes aborted takeoffs and interrupted missions) caused by materiel problems. Most accidents are caused by human error. Doesn't quite track, does it? There are several reasons. One is that a unit just doesn't have the people to conduct a detailed investigation of every precautionary landing.

When an oil pressure light comes on, you don't ask the pilot how much sleep he had the night before. If he had been more alert, though, he might have caught that chafing line on preflight. Another reason might be that the commander or safety officer just doesn't want to put his "dirty laundry" out for everyone to see. "I mean, after all, we just can't tell battalion, division, and the whole world that the hydraulic line failed because a fitting was overtorqued by an improperly trained and unsupervised OJT crew chief!" Sound familiar?

Although these things don't appear in PRAMs, they are often revealed in accident reports. To paraphrase a TV commercial, you can write it now, or we can write it later. When you read in FLIGHTFAX that the destruction of another unit's aircraft and the loss of a crew was caused by the same problem you identified and solved in your unit, nothing will help that sick feeling in the pit of your stomach. (An article entitled "Don't Embarrass the Command" reprinted from APPROACH in the April 1978 AVIATION DIGEST deals with this problem and is worth reading again.)

Since most PRAMs are reports of precautionary landings, let's look at them for a minute. Precautionary landings increased from 72.8 to 205.1 per 100,000 flying hours from CY 71 to CY 78. During that same period the accident rate decreased substantially. That doesn't necessarily prove that precautionary landings prevent accidents, but there have been a lot of precautionary landings that were inches or seconds away from being major accidents.

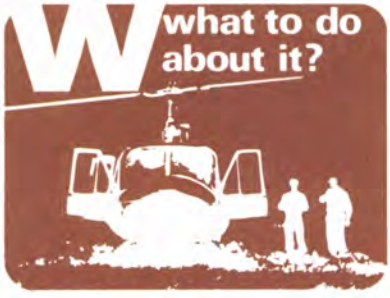
AR 385-40 tells you how to prepare a PRAM but leaves a lot of latitude as to how you describe what happened, what caused it to happen, and what can be done to keep it from happening again. These three items of information—the 3Ws as we call



them—are what we at the Safety Center need 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 deceleration to slow aircraft's forward speed, followed by insufficient 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 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 high gross weight of aircraft (9,000 pounds) and failed to use sufficient pitch application to reduce high rate of descent and forward speed **because** he was inexperienced (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 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 by the Safety Center in the same 3W mishap reporting format we use for accident 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. These terms are defined in more detail below. 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.

Our job at the Safety Center is to help you save lives, increase your aircraft availability, and help improve your unit's readiness. To do this, we need your help in identifying problems and corrective actions. Units that submit "tell it like it is" PRAMs using the 3W approach considering man, machine, and environment are contributing much to the worldwide aviation safety effort.

Definitions of the 3Ws

What happened

A task error is performance which deviated from that required by the operational situation and caused/contributed to the accident.

A materiel failure/malfunction is materiel that ceases to operate entirely, operates but not as designed or intended, or operates as designed but performance is below operational requirements.

What caused it to happen

A system inadequacy is an element of the Army system that did not operate as designed or intended and caused/allowed/contributed to the task error, materiel failure, or environmental factor.

What to do about it

Corrective actions are actions required to correct or reduce the operational impact of a system inadequacy. ■

Accident review

Synopsis

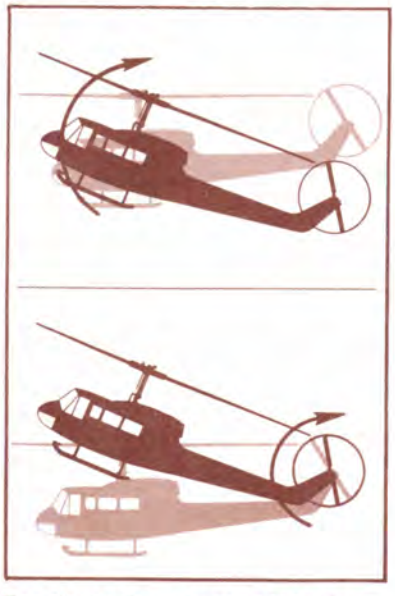
A UH-1H pilot and instructor pilot were on a training flight. The tail rotor hit the ground during an NOE quick-stop maneuver, resulting in major damage to the aircraft.

History of flight

The pilot reported to his assigned IP for a proficiency and readiness test flight. The oral portion of the evaluation and flight planning were accomplished, and a preflight inspection and runup were made. The initial part of the flight was conducted in a designated training area. The crew then returned to the airfield and entered the traffic pattern, where they performed some emergency governor operations and standard, 180-degree, and low-level autorotations. The aircraft was then moved to the slope practice area, which was on the other side of the runway.

The IP demonstrated an NOE quick-stop deceleration, and then the pilot did two of them, which were incorrect. The aircraft was pivoting around the mast instead of the tail rotor. The IP explained the maneuver and demonstrated it again while traveling upwind, this time at a lower altitude (about 5 feet agl) so the pilot could get more of a sensation of altitude gain. The IP then told the pilot to turn around and do one. The wind was 10 knots gusting to 16 knots. The pilot said he understood the proper control inputs, but he pulled back on the cyclic before enough altitude was gained, causing the tail rotor to hit the ground. The aircraft spun to the right, and the IP reduced the throttle to land. The tail boom, cross tubes, and left side of the aircraft were damaged.

The c.g. shown on the DD Form 365F was 140.0. Seven months before, the armored seats had been removed from the aircraft and replaced with lightweight seats and ballast. This was not reflected on the DD 365F. The true c.g. at takeoff was 142.08 and continued aft to 142.78 at the time of the crash. The IP, unaware, had been making autorotations with this aft c.g. in violation of the operators manual.



Top figure shows wrong technique for quick-stop maneuver. When the helicopter is rotated around the axis of the main rotor, the tail boom goes down as the nose of the aircraft goes up. This puts the tail boom into trees and other obstacles. Bottom figure shows correct quick-stop maneuver, with the aircraft rotating around the axis of the tail rotor instead of the main rotor. This raises the nose of the aircraft but keeps the tail of the aircraft stationary and above ground obstacles.

Crewmember experience

The 31-year-old IP had almost 2,000 rotary wing flight hours, with 800 of these in the Huey. The 34-year-old pilot had more than 2,100 rotary wing hours, most of them in the UH-1.

Commentary

The critical aft c.g. condition, tailwinds, low altitude, and the pilot's less than satisfactory performance of the maneuver combined to cause the accident. The pilot applied too much aft cyclic for the amount of collective pitch and failed to maintain enough altitude for the tail rotor to clear the ground.

Although the pilot had demonstrated improper control action on two previous NOE quick stops at a higher altitude, the IP placed the pilot at a 5-foot skid height, downwind with a marginal c.g., for another NOE quick stop. The IP considered the pilot to be experienced and knew he had once been an IP. Therefore, the IP made no effort to guard the controls or otherwise restrict the pilot's movement of either collective or cyclic control.

The IP was overconfident in the ability of the pilot (who had more hours than the IP) to successfully complete the maneuver. In flight situations involving critical maneuvers in close proximity to terrain or other obstacles, the IP must guard the controls and take control at the first sign of trouble.

SIPs conducting standardization rides with IPs should stress the dangers of becoming overconfident in the ability of any pilot, regardless of the pilot's background, flying experience, or qualifications. ■

Selected mishap briefs

uh1 **Precautionary landings** ☐ Aircraft was on disaster relief mission. A crowd of people rushed to aircraft as it was sitting on the ground with its engine running. One person was hit on head by tail rotor blade. Injured person was then loaded aboard helicopter and transported to hospital.
☐ Right fuel boost pump light came on. Clogged wire mesh screen at T fitting on pump caused reduced fuel flow to ejector pump. ☐ Master caution light came on and three loud bangs were heard from engine compartment. Aircraft vibrated and yawed slightly. Smoke was seen trailing from aircraft. After shutdown, smoke was found to be the result of engine compartment being saturated with oil. Caused by engine bearing failure.

ah1 **Precautionary landings** ☐ Master caution and transmission oil bypass lights came on. Caused by failure of pressure switch. ☐ Pilot noticed oil temperature was excessive during hover. Caused by cracked metal fitting on bleed air flexible hose assembly. ☐ Cyclic started motoring to left during runup. Caused by failure of left lateral servo. ☐ Egt fluctuated between 50° and 500° in flight. Caused by failure of cable assembly.

th55 **Precautionary landings** ☐ Engine tachometer went to zero during landing. Caused by failure of dual tachometer indicator. ☐ Excessive vibrations were caused by failure of main rotor blade damper. ☐ Failure of left magneto caused engine to run rough during hover.

oh58 **Accident** ☐ Aircraft had left FARRP en route to nearby unit field site. Engine rpm fluctuated and engine-out warning system activated three times in 1 minute. On the third activation, engine and rotor rpm slowly decayed to 68% and 220 respectively. Pilot continued power-on approach until reaching 3-foot hover where throttle was rolled off. Aircraft landed hard, damaging tail boom and tail rotor drive shaft. Several suitable landing sites were available when emergency began. **See "Put it Down; Leave it Down," 23 May 1979 FLIGHTFAX.** 8001

Precautionary landings ☐ Pilot felt binding in fore and aft cyclic movements. Caused by sticking force gradient assembly.
☐ Transmission oil pressure light came on. Caused by failure of switch. ☐ Aircraft entered unforecast ground fog, and pilot returned to home base.

ch47 **Precautionary landings** ☐ Loud bang was heard from vicinity of flight control closet and shudder was felt in yaw axis of aircraft. Noise was caused by SAS hardover in yaw axis. Hardover was caused by faulty modulator-demodulator card assembly in No. 1 SAS control box.
☐ No. 1 engine chip detector light came on before takeoff. Inspection of plug revealed normal fuzz and detector was reinstalled. During after-takeoff ramp check, flight engineer heard unusual noise and felt high frequency vibration in No. 1 engine area, which ceased after a few seconds. Since all engine instrument indications were normal, decision was made to continue 10-minute flight to destination. About 2 minutes later, noise and vibration recurred, followed by failure of No. 1 engine. Inspection of engine revealed failure of compressor turbine section.

ch54 **Accident** ☐ As aircraft leveled off at about 2,000 feet msl, main rotor blade was seen separating from aircraft. Helicopter rolled to right and crashed inverted. Remaining main rotor blades, tail rotor pylon, and main rotor transmission separated before impact. All four occupants were killed. 7977

Precautionary landing ☐ Second stage flight control hydraulics went to zero pressure during flight. Caused by cracked hydraulic fitting at filter.

Mishap briefs

ov1 **Precautionary landing** ☐ (C series) Observer's entrance hatch popped open during takeoff.

t42 **Precautionary landings** ☐ Electrical system failed in flight. Two cellophane cells had shorted out, causing overheated battery and electrical failure. ☐ Both brakes failed during taxi. Caused by failure of master brake cylinders.

u8 **Accident** ☐ (F series) Shortly after beginning to taxi, pilot's attention was focused inside cockpit because of radio problems. Right wing tip of U-8 hit left wing of parked U-21. 8002

u21 **Precautionary landing** ☐ (A series) Fuel was seen siphoning from right nacelle tank cap during flight. Fuel cap was not completely seated.

c12 **Precautionary landing** ☐ (A series) Landing gear down lights indicated main gear was not down. Tower flyby was made and aircraft was landed. Caused by failure of lamp bulb.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Aircraft was flying low over water along coastline soon after sunset with instrument lights on full bright. Aircraft slowly descended and hit water at relatively high speed, with evidence indicating aircraft flared at last instant. Pilot (there was no copilot aboard) had been on duty for 13 hours before accident. Other personnel reported pilot had been working 15 hours a day for the previous 6 weeks and that he had said he was "tired all over" and it would take many days of rest before he could consider himself normal. Fellow pilot who had recently flown with him said his recent in-flight attention level was low.

☐ Because of cloud cover, mission was flown at 400-foot altitude under VFR conditions. Pilot, thoroughly familiar with terrain, having flown 40 missions over same route, decreased altitude to 50 feet as weather deteriorated. Crew used copilot's attitude indicator during flight since pilot's instrument was not functioning. As ceiling lowered, pilot started right turn and called base for weather information. Base reported transmission was extremely garbled and asked for a repeat. After receiving the second request and giving the desired information, the following message was received: "Roger. Hey! You're in a steep bank! Hey! Pull up! Pull up!" Aircraft hit side of mountain.

Maintenance

uh1 **Forced landing** ☐ After P1 multiplier check at 1,000 feet and 80 knots, IP received permission to make an autorotation. When throttle was rolled off, it went past flight idle stop and engine failed. Caused by improperly rigged flight idle stop.

Precautionary landings ☐ At 2,000 feet agl, pilot pulled in collective to start TEAC. Engine bled to 6000 rpm and collective started binding halfway to full pitch. N_2 governor stops were improperly adjusted. ☐ Fuel quantity gauge was erratic and instrument inverter light came on during landing. Inspection revealed 4-inch piece of safety wire had crossed a.c. inverter, causing short circuit. Safety wire was left after last scheduled battery inspection. ☐ Low rpm warning system activated with rpm in normal operating range. Electrical connector for system was not properly seated. ☐ Erratic egt reading was caused by improperly installed egt thermocouple.

ah1 **Ground accident** □ Pilot heard loud noise and saw flash during maintenance operational check. Engine had been flushed with PD 680 solvent and water solution, and FOD inspection had been completed by technical inspector. However, lower half of particle separator had not been removed for engine flush and MOC. Nozzle end of fire extinguisher had dropped into compressor section. When engine was started, it was destroyed by nozzle. Failure of spring on nozzle allowed nozzle to fall into compressor section.

ch47 **Precautionary landing** □ No. 2 generator light came on. Wire was chafed against clamp under No. 2 tunnel cover.

oh58 **Precautionary landing** □ Pilot noticed d.c. amps at 55 during approach and turned off battery. Voltage regulator was set too low.

c12 **Incident** □ (A series) Air conditioning coil assembly exploded while pilot was taxiing for takeoff. In addition to coil, explosive force pushed former to its immediate rear about one-half inch. Movement of former caused skin to buckle on top nose section and several rivets to loosen on right side. Small section of pitot static line was also damaged. Inspection revealed high pressure relief switch was malfunctioning and was the cause of previous air conditioning shutdowns.

u21 **Precautionary landing** □ (A series) Maladjusted toggle switch caused left main gear light to perform intermittently.

Messages received

- Maintenance advisory message concerning C-12 brake freezing (191300Z Sep 79, C-12-79-01).
- Maintenance advisory message concerning Army Oil Analysis Program (AOAP) for C-12 engines (211300Z Sep 79, C-12-79-02).
- Supply advisory message concerning removal of UH-1D/H stabilizer bar tube and shipment to Corpus Christi Army Depot (031955Z Oct 79).

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Leave M60s at home

It would seem that our experience in Vietnam would have taught us not to free fire M60s from aircraft. This experience didn't come cheaply. It cost us some bullet-riddled main rotor blades, skids, and an occasional fuselage as gunners fell prey to target fixation and aircraft pitched or rolled. In addition, hot shell casings have bounced around cockpits, accumulated around control pedals, and struck tail rotor blades. But apparently some people still haven't gotten the message. This is evidenced by the number of calls the Army Safety Center receives each year from ASOs who say their commanders intend to have observers fire M60 machineguns from OH-58s as a means of marking targets for Cobra gunships.

Our response to such calls remains unchanged. First of all, present doctrine for use of scout helicopters contains no requirement for scout ships to be armed with M60s. Nor do any tasks require scout aircraft to mark targets with gunfire. When such methods are used, not only do you create safety hazards for both personnel and equipment, but you also reveal your position to the enemy and sacrifice some of your standoff capability.

Since mission-related training time is limited, efforts should be devoted to training observation crews by the book—in accordance with published scout tasks. And leave those M60s at home.

For more information and guidance regarding scout doctrine, call Major William Reynolds at AUTOVON 464-3914, or write U.S. Army Armor Center, Directorate of Armor Aviation, ATTN: ATSB-AAD-TD, Fort Knox, KY 40121. ■

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Army aircraft mishap prevention data

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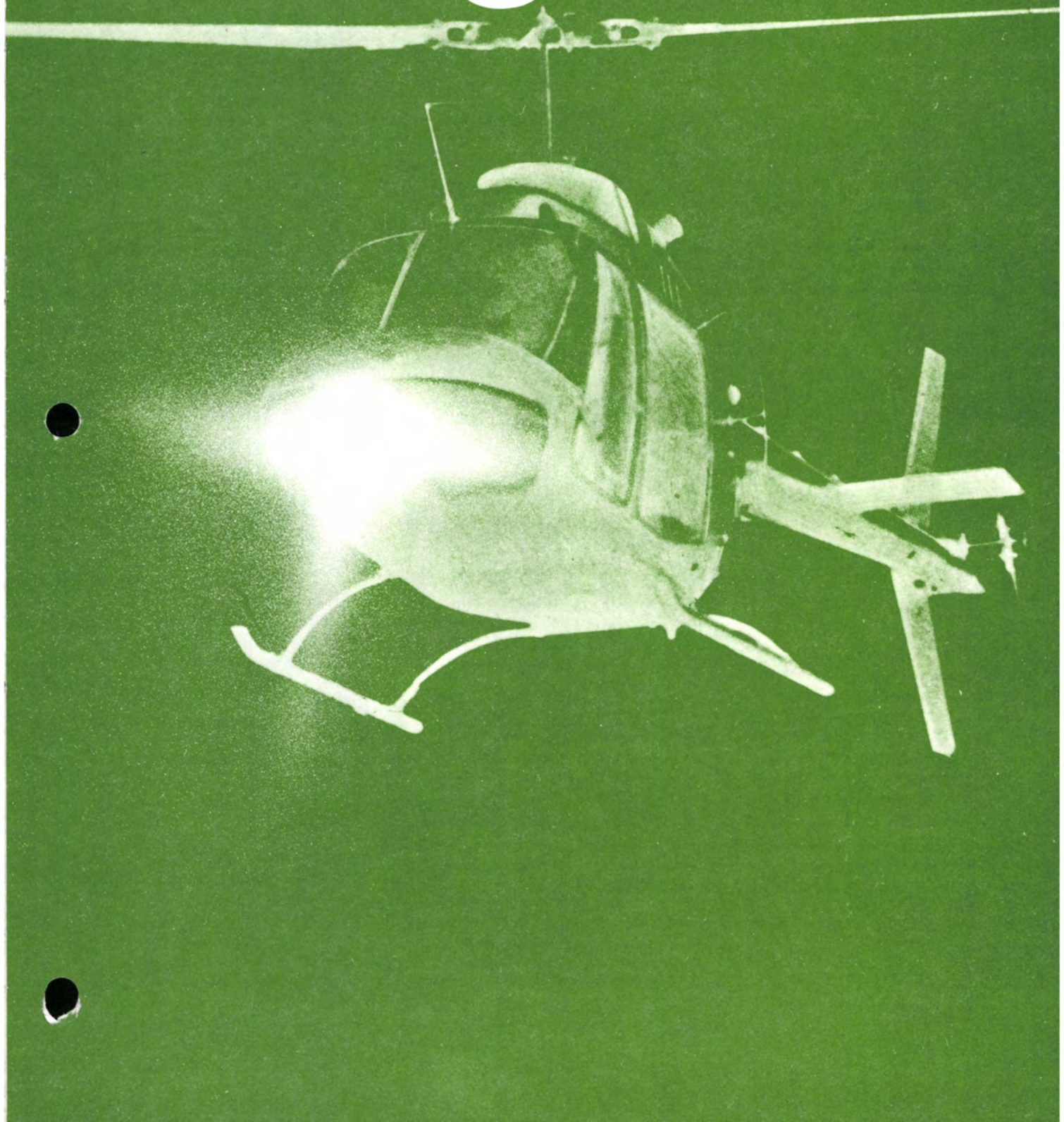

Minimal light operations

While practicing tactical night landings to a single light, an OH-58 pilot made his first two approaches with his landing light on. However, on his third approach, he turned it off—and flew his aircraft into the ground. The cost for aircraft repairs was estimated at $12,000.

The factor that probably played the most significant role in causing this mishap was the pilot's temporary loss of night vision from having used the landing light during his first two approaches. Experts tell us the time required for the human eye to adapt itself to the dark after being subjected to light usually varies from 5 to 45 minutes, depending on the intensity of the light source and duration of exposure. In addition, other variables such as smoking and drinking habits as well as the general health of an individual will influence this time element.

Autokinesis—an illusion of motion of the single light source used to guide the pilot to his landing zone—was probably a contributing cause factor in this mishap. This phenomenon can be easily demonstrated by gazing steadily at a single star on a clear moonless night. After a few seconds, the star will appear to move, changing directions and sometimes darting back and forth.

A third factor—fascination—may also have had some bearing on this mishap. This fixation has been emphatically demonstrated in the past by pilots who became so intent on hitting their target that they developed "target hypnosis" and failed to pull up in time to avoid hitting the target with their aircraft. One thing is certain: The OH-58 pilot in question never intended his landing to terminate in a crash.

To prevent mishaps from similar causes, employ the following safeguards:

- Make sure your eyes are fully adapted to darkness before you attempt any tactical night operations.

- Follow procedures outlined in FM 1-51, Rotary Wing Flight, chapter 6, section 4, by using a lighted "T" or "Y" for tactical operations, and a **minimum** of two ground lights 15 or more feet apart to prevent autokinesis during nontactical night operations. **Note**: A lighted "T" or "Y" offers additional benefits by providing a means for judging proper approach angle, directional alignment, and rate of closure.

- Use the glideslope indicator if available.

- Employ pathfinders during training when possible. They can provide expertise as well as necessary equipment.

Always keep in mind the effect light has on night vision, and if you feel any apprehension at any point of your approach, do not hesitate to turn on the landing light. But remember: **Once you switch it on, you should keep it on. Note:** This assumes no fog, haze, or other meteorological conditions exist that could cause glare and affect vision. If such conditions are present, the landing light should not be turned on; but if it is and glare is induced, the light should be switched off immediately.

The fact remains that even with your eyes wide open, you can't always see everything before you. Nor do you necessarily see what you think you see. A good look at FM 1-51 and FM 57-38, Pathfinder Operations, chapter 4, can enlighten you on this matter and provide information you may have forgotten—information that can be highly instrumental in keeping both you and your aircraft healthy. ■

Mishap review

Synopsis

Rotor rpm decayed during an attempted takeoff from a field training site. The copilot initiated a right turn toward a clear area and transferred control to the pilot. The pilot could not regain rpm or directional control, and the UH-1H landed hard.

History of flight

A routine training mission was being flown in a high density altitude environment. Aboard the UH-1H were the pilot, copilot, crew chief, and four passengers. After about 40 minutes of flight, the aircraft was landed, and three of the passengers got out. The pilot then took off to make two practice approaches to the same area.

A few minutes later, the Huey, with the copilot at the controls, returned to pick up the three passengers. After the passengers were loaded, departure was initiated toward the northwest. While at a high hover, the crew decided to turn right and depart to the south. As the right turn was started, loss of engine and rotor rpm occurred. The copilot transferred control to the pilot. Rpm continued to decay even though the pilot lowered collective as well as the nose of the aircraft in an attempt to regain rpm.

The aircraft continued to turn right, descended, and landed hard, damaging the landing gear, underside of the cabin area, and tail boom.

Crewmember experience

The 31-year-old pilot had almost 3,500 rotary wing flight hours, with more than 2,500 hours in UH-1s. The 33-year-old copilot had more than 1,200 rotary wing flight hours, with almost 300 hours in UH-1s.

Commentary

The pilot did not monitor the actions of the copilot during takeoff from a high altitude site (7,500 feet), allowing him to exceed the limitations of the aircraft. The pilot allowed the copilot to bring the aircraft to a high hover (about 50 feet) before starting a turn. When the pilot took control of the aircraft, he was unable to regain engine and rotor rpm. Neither aviator monitored the engine instruments during the takeoff sequence when maximum performance was required for the near-critical gross weight and pressure altitude conditions. Had either of them done so, early detection of the power loss might have prevented the mishap.

Although not contributing to the mishap, several discrepancies were found during the investigation.

- None of the crewmembers were wearing appropriate life support equipment, particularly survival vests, and no batteries were available for survival radios.
- There was no aviation standardization officer to monitor the standardization program at unit level.
- Maintenance discrepancies included: trunnions installed backwards on swashplate; wrong O-ring on fuel control filter; T-1 main bellows assembly airflow fins installed backwards; and broken wires in N_2 tachometer lead of electrical harness.
- Several avionics discrepancies on DA Form 2408-13 were more than 10 days old.

This mishap and the subsequent investigation caused the command to take a hard look at its overall aviation program. Safety, command supervision, management, administration, training, and maintenance were all determined to be in need of major changes to enhance efficiency and professionalism and to prevent further losses through mishaps. Much to this command's credit, their aviation program policies and procedures have been revamped and upgraded. ■

Selected mishap briefs

uh1

Class C mishaps ☐ During standard autorotation at night, aircraft touched down and slid 265 feet. Aft cross tube failed at mid-span point. Aircraft slid 12 feet after tube failed, causing damage to sling well area and cross tube tunnel area. ☐ Aircraft was over 100-foot trees in OGE hover when crew heard loud noise and felt severe vibrations. Pilot moved aircraft 200 meters to narrow logging road. Compressor stall continued throughout landing. Bleed air heat and device were off during flight. As pilot was landing on road, both main rotor blades hit tree. ☐ Fifth aircraft in flight of six hit tree during low-level flight at night. Chin bubbles and nose were damaged.

Class E mishaps ☐ Whistling noise was heard during takeoff and smoke was seen coming from top battery vent. Caused by internal battery failure. ☐ Unforecast snowshowers forced pilot to land. About 40 minutes later, weather improved and flight continued. Sometime later, another heavy snowshower forced pilot to land again. Flight was continued to destination after 35 minutes on the ground. ☐ Two engine starts were unsuccessful. Emergency start was also unsuccessful. Maintenance personnel then advised crew to attempt another start from emergency governor position. Engine was started and when power was applied, N_2 increased to 6600. Hover check was made and aircraft returned to home base. Suspect internal fuel control malfunction. Crew flew aircraft, knowing a potential emergency situation existed. Aircraft should have been grounded at field site until maintenance check was made. Maintenance personnel should not have advised crew to attempt another emergency start. ☐ IP heard grinding noise from transmission area during landing and then saw master caution and hydraulic lights come on. Inspection revealed hydraulic pressure line from check valve to filter assembly was cracked at outer edge of compression sleeve at filter inlet elbow. ☐ Severe vibrations occurred during flight. Caused by bonding separation of main rotor blade tip.

ah1

Class C mishaps ☐ Aircraft landed hard at termination of low-level autorotation. Indications are that pilot failed to follow proper autorotation techniques and IP failed to take timely corrective action. ☐ Main rotor blade hit tree branches as pilot was hovering in creek bed.

Class E mishaps ☐ Crew felt high frequency vibration in pedals during runup. Caused by excessive play in tail rotor pitch change link bearings. ☐ During termination of approach to OGE hover, tail rotor stuck in full left position. Tail rotor control was lost and aircraft started slow left turn. Right cyclic was applied and power was maintained at near max torque available. Aircraft was slowly dived with power down mountain to gain forward airspeed and control. Control was gained at 50 knots and aircraft was flown to nearest airfield, where running landing was made. Caused by failure of tail rotor feather bearing. ☐ N_2 dropped to 6400 during takeoff. Pilot was unable to regain rpm with beep switch or by reducing collective. Master caution and engine fuel pump lights came on. Postlanding inspection revealed main fuel line from filter to fuel control collapsed internally, resulting in restricted fuel flow.

ch47

Class E mishaps ☐ No. 2 engine oil pressure was lost. Caused by broken prong on engine oil filter, allowing filter to tilt. ☐ High frequency vibration in flight was caused by failure of No. 2 engine drive shaft. ☐ No. 2 engine hot light came on. Caused by failure of engine transmission.

oh58

Class A mishap ☐ Aircraft came out of clouds inverted and crashed. Pilot was killed. 8036

Class B mishap ☐ Aircraft on short final to field site started to spin to right and hit ground. Skids, tail boom, and tail rotor were damaged. 8037

Class E mishaps ☐ Transmission oil chip detector light came on. Caused by failure of transmission. ☐ Master caution and hydraulic lights came on. Caused by failure of hydraulic pressure switch. ☐ Inverter caution light came on and a.c. voltage was lost. Caused by failure of nonessential bus switch. ☐ Engine oil temperature went to red line during NOE flight. Smoke was seen coming from exhaust on shutdown. Oil was contaminated with microcarbon. Carbon built up on oil filter, resulting in high oil temperature. Carbon degraded carbon seal and allowed oil into hot end on shutdown. ☐ Transmission chip detector light came on. Caused by excessive internal gear wear in transmission. ☐ During recovery from autorotation rpm check, collective stuck at mid travel. Extreme force was needed to free it. This same problem occurred five more times before aircraft could be landed. Caused by failure of servo cylinder.

c12 **Class E mishaps** ☐ (A series) Forward vent blower failed during climbout. Blower would not work in automatic or manual positon. Aft vent blower worked intermittently in manual position. ☐ (A series) Moderate ice was encountered during descent at 8,000 feet. Windshield heat was on normal. Ice continued to accumulate on copilot's windshield, and windshield heat was turned to high. About 15 seconds later, outer layer of windshield cracked.

t42 **Class E mishap** ☐ Left propeller would not indicate takeoff rpm. Caused by failure of propeller governor.

u3 **Class E mishaps** ☐ Smoke was seen coming from breather line. When power was reduced, smoke stopped. Caused by hole in top of No. 5 piston. ☐ Left engine oil pressure dropped to below 10 psi during climbout. Caused by internal failure of engine.

u21 **Class E mishap** ☐ (A series) Overspeed propeller governor was inoperative during runup. Caused by malfunction of circuit board in control box.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Crew had been flying 10 hours and was returning to base camp that had neither pathfinders nor field lights. On short final, dust from area rose up around aircraft, and someone on the ground flashed a light into cockpit. With no visibility, pilot decided to land vertically. Overestimating his altitude, pilot lowered collective, resulting in a very hard landing.

☐ Crew with minimal sleep following New Year's Eve party had been on duty 11 hours when decision was made to return to base even though darkness was approaching and weather was marginal. As flight progressed, weather deteriorated, but pilot decided to continue on toward base. Passing through heavy clouds, fog, and rain, visibility was reduced, and aircraft hit ground in a near-normal flight attitude, with an airspeed of approximately 60 to 65 knots.

Maintenance

uh1 **Class E mishaps** ☐ Fuel filter light came on during hot refueling operation. Caused by improper routing of wire. ☐ Aircraft vibrated severely and yawed 15° to 20° to right during takeoff. Pilot made 180° turn and during termination of approach there was a negative response from left pedal application. Antitorque failure procedures were initiated, and aircraft was landed. Castellated nut on tail rotor control tube had backed off because of lack of a cotter pin and possible lack of proper torque. ☐ Hydraulic light came on, followed by intermittent loss of hydraulic system, stiffness of controls, and, finally, complete loss of hydraulic system. Improperly spaced hydraulic lines caused chafing, leading to line failure. ☐ Airspeed indicator was inoperative during takeoff. Copilot's airspeed indicator had been removed for maintenance and pilot's static line was not plugged off. ☐ On engine shutdown, crew chief noticed fluid leaking from aircraft. Entire area under aircraft was covered with

(continued on back page)

Standardization Communication | Directorate of Evaluation & Standardization USAAVNC, Fort Rucker, Alabama 36362 | STACOM 56 14 May 1980

Stacom

FY 80 mishaps

During the first half of fiscal year 1980, Army aviators were involved in 23 Class A (18) and B (5) mishaps—a creditable record. The aircraft involved in the majority of mishaps in the past has been the UH-1. This fiscal year, the OH-58 appears to have taken the lead for that dubious honor, having been involved in eight Class A and B mishaps to the UH-1's seven.

A recurring mishap cause in the OH-58 has been insufficient tail rotor control, usually as a result of the tail rotor stall characteristics of the aircraft. OH-58s involved in mishaps this fiscal year have been operated within gross weight limitations. However, the aircraft in most instances have been sufficiently loaded, and operated under atmospheric and wind conditions, to require near maximum performance.

This type of mishap is unnecessary and can be prevented. Operations and flight standardization officers, ASOs, and IPs must get their act together and spread the ungarbled word about tail rotor stall characteristics and the susceptibility of the OH-58 to encounter this phenomenon when operating in extreme weight and power conditions. An excellent article on the subject, titled "OH-58 Tail Rotor Stall," was published in FLIGHTFAX, Volume 6, No. 47, 13 Sep 1978, and ARMY AVIATION DIGEST, Nov 1978.

Of equally great concern has been the reemergence of the inadvertent IMC mishap. With the introduction of the vertical helicopter IFR recovery procedures, it was anticipated that this mishap cause factor would go the way of the dinosaur. Not so. The inadvertent IMC mishap is still with us and producing fatalities out of proportion to its numbers. The situation leads one to question the instrument proficiency of our operational aviators. There are other pertinent questions. Is the unit ATM program being administered properly? Is the task to "perform vertical helicopter IFR recovery procedure" required of aviators undergoing continuation training and during the annual flight standardization evaluation checkride? Do unit SOPs spell out procedures to follow when operating in marginal weather conditions? If all else fails, are the aviators aware that the helicopter, unlike the fixed wing aircraft, has one saving grace—it can be landed in the smallest of clear areas, allowing the aviator to await improved conditions. Of course, all of the previously cited situations and questions are not germane to the central issue when unit aviators are subjected to undue command or peer pressure to get the job done in order to make the unit "look good!"

The recent tail-rotor-stall mishaps and mishaps involving inadvertent IMC tend to focus on supervisory, training, and flight standardization deficiencies within the units involved. The commander, his staff, and all operational aviators must work in concert to eliminate them. ■

NVG video tapes

The following notice, extracted from the March 1980 issue of ARMY AVIATION DIGEST, is reprinted for the information of all NVG users:

Night Vision Goggles Video Tapes. Worldwide distribution of four new video tapes has been made to active Army and National Guard units and USAR components by the Tobyhanna Army Depot, Tobyhanna, PA.

Produced by the ETV Division, Directorate of Training Developments, Ft Rucker, AL, the tapes are titled "Night Vision Goggles for Aviation Crewmembers: An Introduction to the AN/PVS-5" and are designated as Parts I, II, III, and IV.

Topics covered include a display of the goggles and component identification, mounting of the

goggles on the helmet, making goggle adjustments in preparation for night flight, changing goggle batteries while wearing the helmet and gloves with goggles mounted, and limitations on operation under varying climatic conditions to include cautions and warnings and goggle functions related to flight conditions.

All four tapes should be viewed together to receive the complete message. The times are: Part 1, 10 minutes; Part II, 23 minutes; Part III, 11 minutes; and Part IV, 16 minutes.

Additional copies can be obtained from the Audiovisual Department at Tobyhanna. ■

Checklists

Chapter 8 of most operators manuals generally contains a prohibition against relying on memory for accomplishment of prescribed operational checks, except for those immediate action emergency procedures that shall be memorized for safe aircraft emergency operation.

The operators manuals are in conflict with paragraph 3-13, AR 95-1, which states that operators' and crewmembers' checklists are used for all preflight, ground runup, and shutdown checks; and checklists will be used when making maintenance operational checks and daily inspections. While aircraft are airborne, the checklist will be used when time permits to verify checks made. When time does not permit use of the checklist, or when its use would cause a hazard to safety, required checks may be made from memory.

DES has submitted 2028s recommending deletion of the conflicting paragraphs from the appropriate operators manuals. AR 95-1 is the ultimate authority and its provisions will apply when using the checklist. ■

Antenna towers

STACOM 27, 12 Apr 78, noted the existence of more than 350 radio and television antenna towers in the United States exceeding 1,000 feet agl. STACOM 30, 26 July 1978, noted the untold thousands of structures of lesser heights which can interfere with safe air navigation. There are no federal air regulations that require lighting or marking of obstructions. The FCC enforces the lighting of **licensed** communication towers in accordance with FAA standards.

Recently, a Navy jet aircraft, flying in and out of clouds, struck a 500-foot tower at the approximate mid-point. The tower collapsed, the aircraft exploded on impact, and the two aviators on board were killed.

This is a dramatic reminder to all aviators of the many hazards encountered in low-level flight. The Army aviator constantly operates at these low levels and the risks are higher than in the run-of-the-mill "ash and trash" mission. Nevertheless, the ultimate responsibility for safe operation rests with the aviator; he cannot abrogate that responsibility for a second. ■

Master clock

How many of you Army aviators in need of the correct time are aware of the existence of the U.S. Naval Observatory Master Clock? The observatory's clock is considered to be the most accurate timekeeping mechanism in the world. By dialing AUTOVON 8-294-4950, you will receive a voice recording and tone signal indicating alternately the correct Eastern Standard Time and Universal Time. □

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

(*continued from page 5*)
hydraulic fluid. Hydraulic line chafing against connecting rod resulted in ruptured line.

ch47 **Class E mishap** No. 2 engine fire light came on. Retention nut on firewall terminal had backed off.

oh58 **Class E mishaps** ☐ Engine-out warning light came on at 50% N_1 during autorotation. Caused by improper adjustment of engine-out audio. ☐ TOT rose to 990° C. for 6 seconds during start. Caused by improper rigging of throttle cable.

Messages received

- Maintenance advisory message concerning UH-60A transmission main module oil level dipstick (UH-60A-80-20, 281510Z Apr 80).
- Maintenance advisory message concerning UH-60A main generator wiring installation (UH-60A-80-21, 302100Z Apr 80).

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

Main rotor blade skin debonding

Several reports have been received from the field relating to blade skin debonding. TM 55-1500-204-25/1 with Change 29, par 3-409, contains the following caution: "Do not use solvents or cleaners such as lacquer thinner or kerosene as a cleaning agent. These compounds will weaken bonding of the blades." This caution is followed by an example of soap authorized to be used in cleaning the blades.

TB 746-93-2 with Change 1, chapter 2, contains guidance on how to remove paints from specific surfaces. ■

UH-1 mast plug and thick wall mast

Reference TSARCOM message, 202045Z Dec 79, subject: MWO 55-1500-219-30-9, dated 31 Aug 79, for UH-1B/D/H and EH-1H. Aviation units are required to report to TSARCOM (DRSTS-MEM(1)) via TWX (preferred) or letter (air mail) by aircraft tail number, either compliance or noncompliance with MWO 55-1500-219-30-9 or installation of "thick wall" mast, P/N 204-040-366-15, NSN 1615-00-255-2896. Units should also report stockage level of MWO kit, NSN 1560-01-036-4782, and mast assembly, P/N 204-040-366-15, NSN 1615-00-255-2896. Quarterly reports are required for all **uninstalled** mast inserts (plugs) and "thick wall" masts on hand. Noncompliance of installation of mast insert or "thick wall" mast also requires a quarterly report, listing each aircraft by serial number.

Point of contact is Mr. Ray Boland, TSARCOM, AUTOVON 693-0396. ■

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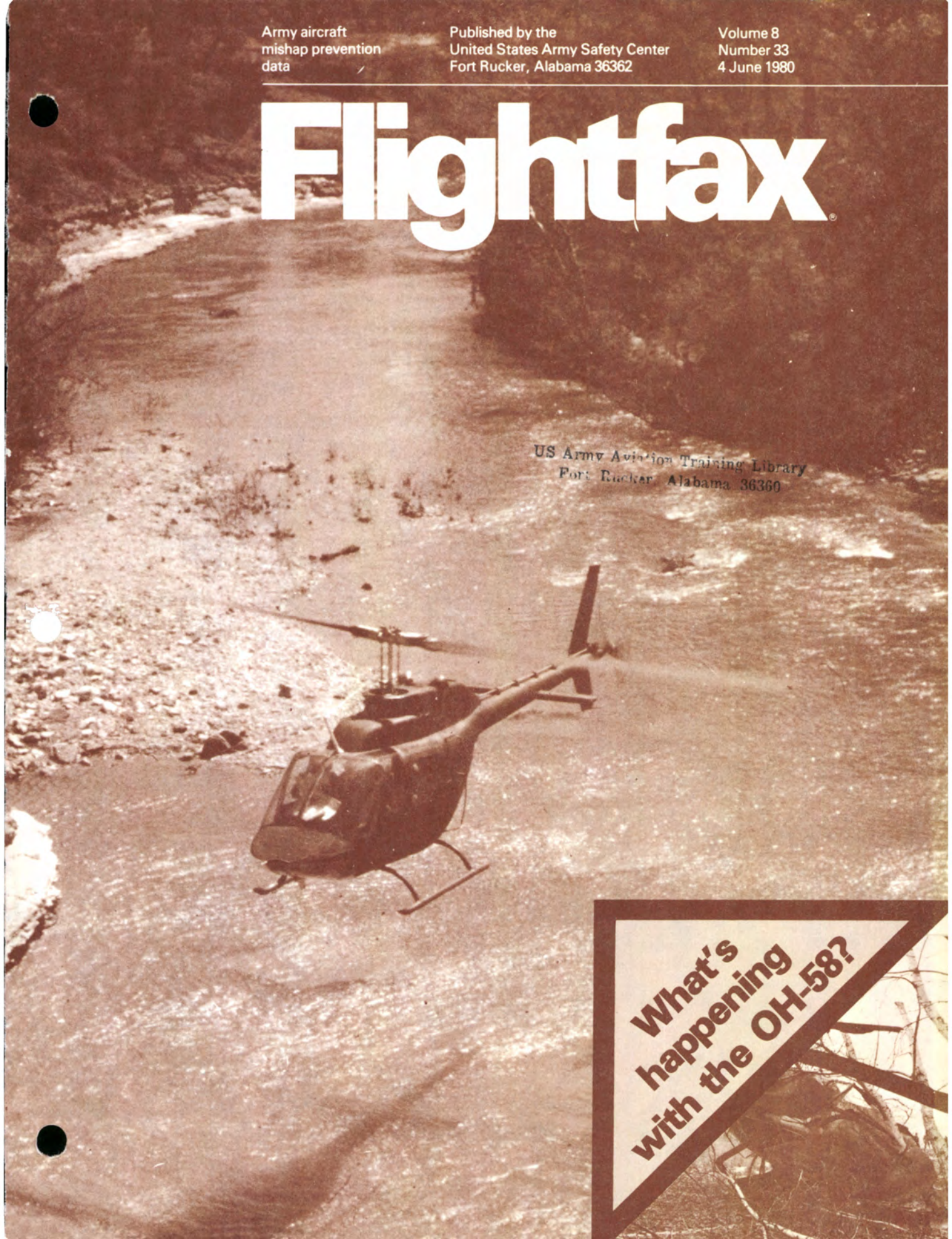

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What's happening with the OH-58?

What's happening with the OH-58?

Six dead aircrewmembers. Six Class A mishaps. Four Class B mishaps. Four Class C mishaps. More than $1 million in damage costs. All in the first 7 months of this fiscal year. And all in OH-58 aircraft.

What's happening? What's the problem?

Is the operation of this aircraft at terrain flight altitudes—mostly at NOE level due to the scout mission—simply more than a single pilot can safely handle?

Is it the lack of aircraft stability, combined with an inadequate tail rotor?

Is it the lack of flight instruments?

Is it the stress and fatigue experienced by every OH-58 pilot from flying continuously without a copilot break?

Just what is the problem with the OH-58? It's not an easy question to answer. There are many things peculiar to the aircraft and the mission which alone or in combination can set the stage for disaster on even the most "routine" missions. Read on.

Insufficient tail rotor thrust. The aircraft was at a 35-foot hover checking Cobra firing. While trying to hold his heading in a quartering tailwind of about 11 knots, gusting to 17 knots, the pilot felt the aircraft shudder, then begin turning slowly to the right. Thinking he might have completely lost tail rotor thrust, the pilot applied right forward cyclic and tried to gain airspeed. But the aircraft continued turning to the right. When the aircraft had turned about 180 degrees, the pilot heard a loud bang from the aft area of the aircraft. At the same time, the rate of turn increased and the aircraft completed two and one-half revolutions. At some point during the turn, the pilot closed the throttle to try to stop the aircraft's rotation. The aircraft then settled, hit the ground, and rolled downslope.

When the pilot hovered the aircraft out of ground effect in the quartering tailwind, the wind was enough to cause insufficient tail rotor thrust and the right spin.

Winds were inaccurately forecast as being 8 knots. No trained weather observers were at the firing range before or during the firing mission.

Recent changes in the OH-58 operators manual incorporate new directional control margin charts which give the conditions under which directional control may be a problem. Also, efforts are underway to develop a specific recovery technique for this problem.

Wire strike. While on a tactical recon mission the OH-58, with pilot and one passenger aboard, flew down into a valley at an airspeed of about 80 to 90 knots. Near the valley floor, the aircraft hit two reinforced wires about 150 feet agl. The wires severed the antenna and control tubes, then wrapped around the mast and blades. The aircraft crashed with an estimated force of about 100 g's. The fuel cells ruptured and the aircraft burned. Both occupants were killed.

In this case, the terrain flight mission was flown by one pilot without communications for flight following or command and control as called for by FM 1-51. The pilot flew the aircraft at low altitude at an excessive airspeed for surrounding terrain. He had been known to fly his aircraft NOE, disregarding SOPs issued by the detachment commander.

TSARCOM expects to have a wire strike protection system for the OH-58 under contract by 1 October 1980.

Tree strike. The aircraft, with pilot, copilot, and crew chief aboard, was on a night mission to locate a unit aircraft that had made a precautionary landing. Skies were overcast and there were periods of light to moderate rainshowers.

After locating the downed aircraft, the pilot tried to keep an altitude of about 200 feet agl as he entered a left turn around the downed aircraft to recon a landing zone. During the turn, the pilot let the aircraft drop about 100 feet. After making a 360-degree turn, the aircraft hit three 80-foot trees. The pilot then flew to an airfield and landed the aircraft.

The left side of the aircraft was severely damaged and both windscreens were broken.

The tree strike was caused by the pilot letting his aircraft get below a safe altitude while making a turn at night during light to moderate rainshowers under overcast skies. The pilot had reduced collective pitch and had applied aft cyclic as he entered a 20- to 30-degree left bank. He did this to slow the aircraft and circle above the downed aircraft. This caused the aircraft to lose altitude. The pilot failed to detect the loss of altitude because he was trying to reestablish a reference with the horizon and the ground.

Insufficient tail rotor thrust. The pilot brought his OH-58A to an out-of-ground-effect hover over a ridgeline and started a pedal turn to the right, which could not be stopped with left pedal inputs. The aircraft spun several times to the right while the pilot tried to gain some airspeed and fly out of the spin. He was unsuccessful and entered autorotation. The aircraft hit hard on the steep slope and rolled on its side.

Unplanned IMC. A single OH-58A pilot flying in marginal weather entered IMC. He became spatially disoriented, lost control of his helicopter, and crashed. The pilot was not adequately trained for IMC flight in the OH-58, his primary aircraft.

Overcontrol. On short final to a landing site, the OH-58C pilot made an abrupt 90-degree right pedal turn. The abrupt turn put him in a downwind condition and resulted in an excessive rate of descent from which he could not recover.

(continued on next page)

What's happening?

Insufficient tail rotor thrust. Because of several buildings and wires to his front, the pilot made an altitude-over-airspeed takeoff. At about 75 feet agl, with full left antitorque pedal applied, the aircraft began to yaw to the right. Trying to control the yaw, the pilot reduced collective pitch. The aircraft hit the ground tail first.

Loss of antitorque control came after the pilot inadvertently increased collective pitch until the engine power applied exceeded available tail rotor authority.

Drooped rotor. During an NOE deceleration maneuver, the pilot increased collective pitch too late and too rapidly, thereby exceeding the engine's acceleration schedule. Rotor rpm dropped enough to activate the low rotor rpm warning audio. There were indications that the pilot's attention was on the engine instruments instead of on leveling and landing the aircraft, which touched down hard in a tail-low attitude.

Loss of perception. The pilot, an observer, and one passenger were aboard the aircraft on an NOE training mission to locate targets. The pilot completed a downwind turn at 30 knots while looking out the left window of the aircraft. When he looked forward again, he perceived the aircraft to be descending. After checking airspeed and engine torque (50-52 psi), the pilot concluded that the engine was not performing properly, so he made a hurried downslope landing with power. At touchdown, the aircraft began sliding toward a treeline. The pilot then rolled off throttle to flight idle. This caused the aircraft to turn left down the slope and crash into the trees.

No power failure had occurred. When the pilot raised his head and looked to the front after leaning to look out the left window, he perceived himself to be in descent when in reality he was flying over rising terrain.

Unplanned IMC. Shortly after takeoff on a service mission to transport two passengers, the pilot entered IMC, became disoriented, lost control of the aircraft, and crashed. All three occupants were killed and the aircraft was destroyed.

After the pilot entered IMC, he did not execute vertical helicopter instrument recovery procedures. He experienced a form of spatial disorientation and lost control of the aircraft.

Several factors adversely affected the pilot's ability to successfully perform the instrument recovery procedures. These included the fact that no copilot was provided to help perform the various cockpit tasks, and although the pilot was qualified for flight, he had logged only 1 hour of hooded flight time in the OH-58. Other factors were the absence of a radio magnetic indicator, the lack of a system for windshield rain removal, and the pilot's apparent unfamiliarity with the recovery procedures.

Power loss. Following takeoff after a simulated search for a downed aircraft, the OH-58A had three separate partial power failures. The pilot may have at first confused the engine-out audio tone with that of an emergency locator beacon. There were suitable landing areas available when the emergency began, but the pilot did not start a power-on landing until the second partial power loss occurred. On short final, the pilot realized the landing area was

unsuitable. When collective was increased to extend the point of touchdown, the engine failed and the aircraft landed hard.

Several OH-58 aircraft have had similar unexplained power losses recently. TSARCOM is working with the engine and aircraft manufacturers to identify the cause of these power losses.

Ground strike. An airborne radiological survey was being made as part of an ARTEP. The crew consisted of the pilot and a CBR specialist. After taking off from a field site and while still close to the ground, the pilot glanced down at his map. The moment he looked back outside, the aircraft hit the ground.

The CBR specialist was not a qualified observer. He had never flown before in an OH-58. He wore an M17A1 protective mask but no SPH-4 helmet or headset, so communications were limited to shouting and gesturing.

Tree strike. During a night low-level navigational flight for aerial observer training, the aircraft was being flown from an unlit, unmarked, snow-covered, tree-lined field site. While at a hover, the aircraft began drifting backwards. When the pilot realized the aircraft was drifting, it was too late to prevent the tail rotor from hitting a tree. As the aircraft was flown away from the tree, it spun right 720 degrees despite full left pedal input. The pilot then rolled off throttle and allowed the aircraft to settle, using pitch to cushion the landing. The aircraft landed hard and was heavily damaged.

The attempted takeoff was in violation of unit SOP which stated that tactical lighting was to be used during tactical operations. Further, the company commander had not had the unit's tactical site surveyed daily as required by the unit's tactical SOP to insure that tactical lighting was available for night operations.

Also, the pilot failed to protect his night vision as outlined in FM 1-51. He used a white lens flashlight during preflight and then switched the landing light on and off on a snow-covered field. These actions caused a loss of night vision.

Further, the pilot permitted the observer to remove and store the copilot's cyclic stick by disconnecting it at the electrical connector. Removal of the copilot's stick can cause the pilot's cyclic to creep slightly aft, and disconnecting the electrical connector causes a loss

Engine failure. The master caution light and engine chip detector light came on during level cruise flight at about 400 feet agl. The pilot started a left turn to a precautionary landing site, using minimum power descent. When the aircraft was about 10 feet away from the landing site, the engine failed. The aircraft settled on a slope and rolled on its right side.

After the crash, fire broke out in the engine compartment, causing extensive damage.

The engine failure was caused by failure of the helical torquemeter gear shaft due to fatigue. The fatigue origin was an inclusion near the outer gear teeth.

The fire was caused by disintegration of the turbine wheels which severed two fuel lines in the engine compartment.

(continued on next page)

What's happening?

So, what's the problem?

These mishaps contain some obvious traditional cause factors such as human error and materiel failure. They also contain some inherent system inadequacies resulting from the increased demands of today's OH-58 missions.

• **Insufficient tail rotor thrust.** To perform its primary mission, the OH-58 must be able to hover out of ground effect. Winds may not always be readily apparent and flights conducted with a tailwind will occur. Several mishaps have occurred where, although within the operators manual parameters, the aircraft spun to the right and crashed. Insufficient tail rotor thrust is a definite factor when operating at high gross weights, downwind, and at low airspeeds. Avoidance by pilots of these conditions compromises the observation helicopter mission and is not a solution to the problem. To perform its mission safely, the OH-58 requires a tail rotor with increased thrust. Testing of an improved tail rotor and three-axis SCAS is being conducted by AVRADCOM in conjunction with TSARCOM for use on the OH-58C.

• **Instrument training.** Although the OH-58 is not an instrument flight certified aircraft, conditions under which missions are flown make inadvertent IMC flight a real possibility. Mishaps occurring during flight at night in snow, rain, or marginal weather demonstrate the need for adequate inadvertent IMC training. AR 95-1 requires that active component rotary wing aviators fly 20 hours of SFTS time annually. Since there are no OH-58 simulators, OH-58 pilots must fly in the UH-1 flight simulator (UH-1FS).

The Observation Helicopter Aircrew Training Manual, TC 1-137, allows the pilot the option of performing required instrument tasks in either the OH-58 or in the UH-1FS. Having a requirement to fly 20 hours of SFTS annually, OH-58 pilots commonly elect to perform all ATM instrument tasks in the UH-1FS and are inclined to complete annual instrument renewal checkrides in either the UH-1 or UH-1FS. The observation pilot should receive sufficient instrument training in his primary aircraft to insure that he is capable of, and confident in, performing inadvertent instrument flight.

USAAVNC is reviewing the instrument tasks in TC 1-137 to determine those that should be performed in the OH-58; if the 20 hours of SFTS required for OH-58 pilots should be reduced in favor of performing instrument training in the aircraft, VFR, under the hood; and if the annual instrument checkride should be given only in the OH-58 aircraft.

• **Aircrews and training.** Army aviation employment doctrine has changed dramatically since Vietnam. A high bird which directed observation helicopters and marked targets is now a thing of the past. The OH-58 crew must now navigate, communicate, locate, and identify targets, control gunships, and, at the same time, fly the aircraft in an extremely hazardous environment.

Although the tasks to be performed have increased and are more complex, the OH-58 crew in a terrain flight profile still consists of a single pilot and an enlisted observer. The observer, through no fault of his own, quite often is not adequately trained to perform observer duties.

Flight at night or during marginal weather greatly increases crew workload. Some units are compensating for these conditions by requiring two rated aviators in the aircraft to share the workload and to provide a backup for the pilot if he becomes spatially disoriented, incapacitated, or fatigued. No analysis of the workload placed on a single pilot flying an OH-58 by today's operating doctrine has been performed. The U.S. Army Human Engineering Laboratory is being requested to do such an analysis. ■

Selected mishap briefs

uh1 **Class B mishap** □ (H series) Aircraft, terrain flying at night, hit trees. 8040

Class C mishaps □ (H series) Aircraft was trail in flight of six. During shallow takeoff from field site, copilot accelerated to catch flight. Aircraft approached three tall pine trees. To avoid tree on left, copilot turned aircraft to right. Copilot, flying from left seat, did not realize how close he was to tree on right, and gun mount and synchronized elevator hit tree. Crew chief looked out and did not see any damage, so flight was continued. Damage was discovered at POL area. □ Aircraft yawed left and engine failed. Pilot entered autorotation. As autorotation was terminated to sloping area, tail boom hit ground, causing damage to tail boom and power train.

Class E mishaps □ (H series) Main transmission oil pressure fluctuated. Caused by main transmission filter bypass line coming loose in flight. □ (H series) Crew smelled fuel and landed. One-half pint of fuel had accumulated in aft compartment because of spillage during refueling. □ (H series) Right fuel boost pump had failed at field site 60 miles from home station and maintenance facility. Because of inclement weather and the possibility of extensive maintenance time required if boost pump failed due to some factor other than pump failure, decision was made to circle red X the aircraft for one-time flight to maintenance facility. Aircraft left field site with 900 pounds of fuel for 45-minute flight. IP was on board. When aircraft arrived at airfield, fuel gauge indicated 400 pounds. Pilot decided to make a low approach and fly for a few more minutes to aid defueling operations. About 10 minutes from airfield, low fuel caution light came on with gauge indicating 350 pounds. While aircraft was in traffic pattern, with gauge indicating 200 pounds, partial power loss occurred and left boost pump light came on. Autorotative landing was made. Power loss was caused by fuel starvation.

ah1 **Class A mishap** □ (G series) As aircraft participating in FTX crested rise, pilot saw enemy tanks and reacted. Main rotor blades hit ground and aircraft came to rest on right side. 8041

Class E mishaps □ (G series) Forty-millimeter round exploded about 3 to 10 feet in front of aircraft, causing two small holes in gunner's canopy. Suspect 40mm fuse failure. □ (S series) Master caution and No. 2 hydraulic lights came on. Caused by failure of pressure switch.

ch54 **Class E mishap** □ (B series) Master caution and main transmission chip detector lights came on during hover. Caused by internal failure of No. 1 engine input of main transmission.

oh58 **Class E mishaps** □ (A series) At 50 feet agl and 40 knots, copilot at controls lost visual reference to ground when he entered fog bank while circumnavigating hill mass. Although pilot still had ground contact, he told copilot to initiate climb. Aircraft cleared fog bank and returned to airfield. Fog was not forecast. □ (A series) Rotorwash blew engineer tape into rotor system and tail rotor drive shaft. Tape wrapped around control tubes and drive shaft, and rpm was lost. □ (A series) Pilot noticed engine oil temperature at 125° C. during flight. Caused by failure of engine oil temperature indicator. Metal staple shorted out resistor on indicator.

c7 **Class E mishap** □ During descent for landing, left passenger air stair door came open and fully extended as flaps were lowered. When door entered airstream, it broke the safety chain. When door reached full extension, the abrupt stop and airflow load caused one support arm to break. The other two support arms were bent and cracked. Air stair door was not properly closed and locked by flight attendant.

u8 **Class C mishap** □ (F series) Gear did not retract after takeoff. Shortly afterward, cylinder head temperature on left engine rose rapidly and engine started surging. Engine was shut down and prop feathered. Visual check by tower personnel showed gear appeared to be down. Gear indicators showed nose gear locked and main gear intransit or unsafe. The stress of the situation and concern about making it to the runway caused the pilots to omit several steps in approved emergency procedures. As aircraft stopped on runway, right main gear and left main gear collapsed. Aircraft came to rest on nose gear and belly.

(continued on back page)

Mishap briefs

u21 **Class C mishap** ☐ (G series) Pilot was practicing single-engine landings with right engine at zero thrust. Pilot pulled left throttle up into beta/reverse range. Aircraft shook and started left turn. Pilot was correcting with right rudder and IP was helping by applying full right rudder and maximum right brake. They were unable to stop before leaving runway. Left prop hit taxiway sign, damaging all three blades and wing.

Maintenance

uh1 **Class E mishaps** ☐ (H series) Egt fluctuated 40° during hover. Improperly installed egt thermocouple assembly clamp caused harness to rub on firewall. ☐ (H series) Transmission oil pressure indicated zero during pretakeoff check. Caused by loose cannon plug to pressure gauge.

uh60 **Class E mishap** ☐ Crew chief saw smoke coming from No. 2 engine compartment during runup. Improperly installed engine deswirl locking ring allowed exhaust gases to be deflected into engine compartment, causing damage to engine cowling and external engine accessories.

ah1 **Class E mishap** ☐ (S mod series) Transmission oil bypass light came on. Caused by improperly positioned wire on bypass switch.

ch47 **Class E mishap** ☐ (C series) No. 1 engine N_1 became static at 76% during flight. Running landing was made. N_2 actuator was out of adjustment.

ov1 **Class E mishap** ☐ (D series) No. 1 and No. 2 hydraulic pressure fluctuated during runup. Caused by improperly tightened cannon plugs on both hydraulic sensors.

t42 **Class E mishap** ☐ Aircraft had undergone weight and balance check. After takeoff, pilot was called and told that mechanic had not replaced nose wheel shaft bolt. Aircraft was landed on runway.

Messages received

- Safety-of-flight message concerning one-time inspection of UH-60A drag beam/axle assembly (UH-60A-80-24, 162045Z May 80). Summary: Examination of a failed drag beam/axle assembly showed that water had accumulated within the base of the drag beam, causing severe corrosion which led to stress corrosion cracking and eventual failure. Contact: Earl Parsons, AUTOVON 693-1661, commercial 314-263-1661.

- Maintenance advisory message concerning UH-60A engine overtemperature removal limits (UH-60A-80-25, 201905Z May 80).

- Maintenance advisory message concerning UH-60A main rotor spindle inner race (UH-60A-80-26, 201910Z May 80).

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

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Mishap review

Synopsis

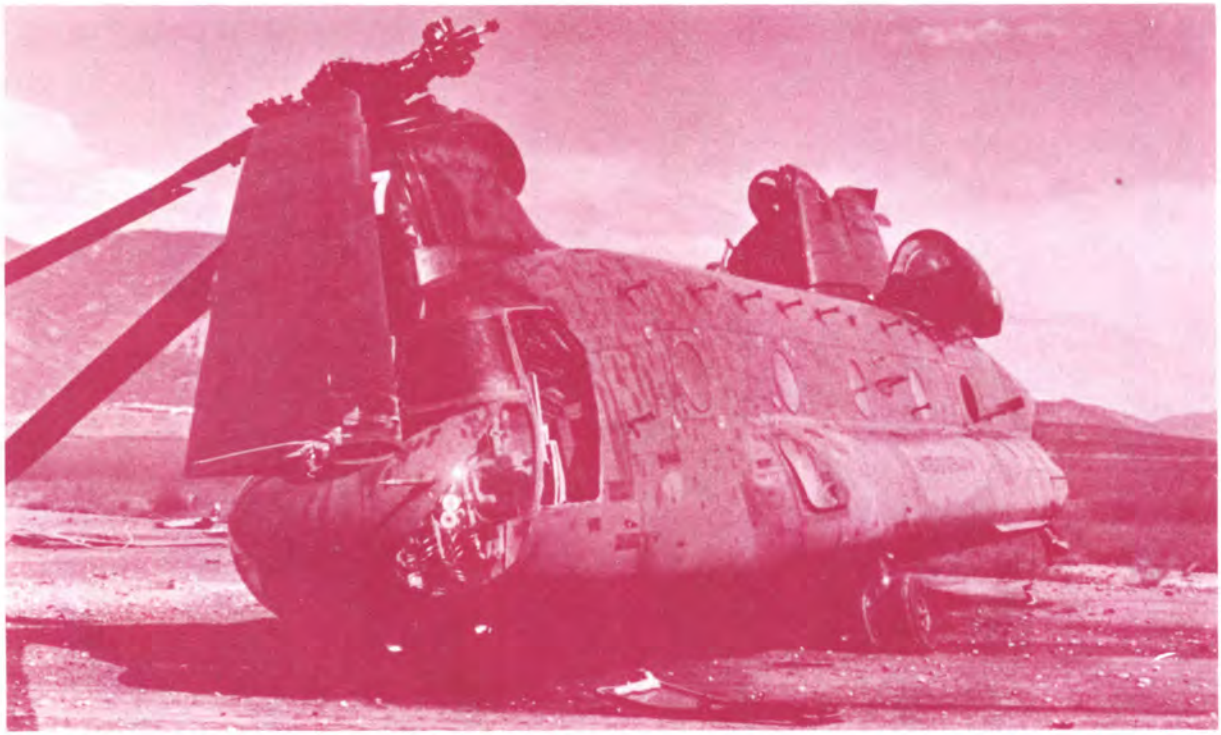
The CH-47C was on a high gross weight training mission, remaining in the traffic pattern for most of the flight. During the final autorotation, the IP decided to terminate with power. Rotor rpm bled off, and the aircraft hit the ground and skidded. The rotor blades hit the fuselage and ground, and the aft transmission and pylon were torn from the aircraft.

History of flight

The flight engineer and crew chief prepared the aircraft for high gross weight training by securing three 600-gallon metal tanks within the cargo compartment. The forward and aft tanks were filled and the center tank was half filled with water. Gross weight at takeoff was computed to be 43,055 pounds.

When the CH-47 took off, the IP was in the left seat, and the pilot was in the right seat. Another pilot occupied the jump seat. The crew chief was in the front of the cargo compartment in the troop seat near the forward cargo hatch. The flight engineer was in the right rear single troop seat. The aircraft remained in the traffic pattern for most of the flight, leaving infrequently for emergency procedure training. The first pilot flew for 45 minutes and made three autorotations. He then changed seats with the second pilot, who flew for about an hour before giving the controls to the IP.

About 100 feet above the traffic pattern altitude of 6,800 feet, the IP overshot the final approach and had to make a sharp left turn back to final as he entered autorotation. He established a crab on a heading of about 100 degrees to return to the runway. At 200 to 300 feet, the IP noticed his rate of descent was high (3,000 feet per minute) and that he was still not aligned with the runway. Deciding to make a power recovery, he increased the thrust lever to increase N_1. He felt a loss of power and noticed his rotor rpm deteriorate. Airspeed was 80 knots.



The IP lowered the thrust lever and applied right pedal to align the fuselage with the direction of flight. In the rear compartment, the flight engineer heard a loud pop and a change in engine and rotor sounds. The IP pulled thrust to use available rotor rpm just before impact. The helicopter hit on the left rear gear, short and to the right of the runway overrun, shearing the gear. The right rear gear hit the ground and the aircraft bounced over a taxiway. The front blades hit the top of the fuselage, and the aircraft skidded, rocking right and left, with the rear blades hitting the ground several times. The rear pylon and transmission separated near the end of the skid.

The flight engineer exited through the rear cargo ramp, and the IP jettisoned the left cockpit door and exited. Both pilots also exited through the left door since the right cockpit door could not be jettisoned. The crew chief left through the right forward cargo door after the rotor blades stopped.

The forward part of the airframe was not damaged in the crash. The inertial reels of the IP and pilot locked automatically, probably preventing injuries. The aviator in the jump seat was securely held by his lapbelt. The crew chief was wearing his lapbelt loose so he could move around and check aircraft clearance and was not held in his seat. During the crash, he submarined under the lapbelt onto the floor.

The flight engineer's lapbelt held him in his seat, which tore free during the crash. Transmission and hydraulic fluid from broken lines in the pylon soaked the flight engineer. His eyes were protected because he was wearing his helmet visor down.

Crewmember experience

The 31-year-old IP had more than 3,000 hours rotary wing flight time, with more than 1,800 hours in CH-47s. He was an instrument flight examiner as well as a standardization instructor pilot. The 30-year-old pilot had more than 2,600 rotary wing hours, with more than 800 hours in CH-47s.

Commentary

The combining transmission failed during autorotation. When the IP increased the thrust lever about 1 inch at 300 feet agl to spool up the engine for a termination with power, the left input roller bearing in the transmission failed and was binding. As a result, the aircraft lost rotor rpm and the No. 1 engine transmission shaft failed because of overstress. Definite cause of the roller bearing failure could not be determined because of the damage, but a maintenance error during overhaul is probable. The combining transmission had accumulated less than 3 hours since depot modification.

It was also apparent that the cowling over the No. 1 engine transmission shaft was damaged before the mishap, causing it to rub on the shaft and cause heat damage. This condition could weaken the shaft and cause its failure. Aircraft cowlings should be properly maintained at all times. ■

Part-time pilot—full-time professional

All forms of aviation require a professional approach, but perhaps none require this demanding state of mind approach more than we do in Reserve aviation. As Reserve pilots we have been removed from an atmosphere in which we flew every day or at least thought about it a good deal of the time. We don't have the luxury of spending our slack time each day thumbing through operators manuals or discussing in detail emergency procedures of aircraft systems with other pilots.

Most of us may not even think about flying during the normal routine of our civilian jobs. At the same time, we as part-time pilots must fly the same aircraft, to the same set of standards, performing the same missions as our active duty counterparts. To do this safely can only be accomplished by taking a full-time professional approach to our part-time endeavor.

We must set aside the time between flight periods to fully review the procedures and limitations of our aircraft. Perhaps more importantly we must be courageous enough to evaluate our own limitations with respect to the mission at hand, the prevailing weather, and other factors. Sometimes, someone else with a higher state of readiness can proceed with the mission or it may be rescheduled when conditions are more favorable. Each pilot must recognize an area in their personal readiness state which requires some greater attention. The place to discover this is on the ground.

The professional approach is not something that can be turned on when you put on your flight suit. It must start long before that; like setting aside the time to review operators manuals during the week, making sure your flight equipment and personal survival gear are in good shape, and making a conscientious and concerted effort to start thinking about flying as soon as you know that you've been scheduled.

We may only be able to fly part-time. But we will only survive if we think professionally full-time. ■

—from Fourth Marine Aircraft Wing SAFETY SENTINEL

Selected mishap briefs

uh1 **Class C mishap** □ (H series) During NOE flight at 30 to 40 knots, as IP was glancing at map, pilot was distracted. When pilot looked forward again, aircraft hit 45-foot tree, damaging both main rotor blades.

Class E mishaps □ (H series) Aircraft landed at helipad to load patient. Several children rushed up to aircraft, remaining just outside rotor system. Patient was loaded, and mission completed. Postflight inspection revealed damage to main rotor blade. Suspect object was thrown into rotor system. □ (H series) Crew smelled odor similar to overheated battery. Emergency procedures for cverheated battery were accomplished and main generator turned off. Odor ceased, and battery and generator were turned on. Standby generator indicated no voltage and starter generator functioned properly. Postlanding inspection revealed failure of generator garlock seal allowed oil to saturate and short out generator. □ (H series) Crew chief noticed fuel leak around main fuel filter during engine start. Main fuel filter O-ring had expanded, losing its sealing capability. □ (H series) Crew noticed spray on windshield and battery loadmeter indicating .5. Battery was turned off, and aircraft landed. Caused by overheated battery. □ (H series) N_2 fluctuated and aircraft yawed. Caused by failure of fuel control. □ (H series) Fluctuation in torquemeter gauge and rise in egt and N_1 were caused by deterioration of torquemeter pressure transmitter O-ring. □ (H series) Pedals were stiff and motoring in both directions in all phases of flight. Caused by failure of tail rotor servo cylinder. □ (H series) High frequency vibration during takeoff was caused by failure of No. 4 hanger bearing.

ah1 **Class B mishap** □ (G series) Aircraft in steep left NOE turn had insufficient power to recover from turn and hit tree. Main rotor blades, left synchronized elevator boom, and left wing were damaged. 8039

Class E mishaps □ (S series) Master caution and engine oil pressure lights came on. Caused by inoperable engine oil pressure switch. □ (G series) Pilot heard noise and noticed white smoke and unusual smell in cockpit. Caused by ECU turbine bearing seizure. □ (S series) While copilot was hovering in dust, pilot took controls to hover to another position and applied excessive power, resulting in overtorque of 105%.

Aviation-related □ Aircraft was being run up to track main rotor blades. Servicemember standing outside aircraft with tracking flag had to raise flag higher than normal since flag was somewhat short and rotor disc had not been lowered. As flag was raised, aluminum pole on which flag was mounted hit tip cap of main rotor blade. Blade had to be replaced. □ Pilot was preparing to start aircraft for battery check. Neither pilot nor crew chief saw that tiedown rope was still attached to rotor blade. Starter was energized and main rotor had completed several revolutions before crew chief noticed tiedown rope. Pilot aborted start, but rope had damged drive train, requiring replacement of 42° and 90° gearboxes.

(continued on next page)

Mishap briefs

ch47 **Class E mishaps** □ (B series) When APU was shut down after engines were started, both generator and No. 1 flight boost pump drive shafts sheared. Aft transmission had to be changed because of sheared shafts. □ (B series) Crew chief saw oil leak as aircraft was being taxied. Caused by failure of forward transmission oil cooler core. □ (C series) Crew chief noticed sizeable hydraulic oil leak just before takeoff. Inspection revealed hydraulic oil cooler fan had developed internal oil leak. Caused by failure of tube assembly.

Aviation-related □ When mechanic removed bolt from lower drive arm and swashplate, swashplate rotated because of weight of blades. Rotation of swashplate caused pitch change links to gouge swashplate and three pitch varying housings beyond allowable limits. Required maintenance manual was not being used. □ Tug operator backed tug to within 1 foot of main cabin door of CH-47 to unload cots and foot locker. Tug motor was turned off. When motor was restarted with gear in reverse, tug backed into helicopter. Operator thought gear was in neutral.

ch54 **Class E mishaps** □ (A series) Rotor tachometer fluctuated and then failed completely during final approach. Caused by sheared tachometer generator shaft. □ (A series) Aft seat pilot inadvertently released sling load with cyclic release button. Aft communications transmitter was operating intermittently and seat wire transmitter button was being used. Pilot confused right thumb release button with left thumb intercom button.

oh58 **Class E mishaps** □ (A series) Engine oil pressure dropped from 130 psi through 50 psi during climbout and reached 0 psi by the time aircraft was landed. Internal failure of engine oil supply line caused clogging of line. □ (C series) Pilot initiated right pedal turn during downwind hover over 50-foot trees. Turn rate became excessive, and pilot applied left pedal, with collective, to stop the turn. This resulted in an overtorque (105%). □ (A series) D.C. ammeter increased to 140 amps and pilot smelled strong battery odor. Battery and generator switch were turned off and aircraft landed. Battery was replaced and voltage regulator adjusted.

Aviation-related □ As main rotor blade was being tracked, tracking flag hit blade. As individual removed flag, it again hit blade, damaging tip of blade.

ov1 **Class E mishaps** □ (D series) No. 2 engine fire light came on during runup. Caused by moisture in fire detection system. □ (D series) Loud whistling noise was heard, and No. 2 engine failed. Fuel starvation was caused by internal failure of main fuel cell.

u8 **Class C mishap** □ (F series) Simulated single-engine landing was being made. IP had told tower personnel that single-engine operation was being performed, but when aircraft was on short final, tower operator urgently instructed crew to go around. Go-around was initiated by adding power and retracting gear. Shortly afterward, No. 1 engine surged. It appeared that a successful go-around could not be executed, so landing gear was placed in down position and landing attempted. Landing gear collapsed on touchdown, apparently because gear was not fully extended. Props and two engines had to be replaced. Power surges may have been caused by engine malfunction. It is not known why tower personnel told crew to go around when they were about to make single-engine landing.

Class E mishap ☐ (F series) Oil pressure drop on No. 2 engine during flight was caused by failure of No. 2 cylinder intake valve.

Aviation-related ☐ While making landing gear retraction test, maintenance personnel failed to remove tow bar from nose gear strut, resulting in damage to landing gear mechanism.

u21 **Class E mishaps** ☐ (A series) Fuel was seen siphoning from No. 1 nacelle fuel cap during level-off. Aircraft had just been refueled and refueler had seated fuel cap. Pilot visually checked cap and it appeared to be properly aligned and seated. ☐ (G series) Pilot saw fuel coming from No. 2 engine nacelle filler cap during flight. Caused by improperly seated fuel cap.

Maintenance

uh1 **Class E mishaps** ☐ (H series) Transmission oil pressure fluctuated and crew smelled oil fumes in cockpit. Caused by failure of transmission internal oil filter gasket. Transmission had 5 hours since receipt from depot. Evidence of undertorque of bolts was found during disassembly. ☐ (H series) IP heard whistling sound from blade during shutdown. Factory inspection patch had come loose. ☐ (H series) Main generator failed during hover. Standby generator would not come on line. Caused by improperly set voltage regulator. ☐ (H series) Mechanic walking past aircraft saw bird fly into aircraft just under tailpipe. Aware of FOD problem, mechanic checked tail rotor drive shaft housing and found bird's nest of grass and straw. He removed cowling to remove nest. Mechanic had trouble replacing cowling and was unable to secure it until another mechanic stopped to help. A short screwdriver was used to align holes in cowling. Tail rotor drive shaft cover had been opened to allow for installation of cowling. Screwdriver was inadvertently left under drive shaft cover. Sometime later, drive shaft hit screwdriver, driving it into metal floor just aft of No. 2 hanger bearing. Aircraft made two training flights with damage not detected on preflight or postflight inspections. Damage was found on next daily inspection.

ah1 **Class E mishaps** ☐ (S series) Vibration was felt and loud noise heard during NOE flight. Caused by dirty inlet section and VIGV. ☐ (S series) Master caution and transmission oil hot lights came on. Oil pressure deteriorated and oil temperature increased. Caused by loose transmission oil pressure line. ☐ (S series) Ammeter was high during takeoff. Battery switch was turned off and then on, with no reading. Battery was smoking when aircraft was landed. Caused by clogged vent line. ☐ (S series) Master caution and No. 1 hydraulic lights came on. Suspect air in hydraulic system caused pump to momentarily cavitate. Air was getting into system because of a loose hydraulic fitting.

ch47 **Class E mishaps** ☐ (C series) While in flight, crew chief saw that forward main rotor system's tip path plane was out of track. Postlanding check revealed main rotor blade was out of track. ☐ (C series) During flight, crew chief discovered hydraulic leak on cargo ramp actuating cylinder line. Caused by overtorqued fitting. ☐ (A series) Aircraft had landed because of chip detector light illumination. On runup after chip plug was cleaned, No. 2 engine fire light came on. Inspection revealed fire warning element was broken when chip detector was removed.

oh58 **Class E mishap** ☐ (A series) Transmission oil hot light came on. Caused by corrosion in cannon plug.

th55 **Class C mishap** ☐ Solo student pilot felt severe vibration, followed by loss of directional control and engine overspeed. Aircraft spun 90° left. SP closed throttle and landed on lane, bending aft landing gear cross beam. Upper rear "H" frame bearing seized because of lack of lubrication, resulting in loss of engine drive to power train.

(continued on back page)

Mishap briefs

c12 **Class E mishaps** □ (A series) Gear-up light remained on after gear was heard to cycle up and three green lights went off. Low pass over airfield revealed gear door appeared to be closed. Landing gear was lowered and aircraft landed. Caused by maladjusted gear-up switch. □ (A series) No. 1 engine fuel control heater circuit breaker popped out during runup. Inspection revealed wire had chafed by rubbing across top of engine cowling door, resulting in shortage in fuel control heater system.

u21 **Class E mishap** □ (A series) Crew saw fuel siphoning from left nacelle fuel cap during flight. Tension on fuel cap was adjusted improperly, allowing fuel to siphon.

Messages received

• Safety-of-flight message concerning one-time inspection of all OV-1B, OV-1C, OV-1D, and RV-1D series fuel systems for contamination (OV-1-80-07, 152145Z May 80). Summary: Reports have been received of self-sealing gel contaminating fuel system and causing fuel starvation. This message details inspection requirement to determine if self-sealing feature has been activated. Contact: Robert Clark, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight message concerning one-time inspection of UH-60 main rotor head assembly (UH-60A-80-22, 131750Z May 80). Summary: When the eight bolt holes that hold the upper pressure plate to the hub were machined, the depth of the tapped hole was not deep enough, resulting in possible bottoming of the bolts in the hub. Contact: John Guenther, TSARCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Maintenance information message concerning UH-60 main rotor spindle assembly (UH-60A-80-23, 131505Z May 80).

• Maintenance advisory message concerning OH-58 fuel filter pressure switch inspection (OH-58-80-07, 141515Z May 80).

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

Urgent change to OH-58A operators manual

The directional control margin chart for the OH-58A has now been published in Change 5 to TM 55-1520-228-10. ■

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Followups

Additional information on mishap briefs previously published

uh1 **Class A mishap** in 12 Dec 79 issue (8011) ☐ Maintenance test pilot was making autorotation. During recovery phase, rpm decreased to 6200. Pilot channelized his attention inside cockpit to try to analyze the problem. Aircraft descended to a critical altitude and hit a wire, which severed pitch control tube. Aircraft then crashed into trees and was destroyed by fire. Improper throttle manipulation during the power recovery resulted in extensive thermal damage to the turbine section of the engine.

Class C mishap in 9 Jan 80 issue (8013) ☐ While performing right simulated antitorque maneuver, IP allowed aircraft to touch down on lane. Student realized ground speed was excessive and bottomed pitch. IP was not guarding the collective and could not stop the abrupt lowering of the collective. Aircraft yawed left and then began to slide to the right toward the sod. IP applied right pedal to align aircraft with lane. Right rear skid hit the sod, causing the crosstubes to fail. Aircraft finally skidded to stop on lane.

Class A mishap in 6 Feb 80 issue (8019) ☐ Pilot-in-command (PIC), seated in left seat and performing copilot duties, requested an IFR climb to VFR on top. Pilot, who did not have a current instrument rating, flew into instrument meteorological conditions, became spatially disoriented, and lost control of aircraft. PIC tried to regain control, but could not. Aircraft hit two trees and came to rest on frozen lake.

oh58 **Class C mishap** in 17 Oct 79 issue (8001) ☐ Three separate partial power failures occurred after takeoff. Pilot may have at first confused the engine-out audio tone with that of an emergency locator beacon. There were suitable landing areas available when the emergency began, but the pilot did not start a power-on landing until the second partial power loss occurred. On short final, pilot realized the landing area was unsuitable. When collective was increased to extend the point of touchdown, engine failed and aircraft landed hard.

Class A mishap in 23 Jan 80 issue (8017) ☐ Aircraft was flying about 400 feet agl when master caution and engine chip detector lights came on. Pilot turned left to precautionary landing site. About 10 feet short of selected site, engine failed and aircraft settled onto 29° slope and rolled on right side. Engine failure was the result of fatigue failure of the helical torquemeter gear shaft. Fatigue failure resulted in overspeed and subsequent disintegration of the third- and fourth-stage turbine wheels.

th55 **Class C mishap** in 12 Dec 79 issue (8012) ☐ Student pilot making normal approach to stagefield induced low rpm condition, entered autorotation, and prematurely applied collective, resulting in hard landing.

Class C mishap in 9 Jan 80 issue (8016) ☐ Engine failed during power recovery from simulated forced landing, and IP autorotated to freshly plowed field. Main rotor blades flexed into and severed tail boom. Engine failure was caused by a portion of the repaired plenum housing breaking off and blocking engine air inlet. ■

No slippage marks

Not long ago, the engine of an OH-58 suddenly failed while the aircraft was about 200 feet agl. Fortunately, the pilot was able to make a forced landing to a frozen marsh without damaging the aircraft.

Inspection revealed the engine failed because a coupling nut had backed off the line to the double check valve. Yet, this aircraft had been properly preflighted, initially by the pilot who had test flown it and later by the pilot involved in the mishap.

This is but one example of the many emergencies that have occurred because of loose coupling nuts associated with OH-58 fuel control units. And one factor common to each of these mishaps was that none of the coupling nuts had slippage marks painted on them.

The need for some positive means of making sure coupling nuts have not backed off from the torqued position is made even more obvious by an experimental test cell run that revealed the following:

- When the coupling nut on the tube (P/N 6854139) from the double check valve to the governing pressure (Pg) port fitting at the fuel control was loosened one-quarter of an inch from the torqued position, N_1 stagnated at 100 percent and N_2 started to decrease, indicating a definite loss of power.

- When the coupling nut on the tube (P/N 870219) from the power turbine governor to the gas producer fuel control PcPy port was loosened one-quarter of an inch from the torqued position, N_1 once again stagnated at 100 percent and N_2 started to decrease.

- When the coupling nut on the tube (P/N 6850900) from the scroll (Pc inlet line) to the T fitting at the power turbine governor was loosened one-quarter of an inch from the torqued position, N_1 stagnated at approximately 43 percent with an accompanying loss of engine power.

White paint applied with a fine brush over connecting surfaces can provide a quick sure means of checking for slippage.

Keep in mind that in the above test the coupling nuts were loosened only one-quarter of an inch. The effect on the engine becomes more severe as these nuts are further backed off. And once a coupling nut becomes loose, it cannot retighten itself. It can only become looser. Obviously, we don't need to expound on what can be expected should an engine suddenly lose power or fail during various modes of flight operations, especially at night.

Yet, preventive measures are simple and can be readily applied. They consist of proper maintenance to insure all fittings and coupling nuts as well as any jam nuts are properly tightened, and the application of slippage marks to insure that pilots and maintenance personnel can readily detect any that may have become loose.

To make it easier to spot any loose fixtures at night when inspections may have to be made with the aid of a flashlight, USASC recommends that the adjoining surfaces be marked with white paint. The small amount of time it takes to do this can save an aircraft and prevent injuries. It's well worth the effort. ■

Selected mishap briefs

uh1 **Class C mishap** □ (H series) Main rotor hit tree during takeoff from LZ.

Ground mishap □ (H series) Maintenance check was being made at full throttle with governor beeped full down. Test pilot checklist, which was on center console, vibrated from top of caution panel lightbox against emergency governor switch. Pilot reached for checklist and accidentally knocked switch to emergency position. Engine rpm increased to 7300 for 3 seconds before pilot reduced throttle to flight idle. Overspeed inspection revealed damage to several components.

Class E mishaps □ (H series) Low rpm audio sounded and needles split. Aircraft was autorotated to landing. Caused by failure of fuel control. □ (H series) As hydraulics were turned off during test flight, cyclic moved uncontrollably to left. Technical observer, who was backing the pilot on the cyclic, sensed the problem and turned hydraulics on. Caused by failure of right lateral cyclic servo irreversible valve. □ (H series) During hot refueling operation, pilot smelled fumes at the same time that fire guard indicated there was a refueling equipment malfunction which was causing fuel spillage. Inspection revealed wiper seal on closed circuit refueling nozzle had split, preventing proper seating between internal tube and sleeve in nozzle and aircraft receptacle. □ (H series) Engine start had to be aborted because of low battery and high egt. Second attempt at start in emergency mode resulted in egt rising to 675° for 14 seconds and maximum temperature of 710° for 10 seconds. Pilot was slow to react to visual indications and take corrective action.

uh60 **Class E mishap** □ Inspection of main rotor system revealed one main rotor spindle sleeve was fully extended. Caused by cracked race on spindle sleeve.

ah1 **Class C mishap** □ (S series) As aircraft was hovering downrange, empty sandbag was caught in rotorwash and pulled through main rotor system. One blade was damaged.

Class E mishaps □ (S series) Transmission oil pressure light came on and oil pressure dropped to 10 psi. Failure of transmission internal oil filter O-ring caused loss of oil. □ (S series) Aircraft was flying NOE at 80 knots airspeed. Cresting top of ridge, aircraft hit tree. Caused by excessive speed for NOE flight. □ (S series) After left bank, aircraft mushed through after leveling out. Engine was overtorqued for about 2 seconds. Because of poor visibility and rain, pilot's attention was outside aircraft and not on instruments. □ (S series) Master caution and engine oil pressure lights came on. Caused by failure of pressure switch.

ch47 **Class A mishap** □ (C series) Aircraft crashed during takeoff. Mishap is being investigated. 8042

Class E mishaps □ (C series) During ramp check, flight engineer saw oil leaking from No. 1 generator seal. Caused by failure of seal. □ (A series) Master caution light flickered during landing. Aft transmission oil filter was contaminated. □ (C series) Transmission oil pressure decreased to 0 psi and caution light came on. Caused by faulty transmission oil pressure selector switch.

ch54 **Class E mishap** □ (A series) Hoist oil pressure light came on during hover. Load was released and aircraft landed with 15 feet of hoist cable extended. Aircraft was covered with hydraulic fluid. Caused by ruptured high pressure line from makeup pump to hoist pump.

oh58 **Class B mishap** □ (C series) On short final, pilot decided to make go-around. Abrupt increase in collective and high bank angle caused aircraft to begin to spin to the right. Pilot lowered collective to try to stop spin, and copilot rolled off throttle. Aircraft landed hard, damaging tail boom, skids, and transmission spike. 8043

Class C mishaps □ (A series) Aircraft were parked in trail. As lead aircraft lifted to hover, it drifted rearward and tail rotor blade hit slow-turning main rotor blades of parked aircraft. Pilot said collective and cyclic controls locked up. Suspect control malfunction. □ (C series) During low-level autorotation, student pilot applied excessive right pedal after initial pitch pull. IP took controls as right skid touched lane. Aircraft rocked onto left skid, then back to level, and yawed left. Spike knock was felt during landing. No damage was found and aircraft flew 2 1/2 hours. Another crew found damaged tail boom during preflight.

Class E mishaps □ (A series) Engine oil bypass light came on during hover. Inspection revealed oil tank cap was not secured. □ (A series) Thermal runaway of battery occurred during landing. Ammeter indicated 70 amps. □ (A series) Torque gauge indicated 70 psi during flight. Caused by faulty gauge. □ (A series) N_2 fluctuation during hover was caused by failure of linear actuator and governor.

th55 **Class E mishaps** □ IP felt aircraft yaw, saw tachometer needles split, took control, and landed. Lower forward H frame bearing seized. Sealed bearing had lost lubrication. Lower H frame race flange exhibited high temperature and overstress damage. Suspect preexistant stress riser in race flange. □ Cyclic trim went to full right during hover. Attempts to return to neutral trim resulted in trim circuit breaker popping. Caused by short in reverse trim board.

c12 **Class C mishap** □ (A series) As aircraft was descending through 15,800 feet msl in clouds, increased static background noise was heard over headset. Blue and red flash was seen, and loud popping noise was heard. Postlanding inspection revealed burned area on No. 1 propeller blade tip trailing edge and melted area on right elevator trailing tip. Caused by lightning strike.

Class E mishaps □ (A series) No. 1 engine torque went to 120% during climb. Power lever was retarded and torque could be controlled with power lever. Caused by slippage in linkage between power lever and fuel control unit. Exact location could not be determined. □ (A series) Two hours into flight, No. 1 nacelle low light came on. Evaluating the situation, and noting 850 pounds of fuel remaining in left main fuel tank, crew decided to continue to nearest point of land. After 40 minutes of flight with no problems, crew assumed light switch in tank had malfunctioned. About 1 hour and 55 minutes after light came on, No. 1 engine lost fuel pressure and flamed out. Single-engine landing was made. Check valve between left main tank and nacelle tank was stuck in almost-closed position.

t42 **Class C mishap** □ Main gear did not indicate up after takeoff and gear motor circuit breaker tripped. IP followed procedures for gear system failure, reset breaker after about 3 minutes, and recycled gear. Circuit breaker tripped again and gear did not indicate up. Gear handcrank would not turn. About 2 miles from airfield, cockpit filled with smoke. Cockpit was vented and smoke cleared. Preparations were made to foam runway and aircraft orbited in holding pattern to reduce fuel load. When fuel load was reduced, aircraft touched down at edge of foam. Partially extended gear supported aircraft for 150 feet before collapsing. Aircraft remained within strip of foam, coming to rest about 2,000 feet from touchdown point, with damage to landing gear and nose gear doors. Inspection of landing gear retract actuator assembly revealed motor had been excessively hot, melting field coil windings and causing motor to short. Actuator worm gear bushing was dislodged, preventing handcrank shaft from engaging, making it impossible to manually extend gear.

(continued on next page)

Mishap briefs

Maintenance

uh1 **Class E mishap** □ (H series) Master caution light came on during flight. Transmission chip plug had mud, water, and oil on terminal. Light had illuminated from the same cause the day before and crew chief had not sufficiently cleaned plug.

uh60 **Class E mishap** □ Engine start was aborted because of flame from exhaust. After cooling period, second start was begun, and tgt rose to 950°. Starter switch actuator was out of adjustment and had been for four days. Starter button would not allow engagement, and pencil was being used. **This is an illegal procedure and should not be used. The method, taught by General Electric, of using a 6-inch steel ruler is for troubleshooting only.**

ch47 **Class E mishap** □ (C series) During engine start procedures, No. 2 engine would not respond to normal or emergency beep. Caused by clogged flow divider on engine.

oh58 **Class E mishaps** □ (A series) Pilot noticed high loadmeter indication in flight. Two cells of battery had burned out. Bolts on battery internal bus bars were improperly tightened. □ (A series) Tail rotor gearbox chip detector light came on. Wire had come loose from plug and grounded out.

ov1 **Class E mishaps** □ (D series) Hydraulic pressure dropped to zero during test flight. Hydraulic suction line on engine-driven hydraulic pump was not properly secured. Pilot did not notice loose line on preflight. □ (D series) Gear remained up and locked when pilot selected gear-down during approach. Both pressure gauges read zero, and windshield wipers were inoperative. Pilot activated emergency landing gear extension system, received three down-and-locked indications, and landed. Hydraulic line was found to be rubbing against left engine inboard nacelle former, causing tear in line.

t42 **Class E mishap** □ Left brake failed during landing roll. Aircraft veered right and came to stop about 10 feet off paved runway. Spring in left brake master cylinder was installed backwards.

Messages received

- Safety-of-flight message concerning one-time inspection of all CH-47A/B/C flight control rod end bearings (CH-47-80-06, 232130Z May 80). Summary: Two failures have occurred in rod end bearings installed in rigid connecting link assemblies. One failure was caused by overload and the other by fatigue. Rod end bearings on forward and aft upper boost actuators are to be replaced. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

- Maintenance advisory message concerning decontamination of helicopters operating in volcanic ash environment (GEN-80-14, 271505Z May 80).

- Safety of personnel and equipment message concerning change of inspection intervals for survival kits and vests (GEN-80-15, 301810Z May 80).

- Maintenance advisory message concerning retrograde of engines and dynamic components (GEN-80-16, 301830Z May 80).

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

Shortfax

Recent TSARCOM Supply Letters

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

- SL 8-80, subject: Automatic and Directed Returns: Components and Parts Removed from Aircraft as a Result of Spectrometric Oil Analysis.
- SL 10-80, subject: Automatic and Directed Returns: Defective CH-47 Rotor Blade ISIS Indicators.
- SL 11-80, subject: Requisitioning Information: Right Hand and Left Hand Fairing (Work Platform) Assemblies, CH-47 Aircraft.
- SL 12-80, subject: Requisition Information: NSN 1560-00-868-5843, P/N 114C3042-3, Yoke Longitudinal.
- SL 14-80, subject: Automatic and Directed Returns: Unserviceable Return Criteria: Altimeters, AAU-31/A, NSN 6610-00-110-3368 and AAU-32/A, NSN 6610-00-115-2405. ■

Use correct sealant

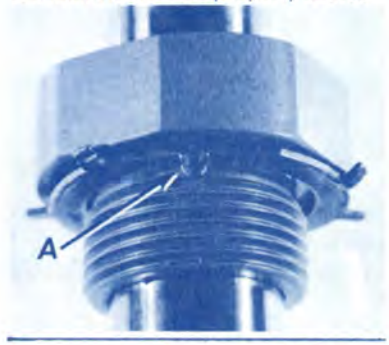
Only one sealant is listed in TM 55-1520-210-23-1 for use when installing UH-1 glass windshields: sealing compound, polysulfide base, high adhesion, premixed and prefrozen proseal 890, MIL-S-8802D, NSN 8030-00-753-4599. Do not use any other sealant for these windshields. Improper sealant application could lead to windshield cracking.

Thanks to CW3 Henselen, 3/5 Cavalry, Fort Lewis, ■

Bend those UH-1 lock washer tangs

During approach for landing, the pilot of a UH-1 felt feedback in the cyclic control. On landing, feedback increased to the point that he could not hold the cyclic steady. Inspection revealed the left cyclic servo bearing retaining nut had backed off because the tab lock washer tangs were improperly bent. Further, the condition of the lock washer indicated that the aligning lugs were not in their respective slots when the retaining nut was torqued. The end result was that the retaining nut backed off to the extent that it required only one-half of an additional turn to remove it.

The solution is simple. Before tightening the bearing retaining nut, make sure both aligning lugs of the tab lock washer are properly seated in their respective slots within the servo cap housing. Then, after tightening the nut to its correct torque value, bend the tangs against the flats on the nut as shown in TM 55-1520-210-23. At least two tangs must align with the flats of the retaining nut and be bent solidly against them.



Aligning lugs (A) — one on either side of lock washer — must be properly seated before nut is tightened and tangs bent.

Thanks to CW3 Robert Smithson, ASO, for this information. ■

Permion and cellophane don't mix

Some units are mixing permion cells with cellophane cells when building up batteries. TM 11-6140-203-14-2 must be followed when maintenance is being performed on nicad batteries. The note in paragraph 5-10 on page 5-11 states: "Note - Each battery must be constructed of cells made by the same manufacturer and carry the same stock number. Do not mix cells made by different manufacturers, or different stock numbers from the same manufacturer, to retrofit a battery." ■

Manual on shipping dangerous materials available

Some Army personnel are not aware of the existence of TM 38-250, "Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft." This manual is to be used by all DOD and other Federal agencies and contractors who ship dangerous materials by military aircraft. The last edition is dated 22 March 1976, with three changes.

The Safety Center does not stock TMs. You must get them through your AG Publications Division. ■

It's a fact . . .

Everyone who has died in an Army aircraft wire strike in the last 5 years was in an aircraft traveling at or above 60 knots.

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Mishap review

Synopsis

The UH-1H was the lead aircraft in a flight of three on a troop insertion mission. After crossing a set of powerlines, the aircraft turned and flew parallel to the wires. The copilot, who was on the controls, saw a set of wires and lowered collective. The main rotor blades hit the wires, and the aircraft crashed. Three passengers were injured.

History of flight

The mission required three UH-1s to pick up troops and take them to three designated LZs. Before arriving at each LZ, the flight was to make a false insertion to increase tactical realism. After each sortie, the flight was to change leads.

The first portion of the mission was uneventful, with seven troops on each aircraft being inserted at the LZ. The second load of troops was then picked up. During this flight, the pilot of the lead aircraft navigated while the copilot flew.

Before reaching the second LZ, the aircraft flew over a set of high tension wires, and the copilot began to fly a course parallel to and east of the wires. A height of 25 feet agl and an airspeed of 45 knots were maintained as the copilot flew contour down a small slope. At the bottom of the draw, the copilot, seeing that the aircraft was about to hit a set of three wires, reduced collective pitch. The main rotor blades hit and cut two of the three wires. The third wire tore through the forward transmission cowling and was then cut by the main generator. The aircraft continued forward flight for 275 yards before crashing in a recently plowed field.

Crewmember experience

The 32-year-old pilot had more than 1,700 rotary wing flight hours, with almost 1,400 hours in UH-1Hs. The 33-year-old copilot had more than 1,300 rotary wing hours, with more than 700 hours in UH-1Hs.

Commentary

The flight was being conducted during the late afternoon when long shadows were present and when poles and wires tended to blend into the dark background of freshly plowed fields. Because of these conditions, the copilot did not see the wires in time to avoid them.

Adequate hazard maps were not available. The tactical maps used by the flight crews during terrain flight contained very few powerlines and other hazards to flight. Commanders were authorized to conduct terrain flight without making an adequate aerial or photo reconnaissance of the planned area of operations or posting flight hazards on maps as specified in FM 1-51. FM 1-1, which had been superseded by FM 1-51, was being used as a reference for the conduct of terrain flight.

Since this mishap, preprinted hazard maps for this unit's area of operations have been developed. The unit SOP and training program are being revised to include requirements to conduct a map and aerial photo reconnaissance before all operational and training missions involving terrain flight. ■

CH-47 beep trim operation

Recently, there has been an increase in rotor system/engine overspeeds on CH-47s. A review of these mishaps indicates that in some cases there was confusion concerning the operation and function of the engine power turbine control system.

The power turbine control system operates the engine N_2 actuators and controls power turbine speed and rotor rpm. During normal beep trim operation with the normal beep trim disable switches ON and **both** the 115-volt a.c. and 28-volt d.c. primary buses energized, the engine N_2 actuators are controlled by either the normal beep trim switches or by repositioning the thrust lever.

If either of the normal beep trim disable switches is turned OFF or a.c. power is lost, the respective engine N_2 actuator can only be controlled by the emergency engine beep trim system. However, if for any reason the normal engine beep trim switches are adjusted (increase or decrease) while a.c. power is OFF or that engine's normal beep disable switch is OFF, the respective N_2 control box's internal trim actuator is repositioned because it is d.c. powered. The result of this will not become apparent to the pilot until a.c. power is restored or the normal beep trim disable switch is turned ON.

When this occurs, the repositioning of the N_2 control box's internal trim actuator will cause an imbalance in a bridge circuit between the control box's internal trim actuator and the engine's N_2 actuator. The respective engine's N_2 actuator will then reposition itself the appropriate amount in either the increase or decrease direction until the circuit is nulled. This sudden and unexpected movement of the engine N_2 actuator and the resultant change in engine and rotor speeds have, in some instances, resulted in overspeeds.

It is important to remember that the engine's normal and emergency beep trim systems only affect engine N_2 and rotor speeds when that engine's condition lever is in FLIGHT position. With the engine condition levers at STOP or GROUND, the engine's N_2 actuators can still be repositioned by operating the engine normal or emergency beep trim system. However, in either case, the engine N_2 and rotor speeds will not change until that engine's condition lever is in FLIGHT.

The "bottom line" is that anytime the normal engine beep trim switches are adjusted with 115-volt a.c. power disconnected from either engine's N_2 control box (i.e., disable switches OFF, generators OFF, engine trim a.c. circuit breakers pulled, etc.) and 28-volt d.c. is applied to that N_2 control box, the internal trim actuator is repositioned. Once 115-volt a.c. is reconnected, the affected engine's N_2 actuator will reposition quickly and unexpectedly.

So, all you Chinook types, remember that even though the normal beep trim switch is often referred to as "a.c. beep," it is controlled by a d.c. circuit. Be aware of this and don't allow yourself to be unpleasantly surprised. ■

Thanks to Captain Ron Isbel, TSARCOM. For more information, call CPT Isbel at AUTOVON 693-0604, commercial 314-263-0604.

Selected mishap briefs

uh1 **Class C mishaps** ☐ (H series) Main rotor blade was found damaged on postflight inspection. Aircraft had just flown through unforecast hailstorm. Size of hail was about one-fourth inch. ☐ (H series) Aircraft had landed on pinnacle. After engine was secured, main rotor continued to coast for more than 15 minutes because of gusty winds and turbulence. Gust of wind caught advancing blade, causing retreating blade to flex down and hit tail boom. ☐ (H series) Main rotor blade hit tree during hover in confined area, tearing skin on underside of blade tips.

Class E mishaps ☐ (H series) Loss of hydraulic pressure in flight was caused by sheared hydraulic pump end bolt. ☐ (H series) Hydraulic light came on during hover, followed by stiffness in cyclic. Caused by failure of lateral servo bellcrank. ☐ (H series) IP noticed unusual main rotor vibration during approach. Postflight inspection revealed lower doubler was missing from main rotor blade. ☐ (H series) Illumination of hydraulic light was caused by failure of hydraulic line. ☐ (H series) While closing up after formation takeoff, copilot jerked collective up, causing two compressor stalls. Ninety-degree gearbox was inspected and no defects were found. ☐ (H series) Fire light came on during flight. Volcanic ash was found in cannon plug.

ah1 **Class E mishaps** ☐ (G series) No. 2 hydraulic and master caution lights came on. Pilot disengaged pitch and roll channels. No adverse feedback was felt, and running landing was made. Failure of pressure switch caused pilot to feel he had hydraulic failure. ☐ (S series) Transmission oil bypass light came on during hot refueling operation. Water and oil were found in rubber boot. ☐ (G series) Engine tachometer fluctuated during landing. Caused by failure of tachometer generator.

ch47 **Class B mishap** ☐ (C series) While on approach at 1,100 feet and 40 knots with external load, pilot heard loud bang and felt jolt, followed by illumination of No. 1 fire detector light and total loss of No. 1 engine instruments and power. Load was jettisoned. Crewmember told pilot there was a fire in No. 1 engine area. Pilot shut down engine and pulled fire control handle. Fire bottle extinguished fire. Single-engine landing was made. Engine had exploded, damaging main rotor blades and aft pylon area. 8044.

Class E mishaps ☐ (B series) IP armed cargo hook release. During approach, pilot inadvertently pressed cyclic cargo hook release button. Load landed in swamp. ☐ (B series) No. 1 tunnel cover opened on takeoff, followed by No. 3 and No. 5 covers. Tower personnel told pilot to land. Preflight was hasty. Apparently, check was not made to insure covers were secure. ☐ (A series) Muffled bang was heard and No. 2 engine N_1 decreased during flight. Caused by failure of turbine wheel and combustion section. ☐ (B series) During in-flight simulated N_2 drive shaft failure, No. 1 engine rpm was controlled by placing engine condition lever to ground. As No. 2 engine was picking up load, during acceleration, or immediately after peakout, No. 2 engine failed. No. 1 engine was quickly regained and aircraft landed. Inspection revealed No. 2 engine had separated at forward combustor outer flange. Flange had broken around its entire circumference, allowing hot end of engine to back away from centrifugal compressor housing.

oh58 **Class E mishaps** □ (A series) Crew flew down small depression during search and rescue mission. Popping sound was heard behind aircraft. Looking back, crew saw what appeared to be a flare on the ground. They turned back to area and saw evidence of wire strike. Crew had not previously seen wires. Minor wire marks were found on main rotor blade. □ (A series) Master caution and hydraulic pressure lights came on during climbout from field site. Caused by electrical short in hydraulic system warning light.

th55 **Class C mishap** □ Solo SP said aircraft tipped back a little as he came to a hover, but he felt nothing unusual and flew to stagefield. He then felt slight one-to-one vibration, which he reported to tower. OIC told SP to park aircraft, which he did. SP then picked aircraft up to hover and said vibration was gone. OIC told him to finish training period. SP completed flight, parked, and signed off flight as O.K. On preflight, the next crew discovered damage to landing gear and tail rotor. When asked if he had made a postflight inspection, SP replied "I think so."

c12 **Class C mishap** □ (A series) As aircraft was descending through 17,000 feet msl, white and blue flash was seen and sizzling noise was heard. Postflight inspection revealed burned area about 1 inch long on trailing edge of No. 1 propeller blade. Caused by lightning strike.

Class E mishaps □ (C series) Aircraft was flying about 5 nautical miles from heavy thunderstorm. Lightning struck near aircraft, but no unusual indications were noticed and flight was continued. Postflight inspection revealed break in radar dome, burn marks on glideslope antenna and two blades of No. 2 propeller, and scorched outboard static dissipator on right elevator. □ (D series) Gear would not retract after manual extension. Caused by failure of emergency extension disabling switch.

u21 **Class E Mishaps** □ (A series) Fuel was seen siphoning from left nacelle tank during takeoff. Fuel cap was not properly seated. □ (A series) At 500 feet after takeoff, pilot noticed props were not synchronized. Copilot saw No. 2 prop rpm dropping and torque increasing. Copilot then feathered prop without reducing power on No. 2 engine and moved condition lever to fuel cutoff. When engine was shut down, crew noticed secondary low-pitch light was on. Engine was restarted and propeller governor circuit breaker was pulled. Aircraft was landed at airfield. Caused by failure of solid state switch. Pilot performed wrong immediate action procedures.

(briefs continued on page 6)

Old hat

If ever a subject was old hat—or should be—it's unintentional gear-up landings. So why are we bringing it up again? Well, after a lull of more than a year, the unorthodox practice of landing gear up has been revived. As a matter of fact, we've had three belly landings during the first 5 months of 1980.

Compared to FY 1977 and 1978, we are doing better when you consider that 33 percent of the 27 fixed wing accidents during that 2-year period involved single-engine operations in multiengine aircraft. Half of these mishaps were caused by failure to lower the gear during simulated single-engine conditions in training situations.

This year's gear-up landings have taken place in the training environment, and each mishap occurred in a different type aircraft—one during a simulated single engine landing, one during a night IFR landing, and the third during a minimum run landing.

A solution to the problem of unintentional wheels-up landings has been sought for years. Possibly the only foolproof system would be to weld down all retractable landing gear. Of course, we all know this is a farfetched idea. So, the only cure to scraped aircraft bottoms is aviator awareness. Checklists have to be run, lights have to be rechecked, and those obnoxious warning horns have to be taken seriously.

On the other hand, you have to expect and be prepared for any interruption in normal habit patterns or any other distraction in the landing pattern. For instance, condition yourself to recheck for the green lights at minimums on every approach. If anything unusual happens in the landing pattern, get in the habit of asking yourself, "Where are my wheels?" If you're an IP, work on your students to get out of the automatic gear-check habit. Instead, make sure that they look at the lights as they check the gear. ■

Mishap briefs

Maintenance

uh1 **Class E mishaps** □ (H series) Crew smelled fuel fumes in flight. Inspection revealed hose assembly had lost torque value, allowing pressurized fuel to spray into transmission area. □ (H series) N_1 fluctuation during flight was caused by loose quick disconnect for customer service line. □ (H series) Master caution light came on, loud pop was heard, and hydraulics were lost. Running landing was made. Caused by chafed hydraulic line.

ch47 **Class E mishap** □ (C series) Crew detected high frequency vibration near No. 1 engine transmission during ramp check. Caused by lack of lubrication on No. 1 engine drive shaft splines.

oh58 **Ground mishap** □ (A series) While tracking main rotor, crew chief allowed tracking flag to hit main rotor, slightly damaging tip cap fairing.

Class E mishaps □ (A series) As engine was started for N_2 rigging, N_1 control stop was inadvertently misaligned, resulting in hot start for 3 seconds. N_1 was improperly rigged. □ (A series) Pilot noticed loss of fluid from reservoir after landing at field site. O-ring on pressure switch was not installed.

c12 **Class E mishap** □ (A series) When landing gear handle was lowered during approach, red lights in handle stayed on and green light for nose wheel remained off. Gear was recycled five times, with the same result. Tower personnel indicated nose gear appeared to be down. Touch-and-go landing on main gear was made to try to bump nose gear into locked position, with no success. Landing was then made using emergency checklist. As nose wheel touched down, red lights in gear handle went out and green light for nose wheel came on. Caused by out-of-adjustment nose gear down lock switch.

ov1 **Class E mishap** □ (D series) Power-on stall was initiated during training flight. As power was advanced, No. 2 propeller increased past 1700 rpm. Rpm remained at 1700 with power at flight idle. Engine was secured when level flight could not be maintained with 95 pounds pressure torque on No. 1 engine. Caused by out-of-rig propeller control.

u8 **Class E mishap** □ (F series) During flight, pilot saw small amount of oil coming from rear of No. 1 engine oil cooler area. Oil separation return line was improperly torqued, allowing leak.

Messages received

• Safety-of-flight message concerning procedure for lifting NOE flight restriction, ground and 25-hour flight checks for UH-1H/M, EH-1H, AH-1G, and TH-1G aircraft (UH-1-80-10 and AH-1-80-14, 042045Z Jun 80). Summary: Message reiterates NOE flight restriction and directs daily ground and 25-hour flight checks of aircraft containing fuel controls with bronze P1 bellows. When fuel controls with stainless steel bellows are installed, these restrictions are lifted. Contact: David Giratos, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight message concerning inspection of OH-6A main transmission (OH-6A-80-03, 052130Z Jun 80). Summary: Failures of the main transmission output gearshaft on OH-6 aircraft have been identified as a potentially hazardous condition. Message requires inspection to locate and report transmissions suspected to contain thin-walled shafts and identify those transmissions known to have thick-walled shafts. Aircraft with thick-walled shaft transmissions may continue to fly. Those with thin-walled shafts are subject to flight restrictions. Contact: Richard Smith, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety of personnel and equipment message concerning removal of 5-year installed service life on aircrew restraint equipment (GEN-80-17, 021950Z Jun 80). All aircrew restraints will now use the on-condition/replacement system.

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

Standardization Communication | Directorate of Evaluation & Standardization USAAVNC, Fort Rucker, Alabama 36362 | STACOM 57 18 June 1980

Stacom

Better LATE than NEVER

STACOM 56, 14 May 1980, addressed the reemergence of the inadvertent IMC mishap. STACOM also offered a possible solution for the helicopter pilot who is confronted with marginal or unforecast weather conditions that continue to deteriorate—**set it down till conditions improve.**

FLIGHTFAX of the same date made note of a UH-1 Class E mishap (precautionary landing) where unforecast snowshowers forced the pilot to land. About 40 minutes later, weather improved and flight continued. Sometime later, another heavy snowshower forced the pilot to land again. Flight was continued to destination after 35 minutes on the ground.

On the basis of the FLIGHTFAX report, it appears to this writer that the aviator deserves an "ATTABOY." Whether the aviator received bouquets or brick bats from his supervisors and peers is unknown, but he can surely take great pleasure in knowing that he proved correct an old adage, "Better late than never." ■

SWB discontinued

All you stateside flyers be advised that the hourly Scheduled Weather Broadcast reports from VORs and NDBs with voice capability have been discontinued from all FAA facilities except those in Alaska, effective 1 April 1980. Alternate sources of weather reports are those made randomly from navigational facilities, the En Route Flight Advisory Service at selected FSSs, and the Transcribed Weather Broadcasts over low frequency NAVAIDS and VORs. The above information was extracted from the March-April 1980 FAA General Aviation News and the inside front cover of the IFR Supplement, effective 15 May 1980. ■

New training circulars

Two new training circulars have made their appearance and are now in distribution channels. They are TC 1-62, 14 April 1980, "Aviation Life Support Equipment" (ALSE), and TC 1-75, 16 April 1980, "Instructor's Guide for the UH-1 Flight Simulator" (UH1FS).

Both circulars contain questionnaires for constructive comments. The questionnaires or any other pertinent information should be addressed to: Commander, U.S. Army Aviation Center and Fort Rucker, ATTN: ATZQ-TD-TL, Fort Rucker, Alabama 36362, Phone: AUTOVON 558-7120. ■

OH-58A directional control

Change 5 to the OH-58A Operators Manual added Directional Control Margin Charts, figure 5-6, sheets 1 and 2. The purpose of these charts is to indicate tail-rotor effectiveness when the helicopter is at a stationary hover at 103% rpm in various wind conditions.

The figures cannot be used to determine tail-rotor effectiveness during deceleration maneuvers or when the helicopter is in a bank, e.g., decelerations with turns while NOE. This is due to the demand for increased power in the above configurations.

NOTE: The above information is also applicable to the OH-58C when operating in like conditions at 100% rpm. ■

Questions and answers

Question: The UH-1D/H Glide Distance Chart (figure 9-2, page 9-4, Operators Manual) is based on 324 rotor rpm. I have heard many aviators insist that glide distance is greater at 294 rpm. I am confused. What is the ungarbled word?

Answer: Dear Confused: While figure 9-2 of the UH-1D/H Operators Manual indicates glide distances only at 324 rotor rpm, it does not state that under certain conditions other rpm's might not produce greater glide distances.

Results of autorotational test flights conducted by the United States Army Aviation Systems Test Activity disclosed that at light gross weights, glide distance is slightly greater at 294 rotor rpm than at 324 rpm. However, as weight increases, glide distance actually decreases when autorotational rpm is maintained at 294. Consider, also, that the tail rotor is less effective at low rotor rpm and that the higher rpm provides for more effective collective pitch during the critical phase of the autorotational touchdown. Finally, be aware of the following instructions given in paragraph 9-15: "Collective pitch should never be applied to reduce rpm for extending glide distance because of the reduction in rpm available for use during touchdown."

Question: A TSARCOM message authorized the following change to

(continued on back page)

Stacom

paragraph 8-23, step 3a, TM 55-1520-210-10, for UH-1D/H aircraft operating in Alaska:

"Battery starts can be made when voltages less than 24 volts are indicated, provided that the voltage does not drop below 14 volts when cranking through 10% N_1."

Is this starting procedure authorized for areas other than Alaska?

Answer: It is authorized in other areas and the procedure cited above will appear in future changes to TM 55-1520-210-10 and TM 55-1520-220-10.

Question: With the electrical power off before engine starts, checklists instruct the crew to check avionics equipment "off and set on the desired frequence." Won't this practice damage the avionics equipment when power is turned on?

Answer: Avionics chapters of aircraft operators manuals contain **no** restriction on selecting frequencies before turning on equipment. Power required for frequency changes is very low. There is no danger that the equipment will be damaged when turned on. ■

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.

Status of first aid kits

Dash 20 and dash 23 maintenance manual Aircraft Master Inventory Guides list the number of first aid kits required for an aircraft. If sufficient first aid kits are not on board, the aircraft is not fully mission capable (FMC) and goes on a circled red X status. The number of personnel allowed on board during flight is restricted. If no first aid kits are aboard, the aircraft is grounded. An article in the June 1980 PS Magazine lists references and an example on page 40. ■

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Density altitude . . .
critical consideration for
summertime or anytime

This thing called density altitude

The term "high gross weight" is often thought of as a weight somewhere near the published maximum (such as 9,500 pounds for the UH-1H). This term can be misleading from a planning point of view since it usually refers to a structural, rather than a performance, limitation. A UH-1H at or below 9,500 pounds may or may not be able to hover depending on the DA. The allowable load shown in the limitations block of DD Form 365F has little meaning then, except as an absolute maximum. Rarely can that much be carried.

Perhaps a better term is "high mission allowable gross weight" which takes DA into account and is based on performance. In the case of the UH-1H, mission allowable gross weight is based on hovering ability and is obtained by entering Figure 7-5 of the operators manual with calibrated torque, pressure altitude, temperature, and the required skid height for hover. Calibrated torque is obtained from Figure 7-3. For a specific mission, this is the maximum (under ideal conditions) gross weight regardless of what the DD 365F says. So far, so good, but how did we account for the effects of density altitude?

Most of us associate high DA with summertime flying and have an almost intuitive feeling that it reduces aircraft performance. What we may not fully understand 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. Major damage resulted from an attempt to take off with the aircraft over gross weight limitations.

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 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.

These effects can be appreciated by considering an aircraft equipped with a barometric altimeter attempting to maintain a constant absolute altitude over flat terrain. Should the aircraft fly into a low pressure area, or into colder air, or into drier air, a decrease in absolute altitude will result even though the altimeter indicates no change. The remedy here is a simple one involving no more than up-to-date altimeter settings.

The effect of nonstandard density on aircraft performance is a little more complicated. Since density enters into the calculation of airfoil lift, it follows that a decrease in density will result in a decrease in lift produced. The exact amount varies with atmospheric conditions and type of aircraft, but, as an example, the difference between flying in humid rather than dry air equates to a degradation of engine performance of a few percent.

There is also a direct effect on engine performance. Less dense air reduces the pressure ratios through an engine, resulting in a loss of power. In a turbine engine, this loss is about 3 to 4 percent, while in a reciprocating engine, the loss can be as much as 12 percent.

Once the problem is thoroughly recognized, corrective action can be taken. During mission planning, the effects of nonstandard pressure and temperature can be taken into account while using the performance charts as indicated earlier. The effect of humidity is harder to measure.

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. If the air is hot and the relative humidity is high, the error can be 1,000 feet or more, which equates to 1 pound of torque or 200 pounds of load. Mission planning that does not consider the effects of humidity can thus result in a decision to carry an extra passenger with potentially disastrous results.

The steps to take then are:

- Check weight and balance.
- Use performance charts to determine mission allowable gross weight.
- Make an approximate correction for humidity. If the air is cold and dry, the correction is negligible. If it is hot and humid, add 1,000 feet (or reduce allowable gross weight by 200 pounds, or reduce maximum torque available by 1 psi).
- Repeat above steps for each point of intended landing (or hovering).
- If the result is marginal, reduce the load still further since the charts are inaccurate, 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.

As an example of these principles, consider the following flight planning

(continued on next page)

Density altitude

problem. You are to transport seven combat-loaded troops from your location at LZ Alpha to LZ Bravo in a UH-1H. Hover OGE will be required. Your operating weight is 6,300 pounds, you must carry 1,000 pounds of fuel on board, and the trip to Bravo will use 580 pounds. Pressure altitude at Alpha is 1,500 feet and temperature is 34° C. Alpha's elevation is 1,000 feet, while Bravo is at 8,000 feet. Crew chief's name is Raquel. Can you complete the mission?

The first step is to compare lift capability to gross weight at takeoff. At Alpha, gross weight = 6,300 pounds (operating weight) + 1,000 pounds (fuel) + 1,680 pounds (7 troops) = 8,980 pounds. Using calibrated torque (44.5 psi) from Figure 7-3, and conditions at Alpha, Figure 7-5 indicates that a normal takeoff may be made at any gross weight up to 9,500 pounds (although hover OGE may not be possible).

The next step is to determine the conditions at Bravo. Since Bravo is 7,000 feet higher than Alpha, the pressure altitude will be 8,500 feet. Using a lapse rate of 2 degrees per thousand, the temperature will be 20° C. When the aircraft arrives, it will weigh 8,400 pounds, but lift capability will be only 7,700 pounds. It now becomes obvious that the mission as stated cannot be flown. What to do? Carry three less troops, right? Wrong! Even then, the ability to hover OGE is marginal, and other parameters, as mentioned earlier, have not been considered. A larger margin of safety should be provided by carrying only three troops, or flying the mission when the temperature in LZ Bravo is cooler.

Sound by-the-book planning results in power margin, and power margin keeps you in the air—summertime or any time. ■

The temptation

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.

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 a 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.

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. ■

Selected mishap briefs

uh1 **Class B mishap** ☐ (H series) After touchdown from practice autorotation, sudden jolt was felt. Antitorque pedals did not respond to input and aircraft slid to stop. Tail boom was severed. Mishap is being investigated. 8045

Class C mishap ☐ (H Series) During standard night autorotation, SP pulled initial collective pitch high and there was insufficient rotor rpm to cushion touchdown. Aircraft touched down hard in nose-high attitude, causing damage to lower fuselage, right rear jack point, and left side of tail boom.

Class E mishaps ☐ (H series) Transmission oil pressure dropped to 30 psi and then fluctuated. Postflight inspection revealed oil leaking from top of transmission. Caused by crack in hose assembly. ☐ (M series) Copilot made improper NOE deceleration and exceeded torque limits. Transient torque peaked at 58 pounds in less than 3 seconds. ☐ (H series) Engine oil temperature and egt increased during flight. Caused by failure of engine oil bypass valve. ☐ (H series) As throttle was set for start, pilot noticed aircraft was cranking. Fuel was turned off, throttle was closed, and engine was motored. Egt was 710° C. for 8 seconds and N_1 reached 8%. Caused by stuck starter switch on copilot's collective lever. Pilots did not hear engine start immediately because of other aircraft running in vicinity.

ah1 **Class E mishaps** ☐ (G series) As aircraft was occupying firing position in confined area, main rotor blade hit tree. ☐ (S series) Engine master caution and transmission oil bypass lights came on during hover. Caused by broken wire to master caution switch.

ch47 **Class C mishap** ☐ (A series) During takeoff from confined area, aircraft turned right and aft rotor blades hit tree branches, denting tip caps and leading edge of blades.

Class E mishaps ☐ (C series) Master caution and No. 1 hydraulic boost pump lights came on, and hydraulic pressure gauge dropped to zero. Postflight inspection revealed failure of hydraulic return line, causing loss of fluid in No. 1 hydraulic boost pump. ☐ (C series) After No. 2 engine was started, forward transmission oil pressure fluctuated and then fell to zero. Caused by failure of oil pressure transducer. ☐ (B series) Rotor tachometer failed during ground taxi. Caused by defective rotor tachometer generator.

oh58 **Class B mishap** ☐ (A series) Engine failed while aircraft was flying over mountainous terrain. Pilot autorotated and aircraft landed hard, damaging skids, tail boom, and transmission. 8046

Class C mishap ☐ (A series) When NOE right hovering turn was made during tactical exercise, momentary shudder was felt. Postlanding inspection revealed damage to main rotor blade.

Class E mishaps ☐ (A series) N_2 rpm dropped from 103% to 95% on takeoff. Caused by failure of linear actuator. ☐ (A series) As aircraft descended through 500 feet agl, pilot noticed N_2 increasing to 105% and responded by increasing collective pitch to arrest descent and decrease N_2 rpm. N_2 rpm then decayed from 105% to 90%. Pilot lowered pitch, retarded throttle to flight idle, and landed. Caused by failure of governor. ☐ (A series) Engine oil pressure light came on

(continued on next page)

Mishap briefs

during approach. Caused by failure of rear seal free-wheeling unit.

th55 **Class C mishaps** ☐ During hover, IP's mike boom pivot adjustment came loose at friction swivel and mike boom fell down. IP removed his hand from collective to reposition mike, and aircraft hit ground. Tail rotor blades then hit ground. Aircraft bounced and turned right, breaking tail boom attachments and bending aft landing gear cross beam. ☐ During first supervised solo, as student pilot was picking aircraft up to hover, aircraft lifted abruptly and spun right. SP bottomed collective and aircraft landed hard, damaging landing gear and landing light. SP said aircraft took off before he was ready.

c12 **Class E mishap** ☐ (A series) After takeoff, aircraft started pressurizing at 5,000 fpm and could not be controlled with rate knob nor altitude selector. Bleed air valves were closed, but aircraft continued to pressurize. Pressurization was dumped at 2.6 psi. Caused by faulty pressurization controller.

ov1 **Class E mishaps** ☐ (D series) No. 2 engine fire light came on during runup. Moisture in fire detection system caused ohms resistance to register too high. ☐ (D series) As gear was raised, cockpit filled with smoke and mist of hydraulic fluid, which was later determined to be caused by failure of hose assembly on nose gear actuator. Because he was unable to snap the connectors, pilot held his oxygen mask over his face with one hand until cockpit cleared. Landing gear indicated unsafe and there was no hydraulic pressure. Pilot tried to recycle gear but could not get a safe indication. Tower flyby was made. Nose gear appeared to be up and both main gear partially extended. Emergency gear extension bottle was activated and gear extended. No-hydraulics landing was made.

t42 **Class E mishap** ☐ After takeoff pilot heard loud clunking sound as gear was retracted to full up position. Gear was lowered and sound was heard again. Safe-down indication was given in cockpit. Pilot made low pass by tower for visual check. Gear appeared to be down and locked. Postflight inspection revealed left landing gear inboard door was still partially down and appeared to be sprung.

u21 **Class E mishaps** ☐ (A series) Gear only partially retracted when placed in up position. Gear motor circuit breaker tripped and would not stay in. Gear was manually extended and aircraft landed. Caused by failure of gear motor. ☐ (A series) Landing gear would not retract when landing gear handle was placed in up position. Caused by stripped splines in gear motor shaft. ☐ (A series) Left fuel boost pump light came on and circuit breaker popped. Caused by failure of boost pump.

Maintenance

uh1 **Class E mishaps** ☐ (H series) Transmission oil pressure fluctuated after takeoff. Postflight inspection revealed loose cannon plug with corrosion buildup on terminals. ☐ (H series) Master caution and hydraulic lights came on, and controls became stiff. Hydraulics-off landing was made. Caused by chafed hydraulic line. ☐ (H series) As pilot was making maximum torque available check during takeoff, collective-up movement became restricted at 40 psi torque. Collective then went to full up position, causing severe collective bounce. Cyclic hardover in left lateral position caused aircraft to roll left about 90 degrees. Cyclic control was

regained and running landing made. Caused by collective droop cam shear bellcrank making contact with improperly positioned transmission oil line. ☐ (M series) During postflight inspection of the third flight of the day, magnetic chip detector plug and cap assembly were found off of 90-degree gearbox assembly, allowing all oil in gearbox to escape. Suspect chip detector plug and cap assembly were not properly secured. ☐ (H series) Malfunction of pilot's airspeed indicator was caused by leak in air line. Instead of using proper cap, line had been taped off when copilot's airspeed indicator was disconnected.

ah1 **Class E mishaps** ☐ (S series) Transmission oil temperature gauge fluctuated and oil hot light came on. Wire bundle leading to gauge and hot light was shorted. ☐ (G series) Transmission oil pressure fluctuated, temperature increased, and transmission oil bypass light came on. Caused by chafed tube.

ch47 **Class E mishap** ☐ (A series) Flight engineer noticed atomized hydraulic fluid spraying on accessory gearbox area, and aft cabin area filled with smoke. Crew chief said there was a generator fire and pilot landed. After landing, it was discovered there was no fire. Utility hydraulic boost pump packing was leaking. Jam nut was not properly torqued.

oh58 **Class E mishaps** ☐ (A series) Master caution and engine oil bypass lights came on. After aircraft was landed, oil was seen running down side of aircraft. Caused by overtorqued line. Helicoil was stripped on accessory gearbox side of pressure reducer line to No. 1 engine bearing. ☐ (A series) Pilot heard rushing noise which sounded like cabin door had come open and saw TOT fluctuating between 800 and 840. Postlanding inspection revealed coupling from bleed air line to diffuser scroll was loose.

ov1 **Class E mishaps** ☐ (D series) No. 1 engine oil pressure gauge fluctuated and oil temperature rose. Pilot saw evidence of oil seeping from bottom inboard side of engine cowling. Engine was secured and aircraft landed. Caused by loose elbow tube. ☐ (D series) After takeoff, right main landing gear would not fully retract into gear well. Caused by overserviced landing gear strut, causing strut to overextend.

Messages received

• Safety-of-flight message concerning UH-60A cargo hook weight limitation (UH-60A-80-27, 101905Z Jun 80). Summary: The cargo hook weight limitation of 7,500 pounds is increased to 8,000 pounds. Contact: Frank Hunleth, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

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

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Heavily loaded aircraft began takeoff down runway, which ended with a steep 200-foot dropoff. As aircraft approached end of runway in rotor-raised dust, pilot decided to abort takeoff since translational lift had not been achieved. Aircraft was then flared, raising more dust and causing loss of visibility. Problem was complicated by dust entering cockpit through hatch that had to be left open to reduce fume hazard from spilled cargo. Pilot then decided to back up since he thought he was already over 200-foot ledge. After traveling backward an estimated 12 to 14 feet, pilot tried to set aircraft down under instrument meteorological conditions, but rear of right skid hit ground first, resulting in main rotor strike.

☐ Two aircraft returning to base at night encountered patchy areas of ground fog with minimum ceiling and visibility. Both aircraft descended under a cloud bank. Pilots saw weather was too bad to continue and decided to return to takeoff site. Lead aircraft started 180-degree standard turn to left, with searchlight turned on in heavy fog. Soon afterward, pilot verified that he had passed through 90 degrees. Fifteen seconds later, second aircraft asked if lead aircraft had completed turn, but received no message. Lead aircraft hit ground with relatively high rate of descent and forward speed.

What's going on here?

Would you believe the six men standing beneath the hovering OH-58 shown in this photo are performing routine aircraft maintenance? Well, they are. A sharp-eyed shutterbug caught them in the process of replacing the skid shoes.

We don't know what self-appointed time study specialist devised this method, but one thing is certain: It is definitely not the approved procedure for skid shoe replacement. The hazards are obvious. Pilot error, some control malfunction, or engine failure could result in loss of lives and injuries. And if unauthorized maintenance practices such as this continue, you can be sure mishaps will occur—sooner or later.

For correct procedures for skid shoe replacement, refer to TM 55-1520-228-20, paragraph 4-27a. Meanwhile, take a good look at your maintenance operations, and make sure your mechanics have not adopted any unauthorized maintenance procedures which could prove hazardous to personnel and equipment. ■

Publications reminder

Up-to-date reference manuals play a big part in helping quality control and safety personnel do their jobs. Information on reference publication files and keeping them current and posted can be found in AR 310-2, AR 340-18-1, and DA Pam 310-13.

All required manuals should be on hand or on order (DA Form 4569), and changes should be posted properly. For requisition of publications, see DA Pam 310-10-2. Superseded or rescinded manuals should not be used, and unnecessary publications should not clutter your space. Libraries should be conveniently located. ■

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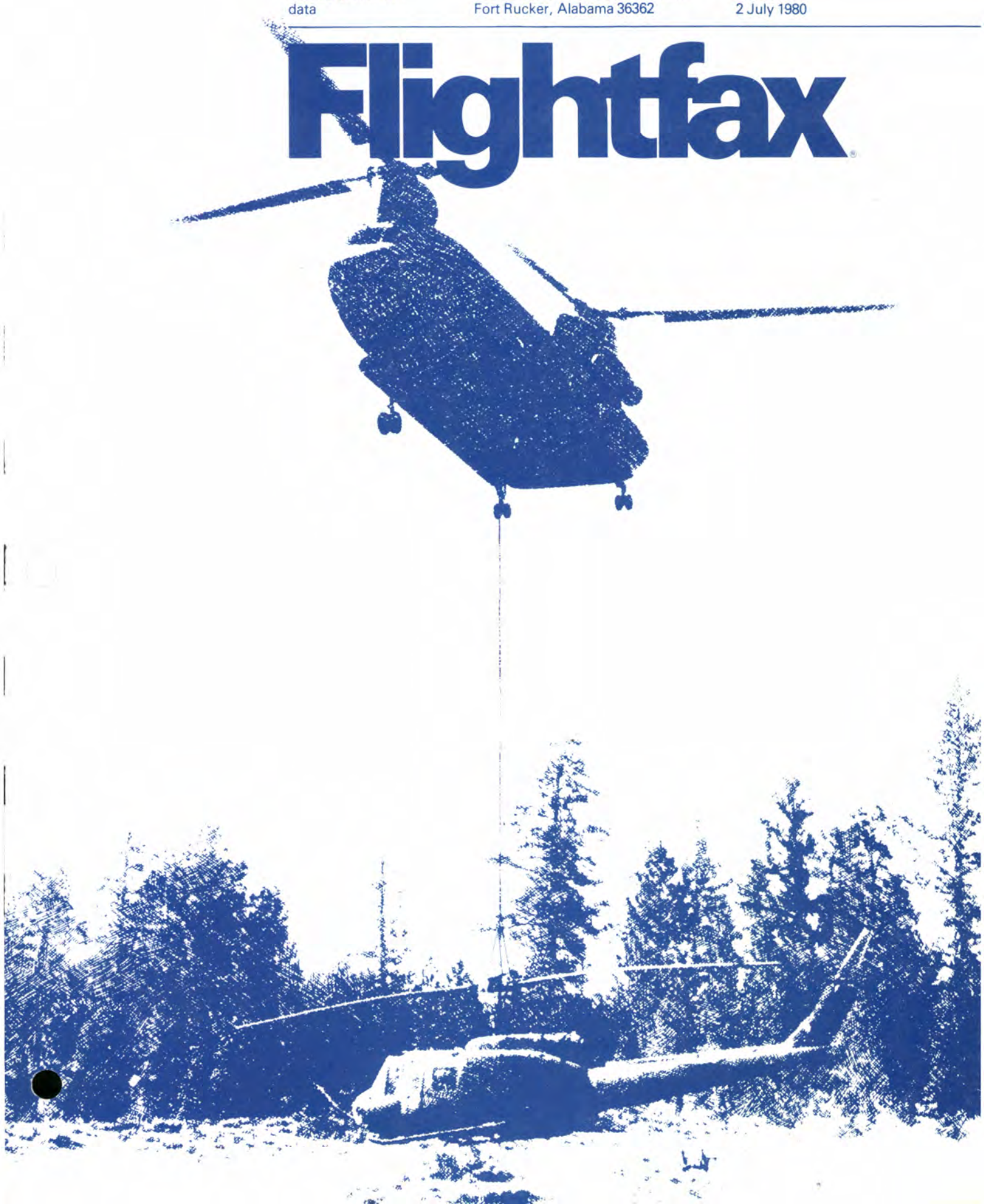

The mark of a professional

Someone once said that the mark of a professional is the ability to make the difficult appear easy or routine. Following is a case in point.

The situation: A UH-1H was lying on its right side on a ridge at 8,700 feet msl. It would have rolled on down the mountain except that the main rotor head and mast kept it from doing so. The transmission was torn free but was still in its normal location. The right skid had been broken and both main rotor blades were destroyed from ground strikes during the rollover. The aircraft had several dents and scratches and some plexiglass had been broken out, but otherwise the fuselage was intact.

The location, a remote area of the Lincoln National Forest about 30 miles southeast of Holloman Air Force Base, New Mexico, is inaccessible by normal recovery vehicles. Forest rangers with small four-wheel-drive vehicles could get near the wreckage by using old logging and fire trails. The area had been burned over years ago, leaving many dead trees from 10 to 90 feet tall still landing. The entire area was covered with mesquite 2 to 12 feet high, and the suface was laced with dead logs and rock outcroppings. There was no way the aircraft could be recovered by ground vehicle.

The mission: To recover the aircraft from the mountain ridge to Biggs Army Airfield, Fort Bliss, Texas, without damaging it further.

The responsibilities: The aircraft belonged to Fort Hood, Texas. Fort Bliss is responsible for recovering downed aircraft in the geographical area. CW4 David A. Stewart accepted and supervised the job for the Material Readiness Division, DIO, Fort Bliss. This also committed Hawthorne Aviation, who has the aviation support maintenance contract at Fort Bliss. The talent and capability for aerial recoveries in the eastern Rockies belongs to Fort Carson, Colorado, and, in this case, FORSCOM approved the mission and the 179th Aviation Company (a Chinook unit) accepted.

Coordination/Planning: The mishap investigation board, working out of Holloman AFB, notified CW4 Stewart at Fort Bliss on 6 May 1980 that the aircraft could be recovered late on the 7th if recovery could be done without destroying the aircraft and, thereby, the evidence. CW4 Stewart flew a rigging team to the crash site on 7 May and met the board there to see what needed to be done. The rigging team decided to rig the aircraft for aerial recovery that day since they had brought the necessary equipment with them.

The board completed their on-site investigation and released the aircraft for recovery. The rigging team replaced the cross tubes with wrapped chain, brought the chains around the cabin to the lift straps, and threaded the straps through the main rotor hub, then downslope to make a lifting donut. The team also secured a line to the tail skid for attachment of a drogue chute.

The CH-47C crew was unable to leave Fort Carson until the afternoon of the 8th because a deep low pressure system had moved in. The crew arrived at Biggs AAF late on the 8th and all agreed the lift

Huey crashed in a remote area of the Lincoln National Forest.

should be made early on the 9th to avoid the high density altitude and gusty winds prevalent in the area during the afternoons. They also decided to place a fuel truck in the desert halfway between the crash site and Biggs since the pickup on the mountain had to be made with a fuel load less than that necessary for return to Biggs with the sling load.

Early on the 9th, the rigging team was flown to the crash site. They installed the drogue chute and cut down three dead trees next to the wreckage to prepare for the lift.

The area was covered with mesquite, brush, and dead trees, making recovery by ground vehicle impossible.

The crew of the CH-47C followed the rigging team into the area and made high and low recons with power checks. They checked the rigging and talked with the rigging crew concerning the actual hookup. All agreed that the aircraft was rigged correctly to assure the transmission, mast, and main rotor hub and blades would remain in place and that as the lift started the aircraft would roll left, uphill and upright. If adequate power was available it should come out of the mesquite and brush vertically and weathervane into the wind once the drogue chute deployed. The Chinook had required 400 pounds of torque to hover during the recon and the crew calculated they had 700 pounds available. They felt this was adequate. If not they would set the wreck back down to be disassembled into two loads. The winds were already high, estimated at 30 to 35 knots with strong gusts.

The recovery: The lift aircraft came over the wreckage, heading into the wind, came to a hover, and turned slightly to the right to allow clean airflow into both rotors as the hook was lowered. A member of the rigging team made the hookup. The slack was taken out of the straps. As the lift started the Huey rolled

(continued on next page)

A chinook was used to lift the Huey from the mountain ridge. The UH-1 was rigged for the pickup so that it would roll left, uphill, and upright.

The mark of a professional

back uphill until it was upright, came out of the mesquite vertically, and streamlined into the wind as the crew took the remaining torque and flew on out. It took 680 pounds of torque to bring the aircraft out of the mesquite. The Huey was gently lowered to the desert floor during the refueling stop and then picked up and delivered to Fort Bliss with no further damage.

Who are the professionals? In this case they were:

• CW4 David A. Stewart who supervised the rigging, the planning, and the coordination with other agencies.

• Robert D. Bevins, DAC, and SSG Robert E. Jack, Material Division, DIO, Fort Bliss; Abel O. Herrera and Jose R. Reveles, Hawthorne Aviation, Fort Bliss, who did the rigging, cut the trees, and made the hookup during the lift. Not a small part of their effort was just carrying the necessary tools and equipment some 200 yards uphill to the wreckage.

• CW4 Mile Rodriquez, pilot; CW3 Charles Davison, copilot; SSG Arthur Lowenberg, flight engineer; and SP4 Danny Arnold, crew chief, the flight crew from the 179th Aviation Company, Fort Carson. They did all the computations to assure the lift could be made safely and properly and they completed the lift under gusty, turbulent wind conditions like the pros they are.

A big "Attaboy" to all concerned for a difficult job well done. ■

The detailed planning and professionalism of everyone involved paid off. The Huey was recovered and delivered to Fort Bliss with no further damage.

Mishap review

Synopsis

An OH-58, with an IP, pilot, and passenger on board, was on a range sweep. The IP and pilot decided to pick up some flare parachutes with an improvised hand-held hook. One chute was blown up into the rotor system, causing the control tubes to be severed. The aircraft rolled over on its right side and was destroyed. The passenger sustained minor injuries.

History of flight

It was a nice, smooth day, with a light wind blowing from the west. The OH-58 took off, flew to a live fire area, and made a range sweep to insure the area was clear of personnel, cattle, and sheep. After doing this, the crew decided to pick up some small flare parachutes lying on the ground. Several members of the unit had said they wanted the parachutes for their children. Knowing that a landing could not be made in the impact area, someone fashioned a grapple, using a broom handle and a wire shaped into a hook, to permit retrieval of the parachutes while hovering over them.

As the pilot hovered the aircraft 2 to 5 feet off the ground, the IP picked up the parachutes with the grapple and handed them to the passenger in the back seat. After about 15 of the chutes had been picked up, the range sweep was continued.

The crew spotted two large parachutes and maneuvered the aircraft so they could pick them up. As one of the parachutes was being pulled into the aircraft, part of the canopy floated up over the engine compartment. The pilot felt some strong bumps in the cyclic, lowered collective, and put the aircraft on the ground. Touchdown felt normal, but the aircraft began a slow roll to the right. The pilot applied left cyclic and the IP rolled off the throttle. The aircraft continued to roll and came to rest on its right side.

The passenger got out immediately. Since the aircraft was lying on its right side, the pilot had to delay his exit through the left door until the IP could get off him. The passenger sustained contusions of the right side and back.

Crewmember experience

The 35-year-old IP had more than 1,400 rotary wing flight hours, with almost 500 in OH-58s. The 43-year-old pilot had more than 900 rotary wing flight hours, with more than 100 in OH-58s. Most of his flight time had been in fixed wing aircraft. He had flown for 17 years without a recorded mishap.

Commentary

The IP and pilot deviated from the authorized mission by picking up the parachutes. Why did two mature, experienced pilots start out on an authorized mission with the full intent of deviating from the mission? Lack of flight discipline? Poor judgment? Excessive motivation to accommodate friends and relatives? Probably all three.

The safe operation of an aircraft is the result of many factors, one of which is professional respect for safety considerations. Rules can't be written to cover every conceivable situation. Sooner or later, commonsense has to come into play.

How can mishaps like this be prevented? By discipline. Preferably aircrew self-discipline; but in the absence of self-discipline, then applied discipline.

Obviously, commanders cannot be physically present in every cockpit on every mission, and once the aircraft is off the ground the crew is on its own. But commanders can make their presence felt in every cockpit through the attitude and climate they have established by the requirements they place on crews.

Commanders must take immediate and positive action with any and all pilots at the first sign of a breach of flight discipline . . . at the slightest deviation from approved missions. There can be no deviations from sound and prescribed operating procedures. ■

Selected mishap briefs

uh1 **Class E mishaps** □ (M series) Pilot saw high engine oil temperature of + 150° C. during hover. Caused by cracked oil cooler fan, which had stopped turning. □ (H series) Torque indicated 25 pounds on takeoff, then started fluctuating between 0 and 100 pounds. Caused by broken wire at cannon plug on torquemeter transmitter. □ (H series) Engine rpm bled off 400 rpm during in-flight fuel control check. Caused by failure of gasket for bleed air deice valve. □ (H series) When right pedal turn was initiated at 5 to 10 feet, aircraft began to bounce and turn to right. Application of left pedal was ineffective and by the time aircraft had turned 90 degrees, rpm had deteriorated enough to activate low rpm audio and light. Crew heard engine winding down. Collective pitch was maintained and left cyclic applied to try to stop rotation and clear obstacles in landing area. Rotation stopped after 100 degrees and rpm recovered to operating range. Aircraft was flown clear of fence, other aircraft, and poles and landed. Topping check revealed engine was developing 5 pounds less torque than required. Suspect fuel control problems. □ (H series) Fuel fumes were detected in cockpit. Caused by seeping fuel system drain valve. □ (H series) Engine chip detector light came on and aircraft was landed. Detector was inspected and aircraft released for flight. After takeoff about 10 minutes later, engine chip detector light came on again and aircraft was landed. During recovery operations by maintenance personnel, chip detector light came on a third time. Suspect internal failure of engine.

Aviation-related mishap □ Pilot climbed up on aft part of aircraft to put on tailpipe cover. When he jumped down, his wedding ring was caught between engine exhaust pipe and cowling and his finger was torn off.

Call Communication Arts Division, AUTOVON 558-4479, or write Commander, ATTN: PESC-CA, Fort Rucker, AL 36362, for copies of this poster.

uh60 **Class C mishap** □ Approaching dirt road during night vision goggle operations, pilot thought debris on road was a tumbleweed. It was actually a large rock. Underside of aircraft hit rock, damaging landing gear strut.

ah1 **Class E mishaps** □ (G series) Illumination of generator light was caused by failure of voltage regulator. □ (S series) During shutdown, crew heard clicking sound from hydraulic pump side of transmission. Caused by failure of hydraulic pump. □ (G series) Transmission oil bypass light came on during runup. Caused by failure of pressure switch.

Aviation-related mishap □ As aircraft was being towed through gate to hangar area, tail rotor assembly hit steel fence post.

ch47 **Class E mishaps** □ (C series) Leak in aft transmission area was caused by cracked fitting on No. 1 flight boost pump. □ (C series) Master caution light, No. 2 hydraulic light, and No. 2 SAS light came on, and No. 2 hydraulic pressure was lost. Caused by ruptured No. 2 flight boost pressure line underneath combining transmission. □ (C series) No. 2 engine torque needles started spinning during landing. Caused by failure of engine torque gauge.

Aviation-related mishap □ As crane was being driven into hangar, crane hit aircraft, breaking chin bubble. Only one ground guide was used.

oh58 **Class E mishaps** □ (A series) During engine response check, N_2 began surging with corresponding fluctuation in torque, N_1, and TOT. Aircraft was landed and engine failed when collective was fully lowered. □ (A series) While crossing a river during visual recon flight, pilot and observer

simultaneously saw wire in their flight path. Pilot tried to miss wire by flying under it, but FM antenna hit wire. Vibrations and binding were felt in pedals and pilot landed on sandbar. About 6 feet of WD-1 commo wire was wrapped around tail rotor hub. Double strand of wire had been strung between poles on opposite banks about 800 meters apart. Height of wire varied between 140 feet at highest pole and 40 feet at lowest point of sag. Wire was hit at 100-foot point. Aircraft was flying into the sun. □ (A series) Master caution and engine chip detector lights came on. Caused by internal failure of engine. □ (C series) Loss of power during runup was caused by fuel control malfunction.

Aviation-related mishap □ As aircraft was being pushed out of hangar to parking ramp, it hit 50-pound fire extinguisher, breaking chin bubble.

c12 **Class C mishap** □ (C series) Before takeoff, pilot noticed numerous rocks on ramp. During taxi, pilot saw nick in windshield. During climbout, windshield cracked from top to bottom.

Class E mishap □ (A series) Cockpit began to fill with smoke during flight. Pressurization dump was used to remove smoke. Caused by burned out forward vent motor.

c45 **Class E mishap** □ On postflight inspection, oil was seen draining from No. 6 cylinder on No. 1 engine. Engine was rough on runup and it was assumed oil was from rings. Cylinder was replaced. The next day, smoke was seen coming from No. 1 engine during runup. Pilot assumed this to be normal. All power checks were okay. On takeoff roll both engines developed takeoff power. After takeoff, at about 300 feet agl, No. 1 engine started backfiring, eventually degrading power performance to minimum thrust. Landing was made at airport. Caused by malfunction of impeller drive gear on supercharger.

Maintenance

uh1 **Class E mishaps** □ (H series) Transmission oil pressure fluctuated during flight. Caused by loose or dirty cannon plug. □ (H series) During simulated hydraulics-off approach, IP and pilot could not reduce collective on base to final. Torque would not decrease from 15 pounds. IP turned hydraulics back on and normal control response was obtained. Caused by out-of-adjustment PC links.

uh60 **Class E mishap** □ Stabilator failed to program during takeoff and could not be reset to automatic mode. Stabilator was manually set at zero degrees and aircraft was landed. Caused by out-of-adjustment stabilator amplifiers.

ch47 **Class E mishap** □ (C series) Both generators failed during approach. Tunnel cover was chafing generator control wire in tunnel cover area, causing generators to fail.

oh58 **Class E mishap** □ (C series) N_1 reached 62% during runup and engine remained at flight idle about 1 minute before it failed. Fuel was leaking from fuel pump. Caused by pinched fuel filter O-ring.

ov1 **Class E mishap** □ (D series) No. 1 torque needle was erratic during runup, and pilot noticed 70-80 pounds torque split. Caused by bent pin on electrical connector to torquemeter indicator.

t42 **Class E mishap** □ No. 2 alternator went off line shortly after takeoff. Alternators were out of adjustment.

Messages received

- Maintenance notice concerning AH-1S tail boom blankets (AH-1-80-16, 161910Z Jun 80). Velcro strips that retain insulation blankets to tail boom sides are coming unglued. Message recommends velcro strips be riveted to tail boom skin.

- Safety-of-flight maintenance notice concerning recurrent inspection of OH-6 main transmission ring gear bolts (OH-6A-80-05, 191905Z Jun 80). Summary: Teardown inspections of OH-6A main transmissions have revealed failure of ring gear bolts. Other related problems include cracks in gear and gear shaft web area. These conditions are caused by loss of torque on the bolts. Message recommends a recurrent visual inspection to detect these failures. Contact: Richard Smith, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

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

Battery problems

The Safety Center receives several PRAMs each week indicating battery problems. Some of these PRAMs give a nomenclature with the incorrect national stock number (NSN), e.g., permion cell battery with NSN 6140-00-753-2251 (which is the cellophane cell battery). Below is the nomenclature with correct NSN.

Nomenclature	NSN
Permion cell BB600A/A	6140-00-881-6887
Permion cell BB600A/A	6140-01-051-9844
Permion battery BB433A/A	6140-01-046-1116
Cellophane cell BB600A	6140-00-881-6889
Cellophane cell BB600A	6140-00-842-0433
Cellophane battery BB433/A	6140-00-753-2251

Some activities have received permion cells, NSN 6140-01-032-3938 or 6140-01-044-4132, from DGSC at the direction of CERCOM. However, these NSNs now incorporate cells produced by more than one manufacturer, and any cells now issued by DGSC could possibly not perform fully to the more severe Army aircraft requirements. So all Army activities requiring replacement cells should requisition only the new CERCOM-managed (B16) permion cell, NSN 6140-00-881-6887. Requisition cells in lots of 19, as they cannot be mixed with cellophane cells or permion cells of different manufacturers.

Maintenance procedures for nickel-cadmium batteries are contained in TM 11-6140-203-14-1, Aircraft and Nonaircraft Nickel-Cadmium Batteries (General); TM 11-6140-203-14-2, Aircraft Nickel-Cadmium Batteries; and TM 11-6140-203-14-3, Nonaircraft Nickel-Cadmium Batteries.

Point of contact at CERCOM is Mr. Ray Bassler, AUTOVON 995-2458. ■

UH-1 drive shaft installation procedures

Installation procedures for UH-1 main drive shaft (P/N 204-040-010-5 and -13) have been deleted by change 9 to TM 55-1520-210-23-1. Units which have not converted to the SKCP 2282 or 205-040-004 series drive shafts will have to keep the instructions on pages 6-1 through 6-21.

Point of contact at the Safety Center is SFC Richard Toler, AUTOVON 558-4202/4198.

Thanks to Sergeant Kemble, 335th Aviation Company, Fort Riley, for this info. ■

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ASO help needed

A questionnaire on pilot experience concerning insufficient tail rotor thrust in the OH-58 is on page 5 of this issue.

We need ASO help in getting OH-58 pilots to fill out and mail this questionnaire. This information is needed to develop an emergency procedure to be included in the operators manual.

Make this a topic at your next safety meeting. Stress to your pilots the importance of furnishing this information to the Safety Center. **If you need more copies of the questionnaire, write or call the Communication Arts Division, U.S. Army Safety Center, Fort Rucker, AL 36362, AUTOVON 558-4479.**

Low, fast, and in the dark

The title just about sums up the three conditions usually present in most tree strikes. And the number of tree strikes is becoming a cause for concern. During the first two quarters of FY 1980, Army helicopters were involved in 23 tree strikes, for an average rate of about four per month. Low altitude, high airspeed, and reduced visibility are the obvious ingredients in these mishaps, but the underlying causes are not always readily apparent.

Case 1. One recent tree strike involved a UH-60A with a crew of three. This was the lead aircraft in a two-aircraft flight on a night tactical mission. Light haze and a moonless night combined to limit visibility as the pilot headed his aircraft toward an LZ marked by a single strobe.

On final approach, the pilot switched on his landing light in time to see the nose of the aircraft entering the upper branches of a tree. As the aircraft passed through the branches, the pilot applied power, climbed, hovered forward, and landed in the intended LZ. Repair costs for damages from the tree strike exceeded $36,000.

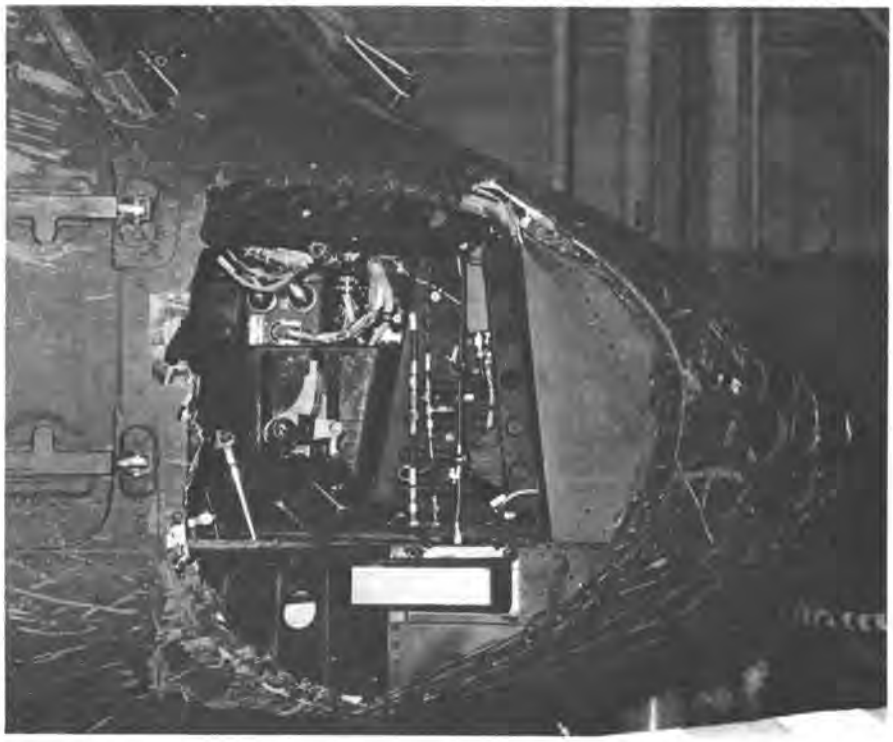
A stroke of fate? Bad luck? No way! Neither fate nor luck had anything to do wih it. But a lot of people did.

To begin with, the pilot did not make an adequate map study to determine obstacle clearance. Excluding the height of obstacles, the highest elevation in the general area was 710 feet msl. Without telling his copilot or the crew of the second aircraft that they were on short final, the pilot initiated his approach from an altitude of 720-750 feet msl. The approach was shallow and fast. The indicated airspeed of the aircraft when it hit the tree was 45 to 50 knots. Since the copilot was not aware the aircraft was on final, he was busy checking his map to fix their location when the tree strike occurred.

No night tactical training program to train and verify mission proficiency of newly qualified UH-60 aviators had been established. Further, the supported infantry commander did not insure the LZ was properly set up with the necessary marking lights in accordance with instructions in appropriate handbooks.

Case 2. A second tree strike surfaced other problem areas. In this instance, a flight of six UH-1H aircraft was assigned a night mission of inserting rangers into a DZ and later extracting them. The insertion portion of the mission was completed without incident. However, during extraction, the fifth aircraft in the flight hit the top of a large tree. Both chin bubbles were broken and the windshield was covered with sap, obstructing the pilot's vision. When the pilot tried to turn on his landing light, he discovered it had been broken during the tree strike and was inoperable. The pilot of the No. 2 aircraft broke out of the flight, switched on his searchlight, and led No. 5 to a safe landing area.

Another unfortunate break? The facts say otherwise. To begin with, the flight leader did not specify a particular altitude at which the flight would be conducted—even though diverging opinions had been expressed concerning



Broken bubble and skin damage shown are part of $36,000 damage this UH-60A sustained in night encounter with tree.

the altitude at which the insertion portion of the mission had been flown. Further, the unit favored realistic training, and the crew was overly motivated. As a result, the pilot of the aircraft involved in the tree strike allowed his copilot to fly 20 to 25 feet above the trees at about 70 knots. This was to try to keep up with the flight leader who was flying at an altitude of 75 to 100 feet above the trees and an airspeed of 80 to 85 knots.

When a pine tree, taller than the surrounding ones, suddenly appeared in their flight path, the crew could not avoid it. The aircraft hit the tree at an airspeed of about 60 to 70 knots. It is also noteworthy that both the pilot and the copilot had been awake 19 hours and 20 minutes at the time of the tree strike.

Solution. As a result of these mishaps, the following actions are recommended:

• It should be emphasized to flight crews that they are to be thorough and detailed in planning all tactical missions in accordance with guidance contained in FM 1-51, Rotary Wing Flight.

• Flight crews should be reminded that it is their responsibility to obtain all information that is critical to safe operations and safe mission completion.

• All flight crews should be made aware that crew coordination and division of crew duties is essential to safety. If information is not to be transmitted by radio, appropriate light signals to be used should be incorporated into the tactical SOP.

• Increased emphasis should be placed on developing the skills of the individual aviator through the implementation of a viable training program. This program should include all aspects of the unit's mission and stress that the pilot-in-command checkride should evaluate mission proficiency (day/night) in each type, design, and series aircraft.

• Missions flown at terrain flight altitudes during the day and night should be flown at an airspeed slow enough to permit pilots to see and avoid obstacles.

• Aircrewmembers scheduled for day and night missions should use crew rest time **for crew rest.**

• All preflight briefings should include specific altitudes for each portion of the flight.

Free cruise

In addition to these actions, the term "free cruise" needs to be mentioned and, perhaps, clarified. One pilot involved in a tree strike defined free cruise as " . . . You can vary your position and altitude in the formation to pick your own individual route over the terrain." If this definition coincides with your thoughts on the subject, then clarification is in order, and you'd better check chapter 9, TM 1-55.

"Free cruise" allows the pilot the freedom to operate his aircraft laterally as deemed necessary to perform his mission effectively. It does not give him the right to arbitrarily fly at higher speeds or lower altitudes as may be dictated by his desires.

One final word of caution. It has been noted that some pilots are not using their clear visors when flying at night. While use of the clear visor will not prevent a mishap, it does serve as a protective device. In the event of a shattered windshield, the clear visor can save your eyesight. Use it. ■

Selected mishap briefs

uh1 **Class C mishaps** ☐ (H series) Aircraft hit treetop, breaking left chin bubble. Visibility was 1½ to 2 miles in rainshowers with light haze and 800-foot ceiling. Pilot was flying too low and too fast for conditions. Crew had been on duty since 0500. Mishap occurred at 1730. Fatigue may have been a factor. ☐ (H series) Compressor stall occurred and torque dropped to 41 pounds during engine topping check. As collective was lowered, second stall occurred, followed by loud bang. Torque and N_1 dropped to zero and pilot entered autorotation. On short final, pilot saw wire crossing his intended landing point and was forced to select another area. He turned aircraft and stretched his glide to clear some tall trees, but tail rotor blade hit some branches, damaging blade. Autorotative landing was completed with no further damage.

Class E mishaps ☐ (H series) At about 500 feet, with seven parachutists on board, aircraft vibrated severely and loud banging noise was heard from engine. This was correctly interpreted as compressor stall, and aircraft was landed. ☐ (H series) As aircraft moved up draw to cross small ridge, main rotor blade hit top of cactus.

uh60 **Class E mishaps.** ☐ Stabilator failed during final approach. ☐ No. 2 hydraulic system failed and backup pump did not come on line. ☐ No. 2 engine compressor stall during hover was caused by failure of deice valve.

ah1 **Class E mishaps** ☐ (S series) Master caution and No. 2 hydraulic lights came on. Caused by failure of flair tip on hydraulic line to turret. ☐ (S series) One percent differential in N_1 tachometer during hover caused unreliable HIT check. Pilot's N_1 tachometer was found to be out of tolerance. ☐ (S series) Engine oil pressure light came on during final approach. Caused by failure of oil pressure switch.

ch47 **Class E mishaps** ☐ (A series) No. 1 engine bleed band started popping during simulation of high-side beep failure, rotor blade vibrated severely, and rotor rpm rose to 243 for 3 seconds. Suspect pocket separation in aft rotor blade caused vibrations and faulty No. 1 engine beep a.c. relay caused high rpm. ☐ (C series) When aircraft was landed to change pilots, crew chief noticed fuel leak on No. 1 engine. Leak developed at tube fitting. ☐ (C series) Rotor tachometer malfunctioned during flight. Caused by failure of tachometer generator. ☐ (B series) No. 2 engine failed on short final. Suspect FOD.

oh6 **Class A mishap** ☐ Aircraft hit hard during standard autorotation and blades flexed, cutting off tail boom. 8047

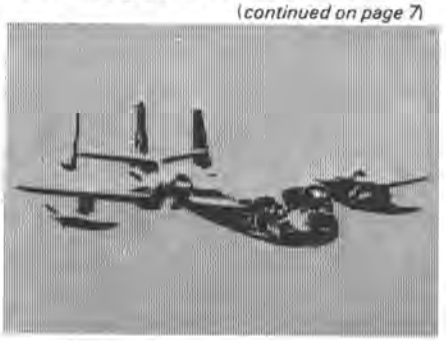
oh58 **Class E mishaps** ☐ (A series) Pilot heard loud bang during autorotation. Caused by failure of trunnion bearing. ☐ (A series) At hot refueling site, pilot saw fluid and vapor coming from battery vent tube. Caused by thermal runaway of battery. ☐ (C series) N_2 fluctuated during hover. Caused by faulty fuel control.

th55 **Class E mishaps** ☐ Engine surged to 3700 rpm during start. Suspect improper throttle position and priming. ☐ Ammeter indicated steady minus 30 discharge during runup. Caused by defective voltage regulator. ☐ Engine ran rough during hover. Caused by failure of servo fuel injector. ☐ Engine oil temperature reached red line during landing. Caused by blocked oil cooler.

c12 **Class E mishap** ☐ (A series) When gear was cycled up, gear partially retracted while gear motor continued to run. Gear would extend and lock normally. Caused by failure of gearbox assembly.

ov1 **Class E mishap** ☐ (D series) Crew heard loud knocking sound in airframe during climbout. Maintenance could not duplicate malfunction. Suspect end of seatbelt was left hanging outside aircraft.

(continued on page 7)



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Remarks

(If more space is needed, attach additional sheet.)

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Questionnaire:

OH-58 pilot experience concerning insufficient tail rotor thrust

This mishap was caused by insufficient tail rotor thrust, even though the aircraft was being flown within the parameters of the operators manual.

The OH-58A and C model operators manuals do not contain procedures to be followed in the event the aircraft spins to the right because of insufficient antitorque thrust. The Directorate for Evaluation and Standardization, USAAVNC, and the Army Safety Center are presently attempting to rectify this shortcoming. You can help.

If you have never encountered an OH-58 spin to the right, please check item A2 and mail the questionnaire. It is preaddressed.

If you have experienced an OH-58 spin to the right, please share your experience with us by completing the entire questionnaire, which will be used for mishap prevention purposes only. Complete one questionnaire for each such experience. Please look over the entire questionnaire before you begin filling it out.

Extra copies of the questionnaire are being provided to unit ASOs. Additional copies can be requested from the Army Safety Center or may be locally reproduced.

For additional information or clarification, call AUTOVON 558-4202/4198 or write to the U.S. Army Safety Center, ATTN: PESC-AS, Fort Rucker, Alabama 36362.

STAPLE

All questions apply to that exact point in time at which the aircraft entered the spin to the right and should be answered with that in mind. Respond to the questions by placing a check mark in the appropriate block.

A.
- ☐1 I have experienced this problem.
- ☐2 I have not experienced this problem. (STOP. Do not go any further. It is important that you mail your questionnaire.)

B. Indicate the appropriate series of OH-58 helicopter.
☐1 A Model ☐2 C Model

C. What was your rank at the time of the occurrence?
☐1 WOC ☐4 CW3 ☐7 1LT
☐2 WO1 ☐5 CW4 ☐8 CPT
☐3 CW2 ☐6 2LT ☐9 MAJ or higher

D. What was your rotary wing hour level at the time of the occurrence?
☐1 Less than 300 ☐4 801-1100 ☐7 1701-2000
☐2 301-500 ☐5 1101-1400 ☐8 Over 2000
☐3 501-800 ☐6 1401-1700

E. What was your OH-58 hour level?
☐1 Less than 300 ☐4 801-1100 ☐7 1701-2000
☐2 301-500 ☐5 1101-1400 ☐8 Over 2000
☐3 501-800 ☐6 1401-1700

F. In what capacity were you flying?
☐1 Pilot ☐2 Copilot ☐3 IP ☐4 Maint Test Pilot

G. Indicate source of your OH-58 qualification.
☐1 Aeroscout Course ☐3 Transition at unit
☐2 Transition at USAAVNC

H. Was full left antitorque pedal applied when the spin started?
☐1 Yes ☐2 No ☐3 Cannot recall

I. Check those blocks that best describe the flight profile.

Ia PHASE OF FLIGHT	Ib TYPE OF FLIGHT	Ic MISSION
☐1 Takeoff/climbing	☐1 NOE	☐1 Training
☐2 Landing/descending	☐2 Contour	☐2 Combat
☐3 IGE hover	☐3 Low Level	☐3 Service
☐4 OGE hover	☐4 At altitude	☐4 Maint
☐5 Level flight		☐5 Other

J. What was the aircraft gross weight (pounds)?
☐1 2400 or less ☐4 2700 ☐7 3000
☐2 2500 ☐5 2800 ☐8 Over 3000
☐3 2600 ☐6 2900 ☐9 Cannot recall

K. Indicate the pressure altitude (feet).
☐1 0-1000 ☐4 3001-4000 ☐7 6001-7000
☐2 1001-2000 ☐5 4001-5000 ☐8 7001 and higher
☐3 2001-3000 ☐6 5001-6000 ☐9 Cannot recall

L. Indicate the temperature (degrees Centigrade).
☐1 -20 ☐3 0 ☐5 +20 ☐7 +40 or above
☐2 -10 ☐4 +10 ☐6 +30 ☐8 Cannot recall

M. APPLIES TO A MODEL ONLY. Indicate maximum torque available (psi) versus torque applied (psi) at onset of spin.

Ma MAXIMUM TORQUE AVAILABLE
☐1 Below 45 psi ☐5 65 psi ☐9 85 psi
☐2 50 psi ☐6 70 psi ☐10 90 psi
☐3 55 psi ☐7 75 psi ☐11 92 psi and above
☐4 60 psi ☐8 80 psi ☐12 Cannot recall

Mb TORQUE APPLIED
☐1 Below 45 psi ☐5 65 psi ☐9 85 psi
☐2 50 psi ☐6 70 psi ☐10 90 psi
☐3 55 psi ☐7 75 psi ☐11 92 psi and above
☐4 60 psi ☐8 80 psi ☐12 Cannot recall

N. APPLIES TO C MODEL ONLY. Indicate maximum torque available (%) versus torque applied (%) at onset of spin.

Na MAXIMUM TORQUE AVAILABLE
☐1 Below 50% ☐5 70% ☐9 90%
☐2 55% ☐6 75% ☐10 95%
☐3 60% ☐7 80% ☐11 100 and over
☐4 65% ☐8 85% ☐12 Cannot recall

Nb TORQUE APPLIED
☐1 Below 50% ☐5 70% ☐9 90%
☐2 55% ☐6 75% ☐10 95%
☐3 60% ☐7 80% ☐11 100 and over
☐4 65% ☐8 85% ☐12 Cannot recall

O. Indicate collective pitch application just prior to the spin.
☐1 Constant ☐2 Being increased ☐3 Being decreased
☐4 Cannot recall

P. Indicate altitude, estimated airspeed, and estimated ground speed.

Pa ALTITUDE (feet agl)
☐1 0-50 ☐2 51-200 ☐3 Above 200 ☐4 Cannot recall

Pb ESTIMATED AIRSPEED (knots)
☐1 Hover ☐4 21-30 ☐7 Over 50
☐2 1-10 ☐5 31-40 ☐8 Cannot recall
☐3 11-20 ☐6 41-50

Pc ESTIMATED GROUND SPEED (knots)
☐1 Hover ☐4 21-30 ☐7 Over 50
☐2 1-10 ☐5 31-40 ☐8 Cannot recall
☐3 11-20 ☐6 41-50

Q. Indicate the relative wind direction at the onset of the spin.
☐1 No wind ☐6 Right front
☐2 Left rear ☐7 Right
☐3 Left ☐8 Right rear
☐4 Left front ☐9 Rear
☐5 Front ☐10 Cannot recall

R. Indicate the approximate wind velocity (knots).
☐1 No wind ☐6 21-25
☐2 1-5 ☐7 26-30
☐3 6-10 ☐8 31-35
☐4 11-15 ☐9 Over 35
☐5 16-20 ☐10 Cannot recall

S. If performing a pedal turn at a hover at the onset of the spin, indicate direction and rate of pedal turn.

	LEFT	RIGHT
Normal rate 90°/4 sec.	☐1	☐4
Greater than normal rate	☐2	☐5
Less than normal rate	☐3	☐6
Not performing pedal turn	☐7	
Cannot recall	☐8	

T. If in a coordinated turn at the onset of the spin, indicate angle of bank (degrees) and direction of turn.

LEFT		RIGHT	
☐1 10°	☐5 50°	☐8 10°	☐12 50°
☐2 20°	☐6 60°	☐9 20°	☐13 60°
☐3 30°	☐7 Over 60°	☐10 30°	☐14 Over 60°
☐4 40°		☐11 40°	

☐15 Not performing coordinated turn ☐16 Cannot recall

U. Describe the most significant factor, in your opinion, that caused the aircraft to spin to the right.

_____
_____
_____
_____

V. Describe in detail those control (cyclic, collective, throttle, and pedal) actions taken by you once the spin began and how the aircraft reacted.

_____
_____
_____
_____

W. If the spin occurred in an OH-58C, comment on your use of the Directional Control Margin charts located in the Operators Manual.

_____
_____
_____
_____

X. Name_____ AUTOVON_____
(Optional. To be used only if additional information is desired from you.)

Y. Other remarks. _____
_____
_____
_____

Mishap briefs

u3 **Class E mishap** □ (A series) During landing approach, about 150 feet above touchdown, wind shear became so intense crew decided to go around. During go-around, flaps stuck at the 33-degree position. Airspeed of 110 mph was maintained during climb with engine rpm at 2700 and 27 inches of manifold pressure required to clear surrounding mountains. Aircraft was flown to airport and landed. Suspect stuck up-limit switch.

u8 **Human factor mishap** □ Copilot complained of feeling dizzy about 20 minutes after takeoff. Two or three minutes later, copilot fainted. Pilot returned to airfield and landed. Temperature was 110 degrees on the ground and 85 degrees in the cockpit.

u21 **Class E mishap** □ (A series) No. 2 N_1 gauge dropped to zero during climbout. Caused by sheared tachometer generator shaft.

Maintenance

uh1 **Class E mishaps** □ (H series) Master caution and hydraulic lights flashed on and off several times, slight feedback was felt in controls, and whining noise was heard from transmission area. Aircraft was flown to airfield and landed, where hydraulic fluid was seen coming from small hole in rigid line. Chafed line was not noticed on previous inspections. □ (H series) During postflight inspection, crew chief saw smoke and fluid coming from battery vents. Caused by thermal runaway. Individual cells were mixed.

ah1 **Class E mishap** □ (S series) Battery switch was turned off after high ammeter reading was noticed. About 3 minutes later, crew smelled strange odor, and aircraft was landed. Battery vent lines were emitting fumes and smoke. Voltage regulator was set too high.

ch47 **Class E mishap** □ (C series) Flight engineer noticed hydraulic leak in aft transmission area and aircraft was landed. Nut connecting line to elbow had been overtorqued during installation.

oh58 **Class E mishaps** □ (C series) Engine failed during runup. Caused by loose fuel line. □ (A series) Excessive cyclic binding occurred during runup. Rusted magnetic brake assembly caused binding. Water which settled under floor below pilot's seat caused brake assembly to rust. Some crew chiefs splash water directly onto floor of cockpit to clean mud from floor and chin bubble. Water not removed seeps and settles under floor below pilot's seat. Areas within the cockpit should be cleaned with a damp cloth or sponge. □ (A series) After aircraft was started, fireguard said flames were coming from right side of engine. Aircraft was shut down. Smoke was seen coming from space around engine exhaust stacks. No fire was visible. Fireguard tried to use aircraft fire extinguisher, but it would not work. Fireguard threw fire extinguisher on the ground and it began to work. Head of fire extinguisher was not fully screwed into canister. No fire damage was visible in engine area. Burner drain valve was stuck.

u21 **Class E mishaps** □ (A series) Secondary idle stop light came on during takeoff roll. Caused by out-of-adjustment secondary low pitch sensor. □ (RU-21D) Crew saw fuel siphoning from left wing fuel cap during climbout. Landing was made and fuel cap checked and reseated. Aircraft took off again and same cap began siphoning fuel. Postlanding inspection revealed fuel cap adjustment needed tightening.

Messages received

- Safety-of-flight maintenance notice message concerning changes to TM 55-1520-210-23 dated 20 February 1979 with change 9 dated 6 May 1980 (UH-1-80-11, 231910Z Jun 80). Various paragraphs in TM 55-1520-210-23 with change 9 require revision. Message gives instructions for changes. Contact: Ray Boland, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

- Safety-of-flight maintenance notice

(continued on back page)

Mishap briefs

message concerning aircraft altimeters (GEN-80-20, 261515Z Jun 80). Message discourages use of the words calibrate/calibration when discussing the requirements for inspecting and testing aircraft altimeters by the special inspections section of dash 23 maintenance manuals. Contact: Edwin Meyer, TSARCOM, AUTOVON 693-0398, commercial 314-263-0398.

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

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Highly experienced pilot made a low reconnaissance of field to determine best landing site and then began approach. When aircraft was about 25 feet from touchdown, truck moved toward selected site. Pilot then picked second touchdown point to right of original site. Instead of making go-around, pilot turned to right. At this point, visibility was completely lost because of rotor-raised dust, and aircraft hit ground beyond planned touchdown point.

☐ Relatively inexperienced pilots were assigned an urgent medevac mission under bad weather conditions. Pilot circled pickup site in heavy rain, with searchlights turned on. He requested ground flares several times but still could not see field. Ground radio operator in communication with aircraft said he could hear pilots loud and clear but would have to repeat his call sign three or four times before crew would acknowledge. Pilots said they were having trouble seeing ground details and asked that ground searchlights be turned on. Aircraft hit ground near pickup site in a near normal flight attitude, with an airspeed of about 80 knots. The condition of the patients to be evacuated warranted a priority rather than an urgent rating, which would have allowed the flight to be postponed. Pilot was quoted as saying before the flight that he thought the weather was too bad and he would like to wait until it improved.

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Mishap review

Synopsis

The UH-1H was hovering at a tactical field site. The pilot saw a wire in front of him and applied aft cyclic. The tail rotor hit the ground, causing loss of the 90-degree gearbox. The aircraft spun to the right and landed hard.

History of flight

The Huey was to transport seven "combat" troops on a reconnaissance and ambush mission. The pilot flew to a field site and picked up the troops. The aircraft was then flown to another field site where the troops were briefed on the tactical situation.

After the briefing, the pilot took off and began the reconnaissance portion of the mission. After flying for about 50 minutes, the crew spotted several armored vehicles. The officer in charge of the troops was told about the situation, and he decided to set up an ambush.

The pilot selected a landing area and began a shallow approach. During the descent, the pilot saw a series of poles running parallel to a road that bordered the southern edge of the landing area, but no wires were seen. On short final, a pole was seen on the north side of the landing area in the vicinity of the intended touchdown point but, again, no wires were seen. The approach was continued.

As the aircraft was hovered forward 3 to 5 feet above the ground with an airspeed of about 10 knots, the pilot was continually looking for wires because he knew there was a good possibility they were there. He thought with his slow airspeed there would be time to avoid hitting a wire if one was there.

Suddenly, the pilot saw the aircraft was about to hit a wire. He applied full aft cyclic to try to stop the aircraft. The tail rotor hit the ground and antitorque control was lost, causing the aircraft to spin to the right. The main rotor blade hit and broke the wire, and the 90-degree gearbox and tail rotor separated.

The Huey had spun about 180 degrees when the pilot abruptly lowered the collective. The aircraft landed hard and spun 40 degrees more to the right before it came to rest upright. The crew and passengers exited without difficulty.

Crewmember experience

The 30-year-old pilot had almost 800 rotary wing hours, with more than 700 in UH-1Hs. The 25-year-old copilot had approximately 200 rotary wing hours, most of them in UH-1Hs. However, his last 70 hours included 60 hours in OH-58s.

Commentary

The pilot knew there was probably a wire between the poles located along the intended flight path, but he decided to maneuver between the poles. He did not tell the copilot what he intended to do, confident that he would be able to spot and avoid the wire.

The copilot saw the wire about the same time the pilot did and shouted at him. The pilot applied excessive aft cyclic to try to quickly stop the aircraft. This resulted in the tail rotor hitting the ground and subsequent loss of antitorque control. The pilot did not recognize the clockwise spin as a loss of antitorque control and did not initiate corrective action. He abruptly lowered the collective to put the aircraft on the ground as quickly as possible.

Hazard identification maps were not available for use by aircrews participating in the training exercise. These maps are required by FM 1-51.

During the crash sequence, a thermos bottle was thrown about the cockpit and cargo area, coming to rest on top of the pilot's collective. Several folding cots, field gear, and other equipment were being carried in the aircraft but were not secured. ■

What you've always wanted to know about the crash but didn't know who to ask

When an aircraft crashes, particularly if someone is killed, it is only natural for all members of that unit to want all the facts about the crash. Understandably, aviation personnel are especially concerned about what caused the crash. This concern goes far beyond curiosity. The questions in their minds are legitimate ones and highly relevant to their own safety. Did a mechanical problem cause the crash? If so, was it caused by maintenance error? Was materiel failure involved? Is the problem peculiar to a particular aircraft? These are only a few of the many questions that come to mind. And they need to be answered. Unfortunately, in some instances they are not.

In recent months, the Army Safety Center has received a number of requests from aviation personnel for information about an accident that occurred in their unit. Some of these inquiries are made in writing; others, by phone. All basically ask one question: What caused the crash? Typical of such requests is the following (paraphrased) sent in by one concerned aviator: **". . . It's been more than 3 months since this accident occurred in our unit. As yet, we have not been given any facts about the cause. Can you give us any information?"**

The need to tell unit personnel of the circumstances of a mishap is twofold: To prevent other mishaps from similar causes and to lessen any anxiety or apprehension that air, ground support and maintenance personnel may have. The big question, then, is who to ask.

During the on-site crash investigation, board members gather important facts. From these facts, they draw conclusions. These conclusions are then translated into findings. If, during the investigation, these findings indicate there is an immediate threat to the safety of others, the board president has the responsibility to inform the commander of the unit having the mishap, or his representative, of the facts so that preventive measures can be taken quickly.

When the on-site investigation is completed, the board briefs the appointing authority and the unit command group on all the preliminary findings. This is followed at a later date, usually 20 to 30 days after the investigation, by a formal written report to the commander. This report includes both findings and recommended corrective actions.

It is the command group, then, that has the authority to pass on—for accident prevention purposes—the information made available to them. The investigation board has no such authority. It is the **obligation of command** to disclose mishap information to unit members to the extent deemed necessary for prevention purposes. ■

Basic breakdown

Recently, a group of Master Army Aviators who enthusiastically accept and support both the Army Safety and Army Flight Standardization Programs made a 3-week tour of overseas aviation units.

What they saw, and later told the Army Safety Center about, was a disregard by flight crews for basic safety and standardization procedures.

Aircrews ignored checklists; flew with loose articles in the aircraft; rolled up the sleeves of their Nomex flight suits; did not wear gloves; did not follow established flight procedures; and had no standardization in the cockpit.

Professionalism begins with basics. And basic procedures provide the foundation and ultimately determine the success of the Army aviation mishap prevention program.

There is a direct link between the regard for basic procedures and the quality of leadership within the unit.

Ideally, aircrews comply with basic safety procedures voluntarily, through professional self-discipline. But when self-discipline fails, command discipline must come into play. Commanders must increase the discipline of pilots and require them to comply with established safety and flight procedures.

We know that every commander can not be physically present in every cockpit, and that once the aircraft is off the ground the pilot is on his own. But every commander can make his presence felt in that cockpit through the attitude he has established through his own example and by the requirements he places on his aircrews. ■

Well done

A safety-of-flight message (GEN-80-18, 031905Z Jul 80) has been issued concerning increased maintenance on aircraft flying in a volcanic ash environment. But right after the Mount St. Helens eruption on 18 May, aircraft from the Washington Army National Guard were pressed into search and rescue missions in the vicinity of the volcano.

The Army Aviation Support Facility at Camp Murray immediately established a program of daily cleanup, oil sampling, and bearing purge, doubling the normally required services. Twenty-five helicopters flew 650 hours during the month following the eruption, with no maintenance downtime attributable to the volcanic atmosphere. All of the aircraft were exposed to the fallout ranging from light to very heavy.

The personnel of the Camp Murray Army Aviation Support Facility are to be commended for the professional manner in which they operated in a unique situation. ■

A quick once-over

There's enough statistical evidence to show that preflight checks are sometimes handled on a hit or miss basis, with the accent being on the miss more often than not. We can't say how many people are getting away with negligent check procedures. **So far,** we can't that is. The list of those who haven't gotten away with it speaks for itself.

The list among other things shows that when it comes to preflight, what at the start seem to be insignificant items are the ones that later turn out to be mishap cause factors.

Over the years, failure to properly preflight aircraft and use established checklists have resulted in engines being started with main rotor blade tiedowns installed and aircraft being flown with seatbelts dangling outside doors, fuel quick disconnect couplings improperly secured, cotter pins missing from critical components, improperly installed fuel caps, external gust locks left in place, and a host of other discrepancies. These errors have caused in-flight emergencies that often ended in damage to equipment and sometimes the destruction of aircraft and loss of lives. The sad part is that every one of these mishaps could have been easily prevented had preflight inspections and operational checks been performed by-the-book.

Why do pilots fail to comply with this basic requirement? Reasons vary, but a sense of urgency to start the mission is a prime one.

The checklist is one of the first things which go out the window when time and patience run short. In a depressing number of cases, when the checklist goes out the window so do the pilot and his crew—**sooner or later.** Overconfidence in the ability of the crew chief and other

maintenance personnel is another reason. The rash of fuel quick disconnect couplings separating during flight a number of years ago serves as a good example of pilots overrelying on their crew chiefs. When this happens, the established system of checks and balances designed to prevent an error on the part of one individual from going undetected by another is nullified.

A third reason is sheer complacency. To be sure, if you stick around Army aviation for a while, you will become familiar with the checklist, even thoroughly familiar. So familiar, in fact, that you can become an easy victim of complacency and fall into that ho-hum attitude which can do you in.

Carelessness, or complacency, concerning the checklist probably stems from the fact that relatively few checks, no matter how detailed and careful, turn up anything seriously wrong. So why bother when the odds are with you? One veteran pilot who retired recently after 6,000 hours in the air in and out of combat noted that there had been only two times in his entire career when a check showed something which prevented takeoff. That's not the point. If he hadn't spotted the trouble the first time there wouldn't have been a second. If he hadn't nailed it the second time he never would have totaled 6,000 hours. He didn't allow complacency to hang around his neck like a tombstone.

Following the established checklist to the letter is the only answer. Not just one of the answers. The only answer. In fact, it is required. AR 95-1 stipulates, in no uncertain terms, that unit commanders insure that aircrew checklists be followed in all cases to ward off inadequate starting, runup, takeoff, and landing. The AR is just what it says, a regulation, and Army regulations aren't exactly in the same class as the kind, but gentle, advice you get from Dear Abby and which you are free to take or leave alone.

Complementing AR 95-1 is the dash 10 CL which provides standard guides to make sure checks are made according to the book. The message is loud and clear. Every unit commander has a stated responsibility to see that all hands follow the checklist from top to bottom without skipping any thing. And the only way to do that is to do it with book in hand.

The checklist is a matter of individual responsibility. You know this. But how many times have you heard (or said yourself when you were in a hurry): "The aircraft is okay. Let's just give it a quick once-over."

Or have you been handed a "revised" checklist with the famous last words: "Never mind what they taught you at school. We do things differently out here."

Do you always insist on a verbal call-out when you are following the checklist and if you don't get verbal confirmation do you assume the worst?

If you are interrupted during a check, do you take up where you left off, or do you start all over again as you should?

Do you always make certain the checklist is in the aircraft?

With the peak summer flying period upon us, we can expect an increase in mishaps caused by preflight failure unless every pilot recognizes the absolute necessity of following the checklist to the letter.

You are fooling nobody, including yourself, when you skip or do an inadequate job on a preflight or operational check because of too much pressure, not enough time, fatigue or a self-induced idea that the checklist isn't all that important in the first place. ■

Correction

The reference to TM 1-55 in the article "Low, Fast, and in the Dark" in the 9 July 1980 issue should have been FM 1-51. ■

Selected mishap briefs

uh1 **Class A mishap** ☐ (H series) Witnesses said aircraft began breaking up during maintenance test flight. Aircraft crashed and burned, killing all four occupants. 8048

Class C mishaps ☐ (H series) As aircraft was about 250 feet agl during takeoff, slingload dropped. Cargo release hook assembly failed. ☐(H series) On takeoff, pilot maneuvered to avoid two buzzards. No impact or vibrations were felt. Postflight inspection revealed FM antenna was missing and tail rotor blades were scratched and dented. Aircraft may have hit one of the birds. ☐ (H series) Pilot misjudged altitude during descending right turn, and aircraft hit tree, damaging both main rotor blades.

Class E mishaps ☐ (H series) IP noticed unusual main rotor vibration during flight. Inspection revealed lower doubler was missing from red main rotor blade. ☐ (H series) Pilot descended to maintain VFR below cloud layer over glassy water in light rain. Visibility was less than 3 miles. Visual reference was lost and floats hit water. Copilot applied aft cyclic, pilot increased collective pitch, and aircraft regained altitude. Closest reference point was shoreline, which was more than 3 miles away. ☐ (H series) Pilot noticed pungent odor, and loadmeter indicated excess load. Battery was turned off and flight continued. Odor was caused by thermal runaway of battery. ☐ (H series) During climbout, crew smelled JP-4 fumes and was told by tower personnel that fuel was leaking from underside of aircraft. Caused by ruptured fuel control overflow line. ☐ (H series) Main generator went off line and standby generator indicated voltage but no load. Caused by failure of main generator and worn brushes in standby generator.

uh60 **Class E mishaps** ☐ Stabilator failed during landing. Actuator was adjusted and aircraft released. ☐ Aircraft was on gross weight flight test using slingload of concrete filled barrels. Steel cable portion of cargo sling frayed and broke as load spun in forward flight, and load dropped.

ah1 **Class E mishaps** ☐ (G series) Crew smelled hot battery odor, and d.c. amps indicated 140. Caused by short in forward battery. ☐ (G series) Engine oil pressure light came on. Caused by short in pressure switch. ☐ (G series) Cyclic made abrupt left movement, causing aircraft to bank at 40° to 60°. Disengagement of SCAS did not help. Pilot initiated descent to sandbar. During descent, cyclic continued to displace at 5- to 8-second intervals. Running landing was made. Caused by failure of hydraulic servo.

ch47 **Class E mishaps** ☐ (C series) Utility hydraulic oil cooler fan developed excessive oil leak and utility hydraulic system started losing pressure while aircraft was flying in IMC at 9,000 feet. Caused by failure of hydraulic motor fan. ☐ (C series) No. 1 hydraulic pressure gauge showed gradual loss of pressure until hydraulic caution light came on. Fluid was seen dripping from No. 1 hydraulic pressure manifold area. Caused by failure of preformed packing. ☐ (B series) High frequency vibration was felt in forward part of airframe during taxi. Caused by defective vibration absorber.

ch54 **Class E mishap** ☐ (B series) Pedals became almost immovable during climbout. AFCS was disengaged and reengaged, and use of pedals returned.

oh58 **Class A mishap** ☐ (A series) Aircraft crashed, damaging main rotor blade, tail boom, fuselage, and landing gear. Details unknown. Pilot reported loss of power. 8049

Class B mishap ☐ (A series) Engine started to wind down as aircraft was on short final. Aircraft landed hard, damaging cross tubes, cross tube mounts, and belly. 8050

Class E mishaps ☐ (A series) Rumbling noise was heard from engine during hover. TOT began to fluctuate and rise. Aircraft was landed and smoke was seen coming from engine area. Caused by

failure of No. 1 bearing in compressor section, resulting in oil leaking past plain encased seal. ☐ (A series) Torque appeared higher than normal during OGE hover check. Collective was reduced and torque continued to climb. Caused by failure of torque indicator.

th55 **Class C mishap** ☐ As SP was starting to flare during autorotation with turn, IP saw rotor rpm in the low green and decaying. IP took control, leveled aircraft, and tried to make power recovery. Aircraft landed hard and rolled onto left side.

ov1 **Class E mishap** ☐ (D series) No. 1 propeller would not come out of reverse until No. 1 engine was shut down. Caused by failure of propeller control.

t42 **Class E mishaps** ☐ Landing gear would not show up and locked during climbout. Gear switch was placed in down position and showed down and locked. Partial failure of landing gear motor was caused by defective brushes. ☐ Gear failed to retract after takeoff. Ammeters indicated 50 amps. Alternators were turned off and gear hand-cranked down. Caused by failure of landing gear actuator motor.

u8 **Class C mishap** ☐ (D series) Dual engine failure occurred during flight. Aircraft was landed gear up without power to unimproved road.

u21 **Class E mishaps** ☐ (RU-21H) Crew saw smoke and smelled fumes during climbout. All electrical heat was on. Heater air intake deice boot failed. Electrical short within heating element caused rubber lip to melt. ☐ (A series) Loud noise was heard and jolt was felt during initial gear retraction. Left gear still indicated down and right and nose gear indicated up. Caused by stripped-out main gear actuator.

Maintenance

uh1 **Class E mishaps** ☐ (H series) Copilot felt feedback in cyclic during hover. Inspection revealed push-pull tube to synchronized elevator was loose and bent. Cotter pin that safeties nut on lower control tube was either not installed or was improperly installed, allowing nut to back off and bolt to vibrate out. ☐ (H series) Hydraulic leak was seen during runup, and master caution and hydraulic lights came on. Caused by broken hydraulic line. Hose assembly was chafing against panel.

☐ (H series) Transmission oil pressure gauge dropped to zero during flight. Caused by loose cannon plug on rear of transmission oil pressure gauge. ☐ (H series) After starter was depressed for 30 seconds, and at 30% N_1, compressor stall occurred. Pilot heard loud bang and egt went to 650° C. Crew chief saw flames coming from engine. Battery was checked and found to have zero voltage. Engine contained solvent. Caused by improper engine flush.

th55 **Class E mishap** ☐ Electrical odor was detected during runup. Caused by radio malfunction. Heavy rains had drenched cockpit interior. Protective rain covers were not installed in accordance with local directive.

Safety-of-flight messages

• Safety-of-flight message concerning UH-60A electromagnetic interference (UH-60A-80-28, 021530Z Jul 80). Summary: Because of the potential for erratic operation of aircraft systems due to electromagnetic interference, the following warning note will be added to the warning page of TM 55-1520-237-10: "Electromagnetic interference (EMI). No electrical/electronic devices of any sort, other than those described in the operators manual or appropriate

(continued on back page)

Mishap briefs

airworthiness releases and approved by USAAVRADCOM, are to be operated by crewmembers or passengers during operation of this aircraft." Contact: Dennis Schumacher, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight message concerning preventive maintenance in volcanic ash environment (GEN-80-18, 031905Z Jul 80). Summary: Increased maintenance is required after exposure to the recent Mount St. Helens eruptions. Message gives recommendations for maintenance procedures should flight in a volcanic ash environment be necessary. Contact: Robert Lawyer, TSARCOM, AUTOVON 693-0396, commerical 314-263-0396.

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

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Crew was dismissed from mission since fog had moved in and covered the area. Aircraft was at field site. Crew decided to return to home base and took off to check out the weather. The moon could be seen through the fog. Takeoff was made with navigation lights, rotating beacon, landing light, and searchlight all turned on. At an altitude of about 100 feet, landing light and searchlight were turned off and aircraft was seen to make a descending right turn. Turn was stopped after about 30 degrees but aircraft continued to descend until ground impact.

☐ Pilot decided to make a "lights out" approach to a field site illuminated by two flashlight batons held by an untrained ground guide who had selected a dusty area for touchdown. During approach, with all lights off except those in the cockpit, pilot momentarily turned on landing light. Because of reflection off haze, pilot immediately turned off light. At a high hover of 15 to 20 feet, and under the direction of the ground guide, pilot started to set down when aircraft became engulfed in dust cloud, began drifting left, and hit nearby tree.

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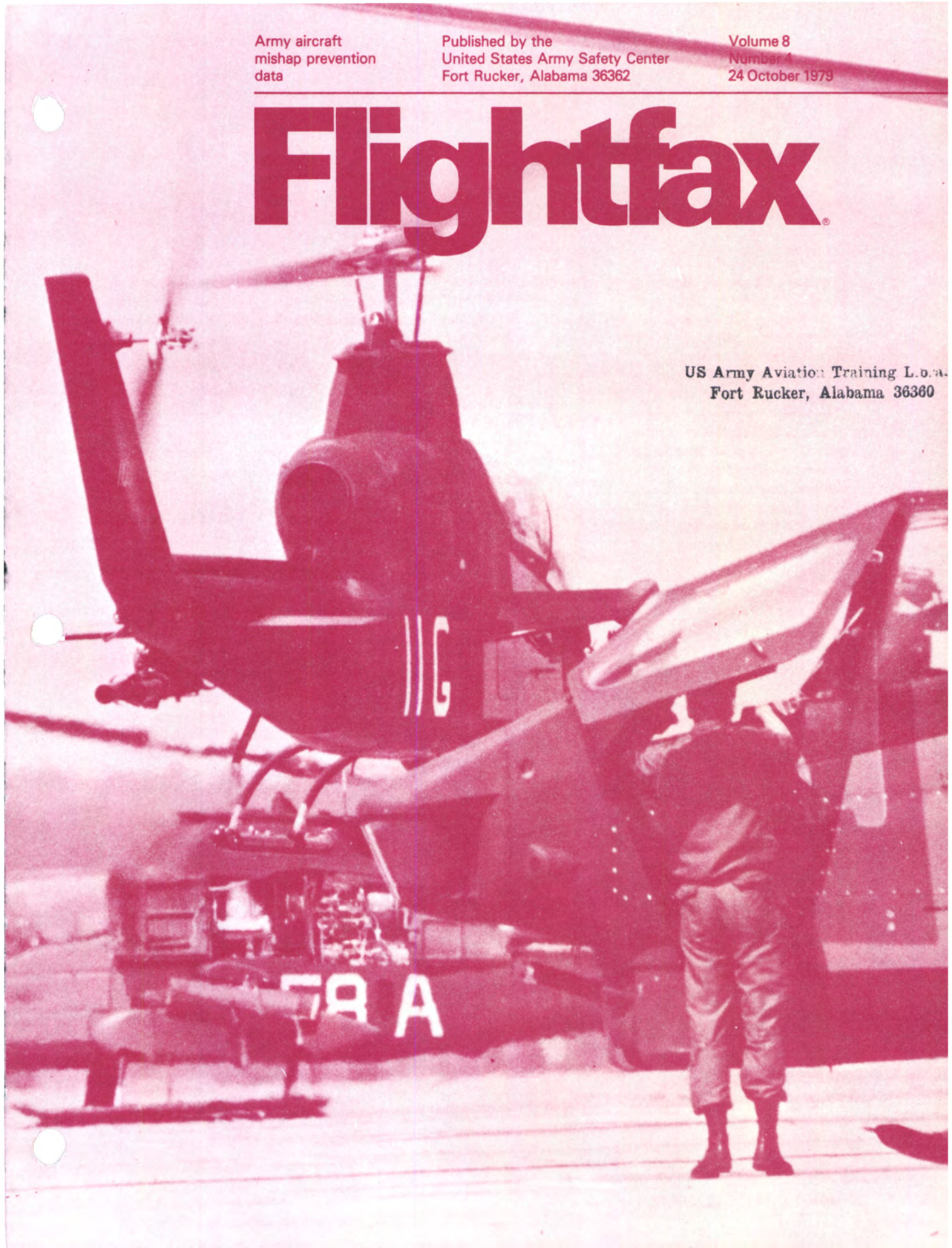

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Stop pneumatic leaks

In a recently published article concerning ecology, the author vividly describes an eagle's last flight, from his graceful and coordinated movements through the air, to his faltering and finally tumbling out of the sky to the ground. For us, the significant factor of this event lies with the cause of this majestic bird's death—a tiny pellet from a shotgun blast fired at this protected species. This single pellet happened to strike the bird in the neck, puncturing a vein. Loss of vital body fluid resulted in unconsciousness and death.

Just like this tiny unchecked flow caused the eagle's demise, a small leak in some vital system of your helicopter can put your "bird" out of commission in remarkably short order. Over the past few months, this has been demonstrated time and again. One problem concerns improperly installed rigid tubing and loose fittings. More recently, incorrectly installed universal fittings have separated from the diffuser scroll. But regardless of the specific tubing and fittings involved, pneumatic leaks have resulted in loss of power and engine failures.

In a recent instance, the pilot of an OH-58 noticed the TOT had reached 875° C. and was rising rapidly. He lowered collective almost to the point of autorotation and the TOT decreased to about 700° C. However, when he pulled in collective to reduce the rate of descent, TOT again began to rise, climbing to about 1,000° C. before the aircraft was landed.

Another OH-58 pilot heard a loud hissing noise coming from the engine area and noticed the TOT exceeded 1,000° C. Simultaneously, the engine failed. The pilot made a right turn to clear obstacles and was able to successfully autorotate to the ground.

Pneumatic leaks caused both of these engine failures. The solution to this problem is an obvious one: Make sure all pneumatic lines are correctly installed and their fittings properly tightened. The correct step-by-step procedures for installing both universal fittings and rigid tubing have been incorporated in TM 55-2840-231-23 which is now being printed. Until it is available to field units, these procedures are reprinted here for your immediate use.

Universal fittings

Use this procedure to install universal fittings with backup rings (see figure 1).

- Install the nut on the fitting and run it back until the counterbore of the nut aligns with the upper inner corner of the seal groove.
- Lubricate seals used on oil, anti-icing, and bleed air tube fittings with lubricating oil (MIL-L-7808 or MIL-L-23699). Lubricate seals used on fuel tube fittings with lubricating oil (for assembly and preservation only) MIL-L-6081, Grade 1010. DO NOT lubricate seals used on fuel system control air tube fittings. Install the seal on the fitting.
- Work the backup ring into the counterbore of the nut.
- Turn the nut down until the seal is pushed firmly against the lower threaded section of the fitting.
- Install the fitting into the boss, making certain the nut turns with the fitting, until the seal touches the boss. Then tighten the fitting one and one-half turns more.
- Put a wrench on the nut to prevent its turning, and position the fitting by turning it not more than one turn.
- Hold the fitting in its position and tighten the nut against the boss. Use the following procedure to install universal fittings without backup rings (see figure 1).
- Run the nut on the fitting end back until the washer face is aligned with the upper inner corner of the seal groove.
- Lubricate seals used on oil, anti-icing, and bleed air tube fittings with lubricating oil (MIL-L-7808 or MIL-L-23699). Lubricate seals used on fuel tube fittings with lubricating oil (for assembly and preservation only) MIL-L-6081, grade 1010. DO NOT lubricate seals used on fuel system control air tube fittings. Place the seal in the seal groove.
- Screw the fitting into the boss until the seal barely touches the boss.
- Turn the fitting and nut together until the nut touches the boss.
- Put a wrench on the nut to prevent its turning, and position the fitting by turning it in up to 270° or unscrewing it up to 90°.
- Hold the fitting in its proper position and tighten the nut against the boss. In addition, the Army Safety Center recommends slippage marks be painted across fittings, nuts, and fixtures following installation.

Rigid tube installation

Tube assemblies must fit and align with the mating flare tube fittings to the degree that both ends of the assembly flares shall uniformly seat in a free state on the cones of the mating fittings. The fit shall be without distortion or stretching of the tube assembly and to the degree that the nuts can be fully engaged up to the final one-half turn with light finger pressure.

If proper alignment cannot be attained by repositioning mating flare tube fittings, bend the tube enough to provide alignment in the free state as specified. Accomplish all bending with the tube removed from the engine. Adjustment of the fit may be accomplished by bending by hand at principal bends. In the event the tube cannot be bent by hand, use a proper tube bending device. The flattened effect of the cross section of the tube as a result of the reforming operation must not exceed 15 percent of the tube OD.

When proper free-state alignment is attained, complete the tubing installation by securing both coupling nuts at the same time and tightening them to proper torque. Always use a backup wrench on the tube fittings when tightening the tube coupling nuts.

When a component to which rigid tube assemblies are attached is replaced, remove all interfering tube assemblies to permit easy removal and reinstallation of the component. This precaution will prevent later damage to the tube assemblies.

The application of slippage marks will provide visual indication of secure fittings. ■

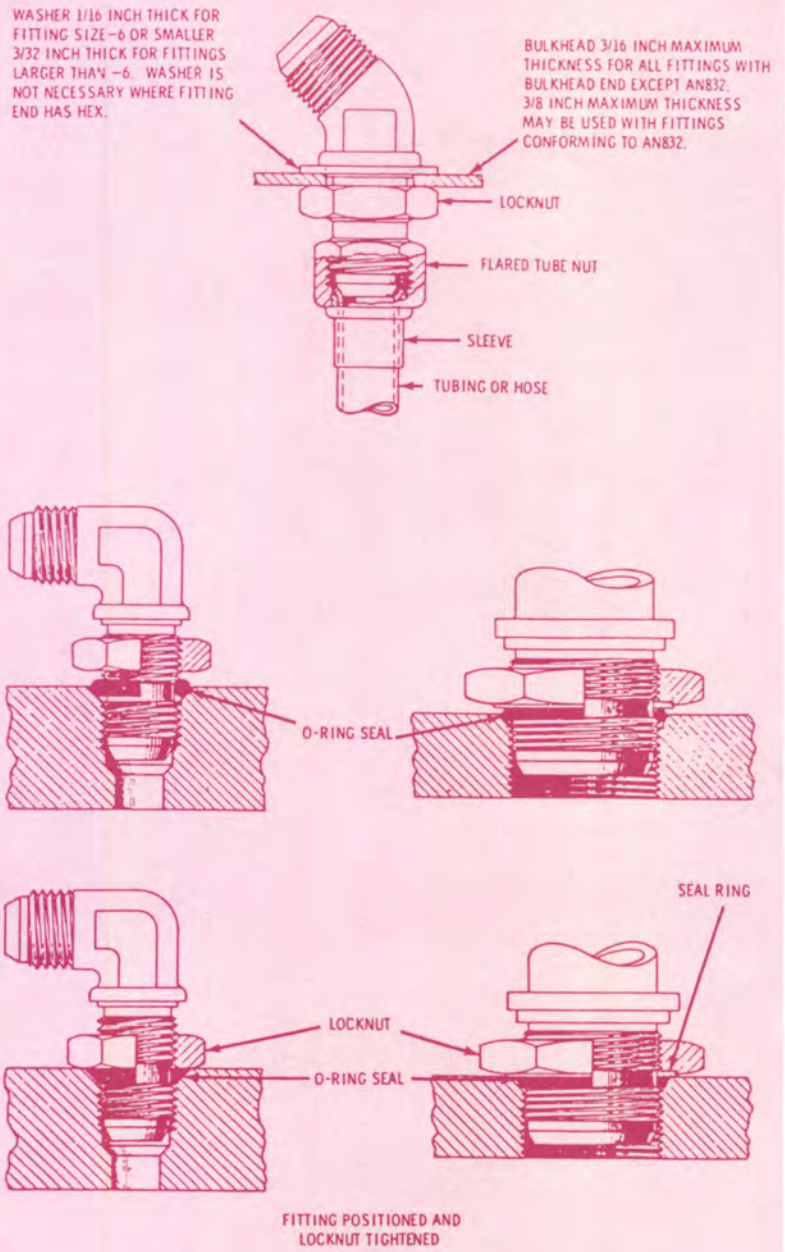
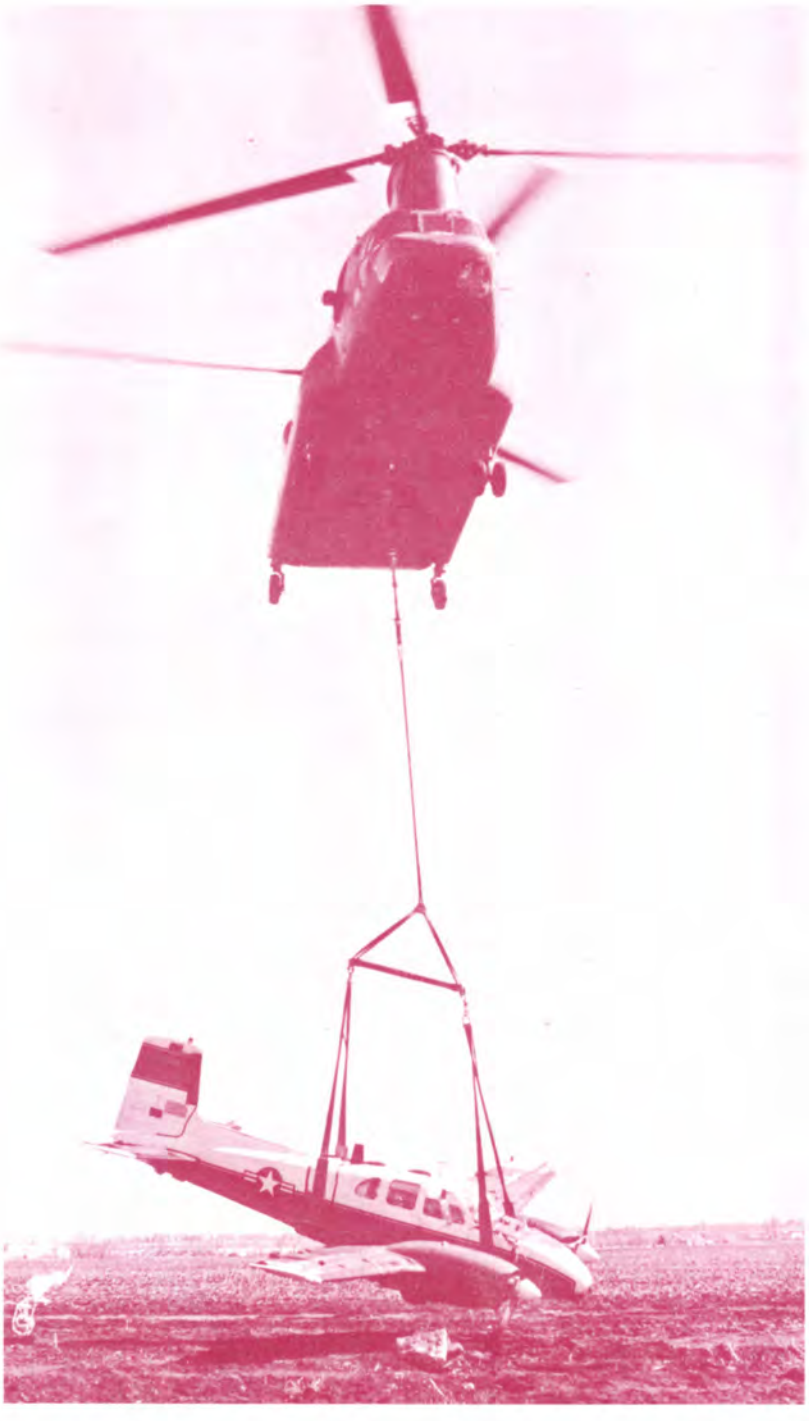


FIGURE 1. - Universal Fittings

Accident review



Synopsis

Shortly after takeoff for a standardization flight, both engines of a U-8G quit because of fuel starvation. The aircraft was landed gear up in a field.

History of flight

An IP was scheduled to give a standardization checkride. He preflighted the U-8, visually checking the fuel tanks, including the main tanks. He noticed the main tanks were about half full. He was not concerned about this because he knew he had plenty of fuel in the auxiliary tanks.

Following the preflight, the IP left the airfield and flew to a point nearby to pick up the pilot. Neither engine was shut down when the aircraft landed, and the pilot boarded. Before taxiing out for takeoff, the IP noticed the No. 1 main fuel gauge was reading about a quarter of a tank and the No. 2 gauge was reading somewhat less. The IP asked the pilot to hold the brakes so he could get out and check the fuel. He visually checked the right main tank and was satisfied he had plenty of fuel.

Nineteen minutes after landing, the pilot and IP took off for a standardization flight, using the main tanks. As the U-8 was leveled at 2,500 feet, the No. 2 engine sputtered and started to quit. The IP switched the fuel selector for the No. 2 engine to what he believed to be the auxiliary tank and concurrently

activated the fuel boost pump. Engine fuel pressure came back up, the engine began running normally, and the climb was continued to 4,000 feet. At this point, the No. 1 engine started to sputter. The IP switched to the auxiliary tank and turned on the boost pump, but the engine failed to regain power.

The No. 2 engine started to sputter again, so the IP switched fuel selectors between auxiliary and main and switched boost pumps, but he failed to get a restart. With both engines out, the crew could not reach an available airport and landed gear up in a plowed field.

Crewmember experience

The 55-year-old IP had more than 7,000 fixed wing flight hours and a total of almost 14,000 hours. The 28-year-old pilot had almost 2,000 fixed wing hours, with a total of more than 3,700 hours.

Witness accounts

According to the maintenance officer, the aircraft was topped off with 230 gallons of fuel 22 days before the accident. This was an error by the crew chief, because the unit SOP called for only 160 gallons to be carried in the U-8. The aircraft had been flown between 1 and 1 ½ hours since that time and had not been refueled.

Commentary

Both engines quit because of fuel starvation. It is not known why the No. 2 engine regained power after starting to quit at 2,500 feet. Maybe the engine was still running off remaining but sporadic fuel in the line from the main tank and then quit later because the fuel in the main line had been exhausted and the engine-driven pump could not pull fuel from the auxiliary tank.

From 4,000 feet, the point where both engines were inoperative, the IP switched the fuel selectors and boost pumps back and forth without confirming that fuel and boost pump selections were for the same tank or giving the switch positioning enough time to work properly before switching again. The fuel system control panel is located on the left side of the cabin below the pilot's storm window, so to look directly at it, the pilot must lean forward and turn his head to the left. Fuel selector switch positions for the right and left engines have reversed positions for auxiliary and crossfeed. (Auxiliary tank is 90° position for the right engine and 270° position for the left engine. Crossfeed is 270° position for right engine and 90° position for the left engine.) Both boost pump switches have like positions, i.e., Off, Main, Auxiliary, from left to right. However, to confirm fuel pressure, the pilot must look to the top center of the instrument panel to two engine gauge instruments that portray oil temperature and pressure in addition to fuel pressure for each engine.

The IP knew the main tanks were less than full but decided not to refill them. Knowing that fuel gauges are inherently unreliable, having visually estimated the main tanks as being about one-half full, and knowing his auxiliary tanks were full influenced the IP's decision not to fill the main tanks.

Mission planning is not just a good idea, it is a requirement. When this requirement is ignored, it often shows up as an accident cause factor, as in this case. Planning is just as important to safe accomplishment of a mission as is the actual flight, and it should be the first phase of every mission. ■

Selected mishap briefs

uh1 **Precautionary landings** ☐ Loud thumping sound was heard from left rear of aircraft. One-quarter inch of forward edge of tip cap separated. ☐ Crew smelled fuel fumes during flight. Caused by failure of fuel control servo filter O-ring. ☐ Severe one-to-one vertical vibrations in flight were caused by worn friction pads in collective. ☐ Transmission oil pressure went to zero and then back to 42 psi. After aircraft was landed, throttle was retarded to flight idle and pressure indicated 35 psi. Caused by failure of oil pressure transmitter. ☐ Main generator and master caution light came on during engine runup, and d.c. voltmeter decreased to zero. Aircraft had been washed prior to flight. Voltage regulator shorted out because of moisture.

ah1 **Precautionary landings** ☐ Master caution and engine oil pressure lights came on. Caused by failure of oil pressure switch. ☐ Fluctuating transmission oil pressure gauge was caused by broken wire on cannon plug.

oh58 **Incident** ☐ One minute after takeoff, as airspeed reached 40 knots, pilot glanced down at his map. When he looked back up, he saw mound of dirt covered with sagebrush in his flight path. Pilot pulled up, but aircraft hit sagebrush, causing incident damage to right chin bubble and vertical fin assembly.

Forced landings ☐ N_2 tachometer deteriorated to 97% during climb. When collective was increased, N_2 tachometer dropped to 53%, where it remained throughout descent. Suspect malfunction of power turbine fuel governor. ☐ Loud bang was heard during hover for takeoff. Aircraft then yawed left and engine lost power. As autorotation was completed, engine quit.

Precautionary landings ☐ As aircraft was flying 100 feet agl, copilot noticed two "birds" flying in front of aircraft. The "birds" turned out to be pictures of birds on kites. Two kites were still flying and no unusual control responses were felt, so aircraft was flown to destination. Two postflight inspections revealed nothing. The next day, crew chief noticed three strands of nylon fishing line extending from under swashplate. Further investigation revealed 50 feet of nylon line wrapped around swashplate bearing, causing teflon deterioration. ☐ Transmission oil pressure light came on. Caused by failure of oil pressure switch.

c12 **Precautionary landing** ☐ (A series) Outer left rear passenger window cracked two-thirds of the way around with additional cracks extending to edge of window. No loss of pressurization occurred. Crack was found on postflight inspection.

ov1 **Precautionary landing** ☐ (D series) Multiple compressor stalls occurred during takeoff. Caused by failure of engine.

Maintenance

uh1 **Precautionary landings** ☐ Crew noticed excessive play in pitch change horn mount. Caused by improperly torqued bolts. ☐ Egt indicator was erratic during runup. Firewall adapter plug was cleaned and tightened. ☐ Master caution light came on. Caused by improper installation of weather boot on transmission chip detector.

ch47 **Precautionary landings** ☐ Hydraulic leak in No. 2 flight boost T fitting was caused by overtorque. ☐ Hydraulic leak from lower T fitting on utility hydraulic system override valve was caused by pinched O-ring.

oh58 **Precautionary landing** ☐ Master caution and engine oil bypass lights came on. Caused by chafed wire.

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Standardization Communication | Directorate of Evaluation & Standardization USAAVNC, Fort Rucker, Alabama 36362 | STACOM 49 24 October 1979

Stacom

Improving the record

A cursory look at the Army aviation accident record for fiscal year 79 indicates a total of 75 accidents and 18 fatalities for the period. This is a sizable reduction in accidents and fatalities over the previous year's total of 90 accidents and 57 fatalities, and is evidence of an increasing awareness of professionalized safety and standardization within the ranks of Army aviation. There is still room for improvement.

The Directorate of Evaluation and Standardization (DES) will continue to "blow the whistle" on what it considers areas of concern to the safety and standardization posture of Army aviation. Our past year's STACOMs have alerted the field, or outlined the DES position on several problem areas. The subjects covered have included icing, center-of-gravity limitations, rotor-induced whiteouts, guidelines and recommendations to IPs, performance planning, and other problem areas that DES has attempted to surface in a timely and effective manner. Accident data will continue to be analyzed to detect trends that affect IP performance and standardization. ■

Go-no-go placard

The maintenance procedure to establish the go-no-go placard has been eliminated from the TM 55-1520-210-23 series manual, dated 20 February 1979. It is not to be reestablished.

The Operators Manual, TM 55-1520-210-10, dated 18 May 1979, has also eliminated all reference to the go-no-go placard. In its place, the aviator is required to use the performance charts in chapter 7 for premission planning. The performance charts enable the aviator to determine power requirements and aircraft capabilities with far greater accuracy than was possible with the eliminated go-no-go method.

Excellent instructional material in the use of performance charts can be found in STACOM 33, "Know Your Aircraft's Performance Limitations," 18 Oct 78; TC 1-10, Mountain Flying Sense, June 1978; and two **Aviation Digest** articles, "Hover Power Check," October 1978 and "Chuck Greenie Learns a Trade," April 1979. ■

UH-1 simulated emergencies

Question: May an IP, in simulating flight emergencies in the UH-1, be permitted to pull circuit breakers, turn off generators or inverters, or "beep down" the rotor rpm as long as he remains within the operating limits of the aircraft?

Answer: The critical part of this multiple question is the last part; **all** aviators, including IPs, must at **all** times work within the operating limits of the aircraft. It is difficult to perceive how an IP can confront an aviator with continuous, multiple inoperative systems and still expect training to continue and aircraft operations to remain within limits. There does not appear to be any correlation between this type of exercise and the requirements of the ATM (Aircrew Training Manual). This type of technique could be better and more safely performed in the SFTS, but its usefulness in the real training world still appears highly questionable. A final thought—this type of instructor was supposed to have disappeared with the Neanderthal. Let's hear your thoughts on this question. ■

Standard alternate weather minimums

In reply to recurring inquiries, STACOM 42, 18 April 1979, stated that the standard alternate weather minimums for precision and nonprecision instrument approaches, as described in paragraph 4-24a(1), AR 95-1, apply to both fixed- and rotary-wing aircraft operations. Visibility requirements cannot be reduced for rotary wing flight planning purposes.

(continued on back)

Stacom

Standard alternate weather minimums are:
Nonprecision approach: 800′ ceiling; 2 miles visibility.
Precision approach: 600′ ceiling; 2 miles visibility.

For further information on this subject, see United States Standard for Terminal Instrument Procedures (TERPS), paragraph 360, Standard Alternate Minimums, and the last paragraph on pages iii and iv. ■

Correction

The Aircrew Training Manual update in STACOM 48, 26 September 1979, should be changed from TC 1-145, Change 2, dated 1 Jan 79; Change 2 dated 15 Jun 79; Change 3, dated 3 Sep 79; to **TC 1-145, Change 2, dated 1 Jan 79; Change 3, dated 15 Jun 79; Change 4, dated 3 Sep 79.** ■

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

OH-58C aircraft released to field

Two hundred and thirty-one OH-58C aircraft, NSN 1520-01-020-4216, were conditionally released for issue 17 July 1979. The aircraft were fielded to TRADOC and FORSCOM users beginning 8 August 1979. TRADOC will evaluate the OH-58C configuration for future modifications and to determine suitability for release of the remaining 44 aircraft to USAREUR. ■

—from USATSARCOM Information Bulletin

Missent TAMMS forms

Large numbers of aviation TAMMS records (DA Forms 2410, 2407, and 2408-9) are being missent to TSARCOM, costing additional funds for handling and postage. In accordance with appendix B, section I, TM 38-750, the forms should be sent to Commander, U.S. Army DARCOM MRSA, Lexington, KY 40511.

All DA Forms 2410-1, EIRs, and WCAs should continue to be addressed to TSARCOM, using the following office symbols:

- DA Form 2410-1; DRSTS-SPFO.
- EIRs: DRSTS-MEM.
- WCAs: DRSTS-MEM.

—from USATSARCOM Information Bulletin

CH-47C transmission

Recent grounding action of the CH-47C combining transmission, NSN 1615-00-176-2628, P/N 114D5200-2, has created a worldwide shortage of usable transmissions. Expedited return of all unserviceable assets to Corpus Christi Army Depot is essential to prevent a break in the transmission overhaul line. Expedited return will insure the speedy return of serviceable transmissions with a 1,200-hour TBO. ■

—from USATSARCOM Information Bulletin

19- or 20-cell batteries?

As you may have noticed, the battery shown in the 25 April 1979 FLIGHTFAX contains 20 cells. The Aviation Center and certain RU-21 units are testing this 20-cell battery. If you are not at Fort Rucker or in one of the units authorized use of the 20-cell battery, do not add another cell to your 19-cell batteries. ■

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Twelve 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.

Twelve aviators received the Army Aviation Broken Wing Award from April through June 1980.

• **CW3 George E. Barnard, A Company, 227th Aviation Battalion, 1st Cavalry Division, Fort Hood.** CW3 Barnard was on a VFR low-level ARTEP evaluation flight in a UH-1H. During climbout, at 350 feet agl and 60 knots, the low rpm audio sounded and the warning light came on. As N_2 passed through 6100 rpm, Barnard initiated autorotation by rolling the throttle to the flight idle position and establishing autorotational descent. During descent, it became obvious that the established glide would necessitate a landing into the trees. So Barnard maintained airspeed until about 80 feet agl (40 feet above the treetops), where he started to decelerate and applied collective pitch, allowing the aircraft to clear the trees. While over the treetops, Barnard dissipated the remaining airspeed and applied remaining collective pitch to cushion the aircraft to the ground. The Huey was landed with no damage to an open area, interspersed with small trees, with only 8 feet of ground run.

• **CW2 Louis T. Delia, Troop C, 7/17th Cavalry, 6th Cavalry Brigade, Fort Hood.** CW2 Delia was flying an OH-58A at about 40 knots and 40 feet agl when his engine failed. He turned toward the only available clear area, initiated autorotation, and landed on a tank trail bordered by trees.

• **1LT James A. Dixon, Troop B, 2d Squadron, 10th Cavalry, Fort Ord.** Lieutenant Dixon, on an AH-1G recon mission, was directed to a masked position for a target handoff. As the aircraft neared the desired location, a quick stop to a hover was begun. With the aircraft in a nose-high attitude, power was applied to stop the forward airspeed and rate of descent. At the point of the highest power setting, the tail rotor feather bearings failed, causing the tail rotor to freeze in near full left pitch setting. As power was reduced to maintain a hover, the nose of the aircraft started a slow left turn, placing the tail rotor close to tall trees on the right. At the time of failure, the aircraft was in a narrow deep ravine with a high sloping hill on the left, tall trees in the rear, a cliff-like hilltop 100 feet higher than the aircraft's position in the front, and a forested sloping ridgeline to the right. Dixon applied power to stop the spin, cleared the trees and ridgeline to the right, took advantage of the sloping terrain, and slowly descended while gaining airspeed. The aircraft was yawing 75 degrees. As airspeed was gained, the yaw angle reduced to 45 degrees. Dixon flew the AH-1 to the nearest level landing area, a heliport about 6 minutes away. As power was reduced for approach on 1/8-mile final, the aircraft was in a 90-degree yaw. Just before touchdown, the nose came around with power application and the aircraft touched down 20 degrees left of the centerline.

• **CW3 John C. Horvath, 62d Aviation Company, 11th Aviation Battalion, APO NY 09039.** CW3 Horvath was on an OH-58 service mission, flying over heavily wooded and hilly terrain, when his engine failed. Realizing the only available safe landing area was to his left rear, he initiated a 180-degree autorotative turn to the left, lining up with the narrow valley floor, between two ridgelines. Quickly scanning the intended touchdown area, Horvath realized he had to continue the turn to miss electrical wires, placing the aircraft in a downwind configuration. He adjusted his deceleration, initial pitch-pull, and cushion accordingly, and landed in a plowed field, with no damage.

• **CW2 James P. Hughes, Army Aviation Center, Fort Rucker.** CW2 Hughes was an IP in a UH-1H flying formation 75 to 100 feet over wooded terrain. When the student pilot reduced power to make a formation change, the engine failed. Hughes took control and autorotated to a small plowed field surrounded on all sides by trees or other objects.

• **CW3 Jon N. Leonard, West Virginia Army National Guard, Parkersburg, West Virginia.** CW3 Leonard was on a maintenance test flight in a UH-1H. As power was reduced on base leg for landing, an extreme and almost uncontrollable vibration occurred. The vibration was so severe Leonard could not keep his feet on the antitorque pedals. The crew chief helped him with the pedals and together they verified they had tail rotor control but had lost part of the main rotor. The unavailability of a suitable landing area forced Leonard to continue to the runway. Power was reduced at the beginning of the approach to about 15 to 16 pounds of torque, and the collective was not moved again until termination of approach. Leonard used both hands on the cyclic control to maintain flight attitude. Because of the severe feedback in the cyclic control, he was unable to touch down in a level attitude. One skid and then the other hit the runway two or three times before the landing was completed. The red main rotor blade had separated about 5 feet from the outboard end.

• **Captain Charles E. Merkel, Jr., U.S. Army Aviation Board, Fort Rucker.** CPT Merkel had been flying about 1 ½ hours on a support mission when loud noises were heard from his UH-1H engine compartment. The hydraulic system then failed. Airspeed could not be reduced because the collective was frozen. A descent from 7,000 feet was made by varying the thrust vector through the use of banks and out-of-trim conditions. Merkel decided to land at an airfield about 10 miles away. The runway was blocked by a herd of deer which caused the landing to be delayed. After the runway was cleared, Merkel gained manual control of the throttle and made a running landing. The failure occurred at dusk and the landing was made after dark. Time from onset of emergency to landing was about 20 to 25 minutes.

• **Major Gilbert M. Montgomery, Hq Company, Hq Command, USAG, Fort Stewart.** MAJ Montgomery was flying a U-21 on a service mission. About 1 hour into the flight, the inverter a.c. warning light came on. The aircraft was flying at 8,000 feet msl in clouds and moderate turbulence. Montgomery switched to the spare inverter and requested clearance to a lower altitude to avoid the tubulence.

(continued on next page)

Broken Wing Award

As the flight was being vectored for a GCA, both pilot and copilot attitude indicators and RMIs were lost completely, and the navigation radios became totally unreliable. Montgomery continued the approach, using pressure/static instruments and the turn and slip indicator to control the aircraft. After about 15 minutes on emergency panel instruments, with moderate turbulence present, Montgomery completed the approach, breaking out of the clouds at 1,000 feet msl. Postflight inspection revealed malfunction of both main and spare a.c. inverters.

• **Captain Joseph M. Reames, A Company, 8th Combat Aviation Battalion, 8th Infantry Division, APO NY 09111.** CPT Reames was the pilot of a UH-1H flying at 2,500 feet msl over extremely hilly terrain. The copilot had control of the aircraft. A loud bang was heard and the engine oil pressure fluctuated between 40 and 100 psi. The copilot noticed that torque was being lost. Another bang was heard and the rpm light and audio activated. Reames took control, started a left turn into the wind, and entered autorotation. The cabin began to fill with smoke, and the crew believed there was an engine fire. A plowed field was selected as the landing site. Committed to the landing site, Reames saw some wires in the area and had to maneuver around them. The aircraft was decelerated and initial pitch was pulled. The aircraft then pitched forward and yawed slightly. Postlanding inspection revealed the tail rotor had hit the ground and separated.

• **CW3 Lyle M. Rizk, 222d Aviation Battalion, Fort Wainwright.** CW3 Rizk was flying his OH-58 over snow-covered terrain when the engine failed. He successfully completed a low-level autorotation to the only available landing area, a frozen pond surrounded by tall trees.

• **CW3 Thomas B. Smith, Army Aviation Development Test Activity, Fort Rucker.** CW3 Smith was the IP on a YCH-47D training flight. The aircraft was landed and the flight controls placed in a neutral position. When the advanced flight control system (AFCS) switch was placed in the No. 1 position, the aircraft pitched down about 10 degrees. Smith immediately turned off the AFCS and applied aft cyclic to regain control of the aircraft. He then told the student pilot to turn on the AFCS. As the switch was turned on, the nose of the aircraft pitched down violently. To keep the forward blade from hitting the ground, Smith applied thrust to get the aircraft airborne and simultaneously applied aft cyclic to try to regain a level attitude. The AFCS was turned off, and the aircraft was stabilized at a 15-foot hover. The nose then began to pitch up, requiring about 7 inches of forward cyclic to maintain a level attitude. For the next 7 minutes cyclic applications of 5½ inches forward to 4½ inches aft were required. The flight engineer checked for jam indications on the actuators but none were found. Attitude was stabilized enough to set the aircraft down, but it then pitched up and yawed to the right, becoming airborne. The aircraft was again put on the ground and held there for about 15 minutes until maintenance personnel could disconnect the electrical leads to the differential airspeed hold actuator, which stopped all of the uncontrolled inputs. ■

Selected mishap briefs

uh1 **Class C mishaps** □ (H series) Aircraft drifted left while hovering in confined area, and tail rotor blade hit tree branches. Confined area had a 5-degree slope and aircraft was light on the skids while picking up troops. □ (H series) Aircraft was landed in LZ and throttle retarded to 5500 rpm. Pilot noticed engine oil temperature at 108 degrees and took off to try to decrease temperature. Oil temperature stabilized at 103 degrees and pilot continued to fly for 70 minutes. Engine change is required because pilot flew aircraft with oil temperature in excess of 100 degrees for more than 30 minutes. □ (H series) Forward cross tube failed at right attaching point during running landing, causing sheetmetal damage from attaching point outboard to cross tube tunnel area. Caused by fatigue failure.

Class E mishaps □ (H series) Postflight inspection revealed no oil in 90-degree gearbox sight gauge. Oil was leaking from worn gearbox input seal. □ (H series) Master caution light came on during takeoff. Caused by broken chip detector wire. □ (H series) Master caution light came on during flight. Caused by metal fuzz on 90-degree gearbox, which had been in service only 3 hours. □ (H series) High frequency vibrations in flight were caused by failure of No. 1 hanger bearing. □ (H series) Preflight inspection of oil cooling fan compartment revealed 3-inch crack on skin area next to upper right attaching bolt. □ (H series) Fluid was seen coming from top battery vent during flight. Caused by failure of permion cells.

uh60 **Class E mishap** □ Transmission oil pressure went to 25 psi during flight. Caused by defective preformed packing.

ah1 **Class E mishaps** □ (S series) Pilot noticed fluctuation in amperage and voltage gauges during flight. Caused by failure of d.c. generator. □ (G series) Engine tachometer failed during landing. Caused by defective generator. □ (S series) HIT checks were +32° and +34°. Caused by inaccurate temperature gauge.

ch47 **Class B mishap** □ (C series) Postflight inspection revealed damage to forward yellow and aft green rotor blades. Damage consisted of burned areas on top and bottom of both blades. During flight, crew had seen lightning within 1 nautical mile of aircraft but had received no indication of lightning strike. 8051

Class E mishaps □ (C series) No. 1 engine torque increased and No. 2 engine torque decreased. Rotor rpm increased but was controlled by adjusting thrust. No. 1 engine could not be controlled with a.c. or d.c. beep trim. Caused by failure of No. 1 engine N_2 governor overspeed drive shaft. □ (B series) Large amount of oil accumulated on windshields during flight. Caused by failure of vertical hinge pin seal on green blade. □ (C series) At 1,000 feet agl, crew chief saw one leg of sling break. Pilot initiated descent. At 10 to 20 feet (load height) in forward hover,

(continued on next page)

Mishap briefs

aircraft began to fall through. Load was released. Postflight inspection revealed sling had been cut by load. Rate of closure was apparently too fast.

oh58 **Class E mishaps** □ (A series) Popping sound was heard from rear of aircraft as starter button was depressed. Battery was checked and two side clips had popped off. □ (C series) High frequency vibration was caused by bent aft tail rotor drive shaft. □ (C series) As pilot was applying left pedal during downwind descent, aircraft started to fall through. Pilot tried to stop descent, causing overtorque. High density altitude caused less power to be available. □ (A series) Low rpm audio and light activated during cruise flight at 100 knots and 3,000 feet msl. Collective was lowered and power recovered from about 90% N_2. Power was applied to establish cruise and, at about 50 pounds of torque, engine rpm began to bleed off again. Through a series of up and down collective movements, pilot was able to get 50 pounds of torque established and maintain minimum safe altitude. Pilot returned to airfield and landed. Caused by failure of fuel control. □ (A series) Master caution and d.c. generator lights came on. Caused by sheared generator drive shaft.

th55 **Class C mishap** □ During student pilot's first supervised solo approach, aircraft settled from about 8 feet and hit lane. Engine was heard activating overspeed device. Aircraft then bounced and spun rapidly before SP bottomed collective and landed hard. SP may have lost control.

Class E mishaps □ Engine ran rough. Caused by worn No. 1 cylinder fuel injector line. □ Gearbox light came on during landing. Transmission oil pressure switch could not be adjusted. □ Engine ran rough during hover. Caused by bent No. 2 cylinder exhaust valve push rod. □ Exhaust flange broke during hover.

u8 **Class E mishap** □ (F series) When power was reduced for cruise, No. 2 engine stopped. Caused by failure of fuel injector pump.

Lapbelts--a hazard to your health?

Possibly. If you let the dangling end of the lapbelt become locked in the entrance hatch of an OV-1, it could prove hazardous if you had to eject. The lapbelt would suddenly tighten and could cause abdominal injuries. Make sure your lapbelt is not hanging outside when you close the entrance hatch.

Maintenance

ah1 **Class E mishap** □ (S series) Transmission oil pressure light came on and gauge went to zero during landing. Caused by loose transmision oil pressure switch.

ch47 **Class E mishaps** □ (B series) No. 2 engine oil pressure dropped to 38 psi during takeoff. As oil pressure was adjusted on No. 2 engine, partial blockage in oil line was apparently freed, and pressure was adjusted to 120 psi plus or minus 20. □ (B series) Fire detection light came on during taxi. Caused by sensing element chafing against engine cowling.

oh58 **Class C mishap** □ (A series) Pilot noticed TOT in yellow range during downwind hover. HIT check was +16 during engine runup. Pilot landed and had crew chief check engine deice actuator to insure closure. When copilot door was opened, high-pitched noise was heard. Inspection revealed FOD in compressor section. Screw, bolt, or nut may have been left in plenum chamber after phase maintenance.

Class E mishaps □ (A series) Crew smelled fumes and, during descent, anticollision light circuit breaker activated. Upper anticollision light electrical wire had been melted by bleed air return line. Wire had been misrouted. □ (A series) Master caution and generator lights came on. Caused by loose wire on terminal at starter generator.

New guidelines

Change 13 to the OH-58 maintenance manual (TM 55-1520-228-23-1) gives new guidelines for reworking the tail rotor yoke assembly.

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

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.

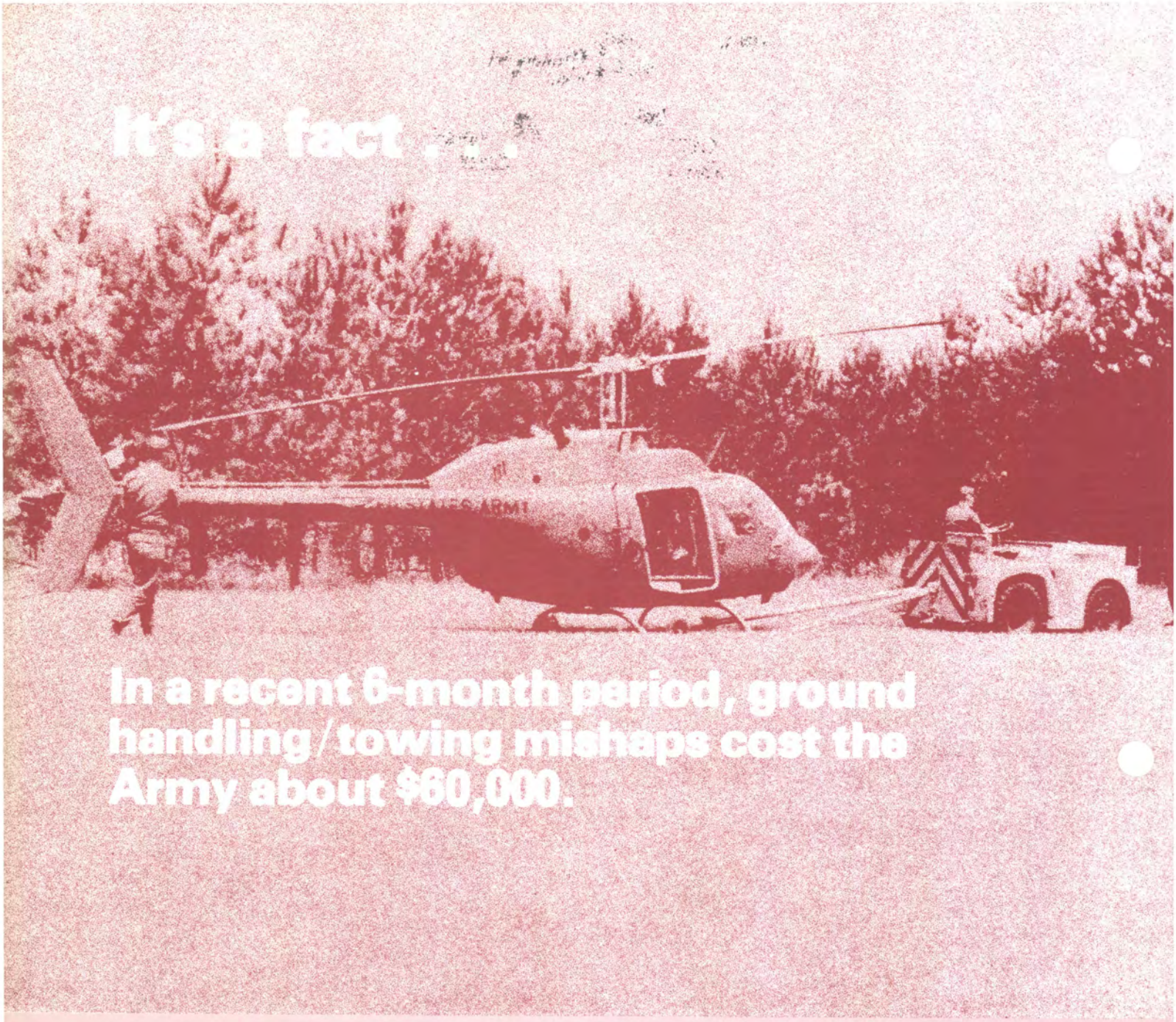
Fixed Wing TM 55-1510	Aircraft	Basic Manual	Last Change	Basic Checklist	Last Change
201-10/4	RU-8D				
	U-8D/G	3 Apr 78		Jul 78	
201-10/5	U-8F	21 Mar 78	1, 18 Dec 78	Jul 78	
204-10/3	OV-1B	9 Mar 79	1, 14 Jan 80	Feb 79	
204-10/4	OV-1C	10 Apr 79	2, 14 Jan 80	Apr 79	
208-10	T-42A	27 Feb 79		Feb 79	
209-10	U-21A	25 Mar 77	4, 11 Oct 78	Feb 77	4, 16 Aug 78
209-10-1	RU-21A/D	28 Feb 77	4, 17 Jul 78	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	3, 5 Oct 78
215-10	U-21G	11 Mar 77	3, 16 Jan 78	Apr 77	2, 9 Jan 78
215-10-2	RU-21H (GR-V)	29 Dec 78		Dec 78	
216-10	U-3A/B	11 Dec 78		Dec 78	
	C-12A	15 Aug 77	1, 7 Dec 78	Dec 78	
	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	1, 26 Jul 79
214-10	OH-6A	17 Dec 76	9, 6 Jun 80	Dec 76	2, 3 Apr 79
217-10-1	CH-54A	8 Apr 77	1, 9 Jan 78	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, 10 Oct 79	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	5, 26 Mar 80	Jul 78	1, 27 Nov 78
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	9, 28 Apr 80	Jul 78	1, 10 Oct 78
236-10	AH-1S (PROD)	11 Jan 80	1, 28 Mar 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.

Instructor pilot's handbook

The latest Instructor Pilot's Handbook (Fundamentals of Instruction) is dated **March 1978.** IPs desiring copies of the latest version should submit their request to: Commanding General, U.S. Army Aviation Center, Dept of Acad Tng, ATTN: ATZQ-T-AT-E, Tng Lit Mgt Br, Ft Rucker, AL 36362. ■



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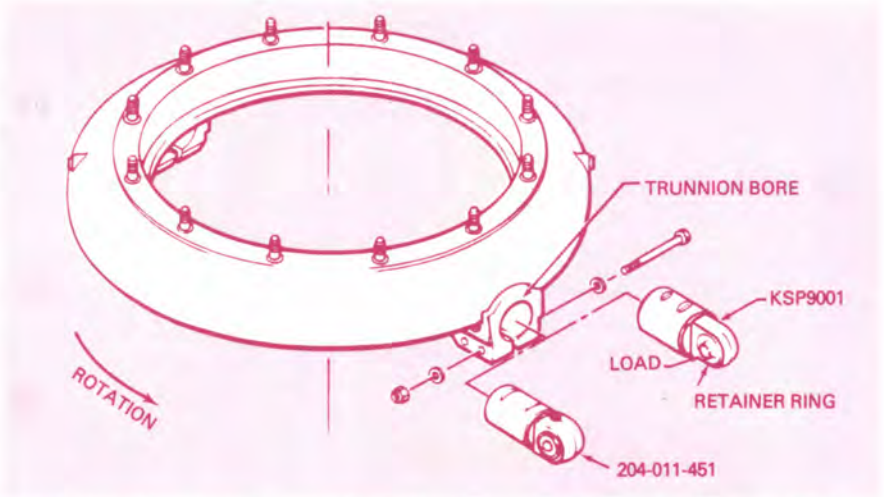
No ifs, ands, or buts about it

All UH-1 trunnion maintenance inspections **must** be done by the book – and only by qualified personnel. There are no ifs, ands, or buts about it.

Last year we lost two crewmen and an aircraft because a trunnion separated from the outer swashplate ring, causing the aircraft to enter an uncontrollable, descending right turn and crash. Investigation revealed the assembly had not been properly inspected and maintained. A check of the trunnion bores in the swashplate outer ring showed they were egg shaped, and the inside diameter of each was excessive. In addition, the possibility exists that insufficient torque had been applied to the clamping bolts of the damaged swashplate outer ring trunnion bore.

While we don't know at what echelon of maintenance the error occurred, we do know that some maintenance personnel have not been following correct procedures when replacing trunnion assemblies. This was clearly evidenced by the number of damaged trunnion components noted during a one-time inspection of UH-1 aircraft following the accident and by the observation of improper procedures used by various mechanics while they were participating in this inspection.

A common discrepancy noted was the use of screwdrivers or other unauthorized tools to spread trunnion housing ears during removal and installation of trunnions. In fact, a section of one trunnion housing broke when a mechanic pried the ears apart with a screwdriver. Ironically, this occurred while he was performing a one-time inspection of trunnion assemblies.



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.

Unfortunately, discrepancies such as these still persist – despite the publicity given this accident. A recent spot check of aircraft revealed that some personnel are still failing to follow correct procedures when performing maintenance on trunnion assemblies. Yet, correct maintenance of these components is critical to safety. Inspections must be thorough and all work must be exact. No shortcuts are permissible.

To begin with, swashplate rings, including the trunnion housing, are made of cast aluminum alloy. So, they can be easily damaged if improperly handled or maintained. The **only** authorized device to be used in spreading the trunnion housing ears is the work aid described in

TM 55-1520-210-23-1 (change 6, 31 January 1980), figure 5-38. Even this tool must be used with caution as stipulated in the dash 23 to prevent excessive spreading of the housing ears. Otherwise, either permanent distortion of the trunnion housing and bore or materiel failure of the casting can occur. Distortion of the trunnion housing can prevent proper retainment of the trunnion even though the retaining bolts may be correctly installed and tightened to their specified torque value.

The use of screwdrivers or other unauthorized tools to spread trunnion housing ears almost always produces surface damage in the area of contact. Also, such tools provide no means for controlling the amount the housing ears are spread, imposing internal stresses on the casting that can cause it to fail immediately or at some later time.

When bolt holes and trunnion slots are improperly aligned, the retaining bolts cannot be inserted without hammering or twisting them in place. Either of these actions can distort the bolt holes, damage the bolts and trunnions, impose internal stresses on trunnion housings, and fail to provide proper retention of the trunnions.

The solution is simple: BY-THE-BOOK maintenance and inspections. And the place to start with is TM 55-1520-210-23-1 (change 6, 31 January 1980). The instructions are thorough and clear. You **must** follow them to the letter, being careful to observe every warning and caution stipulated.

For example, paragraph 5-66r (WARNING) of change 6 requires that the trunnion bores on both the outer and inner rings of the swashplate be measured to insure they are within specified tolerances before the trunnions are installed. Following their installation, a spring scale test must be conducted before the retaining bolts are inserted in place and torqued. Further, these checks must be made by a **qualified technical inspector.**

In addition, when trunnion bearings, KSP 9001-1/3/5, are installed, the retainer portion of the bearing must be installed as shown in figure 5-35, page 5-73 of change 6. This is to make sure the friction (thrust) load will be carried by the bearing seat and not by the bearing retainer.

In short, when it comes to trunnion assemblies, there is no substitute for correct maintenance and inspections. Using only those tools authorized and following TM procedures are absolute necessities if safety is insured. ■

Aircraft entered uncontrollable, descending right turn and crashed after trunnion separated from outer swashplate ring.

Cargo load shifts

Anytime a pilot is requestd to "take this back," meaning cargo of some kind, the best thing he can do is refuse. There are many things that can happen when carrying cargo, and most of them are bad.

For openers, is the cargo in the proper container? Can the container be secured to hold its position on takeoff and landing? Will the container interfere with any control cables? If the container breaks loose, will weight and balance of the aircraft be affected? If the container pops open, will any of the contents endanger any souls on board, lodge in control cables, or make like a missile?

For example, the pilot of an aircraft with lots of room took some items for a friend from A to B. During the flight, the aircraft ran into a bit of turbulence. The containers popped open and little ole traveling iron ricocheted off one crewmember's head, knocking him out, and gashed the leg of another crewmember. It hit both of them on the same airborne circuit. The rest of the contents spewed all over the deck, picking up a spot of oil and grease. The shipper became highly irate at the pilot when he learned what happened. You just can't please some folks no matter how hard you try.

Then there's the real, sad story of the pros who let a load get away from them. These guys were in the business of hauling cargo. They knew the procedures, knew what security had to be taken, and despite normal precautions, they are dead.

They were victims of a load shift and never had a chance. The weight of their cargo was well within limits, and positioning of the load was right on the c.g. They checked the securing devices, straps, and cables, and believed everything to be in order.

When ready, they took off. Somehow the cargo broke loose, slid aft (way out of c.g. limits), and the aircraft gradually increased its nose-up attitude. The aircraft climbed to 300 to 400 feet, 60 to 70 degrees nose up, stalled out, rolled to the left into a dive, and crashed almost in a flat attitude. No one survived. Both engines were at full power and no controls had failed, but the c.g. had shifted so far aft that the aircraft couldn't fly.

Finally, there's the one about the CH-53 helicopter. Everyone knows a helicopter is a nice, wide, plenty-of-space slow mover. Well, would you believe that this whuppity upper, with its wonderful turbines, **almost** fell out of the sky! Seems the crew had been tasked to transport, internally, a shiny, new, 1½-ton generator. The crew chief and helper were in the cabin strapped in for takeoff.

Nearly every helicopter ever built parks flat, takes off flat, climbs flat, glides flat, autorotates flat, and lands flat. But this one didn't! Within milliseconds after takeoff the nose pitched up. In a couple more milliseconds the crew chief and his helper saw the load sliding aft and they jumped up. Even though there was a good chance they'd be crushed, they got behind the load and prevented further aft movement by sheer will and muscles. Because the pilot unloaded the rotors (slight pitch down) at that very moment, they were able to move the load forward toward the c.g.

It is inconceivable that pilots would aviate with unsecured items in the aircraft, but they do. These hairy stories of loads shifting, after proper security, should convince you to: Not do it/do it with caution/go your own way (choose one). ■

—from 101st Airborne Division and Fort Campbell Aviation Safety Bulletin

Recap of TSARCOM messages

Following is a list of AIG 8881 addressed messages for the AH-1, UH-1, OH-6, OH-58, CH-47, and CH-54 transmitted by TSARCOM (DRSTS-M) from 1 April through 30 June 1980.

AH-1-80-08 SOF message on inspection of nuts, tail rotor drive shaft clamps

AH-1-80-09 Maintenance advisory message on AH-1S rotor blades

AH-1-80-10 Maintenance advisory message concerning cap assembly, 42-degree gearbox

AH-1-80-11 Maintenance advisory message on modification of AH-1S inverter control wiring

AH-1-80-12 Maintenance advisory message on retirement schedule/firing transfer charge assembly

AH-1-80-13 Change 1 to SOF message on one-time inspection of attaching hardware of lever assembly

AH-1-80-14 SOF message on procedure for lifting NOE flight restriction ground and 25-hour flight checks for UH-1H/M, EH-1H, and AH-1G, TH-1G aircraft

AH-1-80-15 Change in engine start procedures for AH-1S (prod), AH-1S (ECAS), AH-1S (MC), and AH-1S (G-MC) aircraft

AH-1-80-16 Maintenance notice concerning AH-1S tail boom blankets

UH-1-80-05 SOF inspection of nuts, tail rotor drive shaft clamps

UH-1-80-06 Maintenance advisory message concerning replacement of hydraulic pressure switch.

UH-1-80-07 Maintenance advisory message concerning cap assembly, 42-degree gearbox

UH-1-80-08 Maintenance advisory message concerning illumination requirements to be included in special mission MWO 55-1520-210-30-57 dated 1 Oct 79, modification instruction for night hawk/night vision goggles training compatibility (UH-1D/H helicopters)

UH-1-80-09 Change 1 to SOF message on one-time inspection of attaching hardware of lever assembly

UH-1-80-10 SOF message concerning procedure for lifting NOE flight restriction, ground and 25-hour flight checks for UH-1H/M, EH-1H, and AH-1G, TH-1G aircraft

UH-1-80-11 SOF maintenance notice messsage concerning changes to TM 55-1520-210-23 dated 20 Feb 79 with change 9 dated 6 May 1980

OH-6A-80-02 Maintenance advisory message on tail rotor assembly link configurations

OH-6A-80-03 SOF message on inspection of OH-6A main transmission

OH-6A-80-04 SOF message amendment

OH-6A-80-05 SOF message on recurrent inspection of OH-6A main transmission ring gear bolts

OH-58-80-06 Maintenance advisory message on passenger seat cushions

OH-58-80-07 Maintenance advisory message on OH-58A/C fuel filter pressure switch inspection

OH-58-80-08 SOF message on OH-58A/C fuel system maintenance and operation

CH-47-80-05 SOF message on one-time inspection of CH-47A, B, and C aircraft cargo hook beam tracks

CH-47-80-06 SOF one-time inspection for all CH-47A, B, and C aircraft to inspect flight control rod end bearings

CH-47-80-07 SOF message amendment

CH-54-80-02 SOF message one-time inspection of main rotor blade tapered pins on CH-54A aircraft ■

Selected mishap briefs

uh1 **Class B mishap** □ (H series) Skid settled in hole during touchdown and tail rotor and 90-degree gearbox separated. Pilot picked aircraft up to hover, and aircraft then spun and landed hard. 8052

Class D mishap □ (H series) In cruise flight at 10,200 feet msl, pilot decreased power to correct altitude to 10,000 feet. Three or four muffled explosions from engine area were heard and aircraft nose yawed. N_1 fluctuated and N_2 decreased about 300 rpm. Egt fluctuated between 580 degrees and 610 degrees. Pilot reduced collective pitch and initiated 2,000 fpm descent to 7,000 feet msl. He then increased pitch to test power response. Engine responded normally and aircraft was landed at airfield. Suspect engine compressor stall. Pilot suffered mild hematoma of right ear as a result of rapid descent.

Class E mishaps □ (H series) Pilot heard whistling noise from main rotor blade, followed by severe vibration. Caused by bonding separation. □ (H series) Pilot thought he heard loud air noise during landing. Postflight inspection revealed cracked lower support assembly and broken combustion drain. Engine decking was found to be debonded from heat. Two other aircraft were found with similar conditions, one with a cracked support assembly and combustion case and one with a cracked support assembly. □ (M series) Loud bang was heard during start. Battery had exploded. One battery cell cracked on both sides one-third of the way from the top. Failure is believed to have been caused by faulty cell vent cap which caused cell to crack, spilling electrolyte into battery case. Cell probably cracked during flight, but because of ventilation hydrogen did not reach an explosive level. After aircraft landed and was shut down, hydrogen built up to an explosive level inside battery case. Battery exploded on the next start. □ (H series) During runup, crew chief saw fuel leaking from fuel control filter. Caused by O-ring failure. □ (H series) Copilot allowed aircraft to drift left during takeoff, and main rotor blades hit small tree. □ (H series) As aircraft was landing on incline, passengers, without clearance from crew, jumped out of aircraft from left side, causing aircraft to rock sideways. Copilot allowed aircraft to land abruptly, damaging aft cross tube.

uh60 **Class E mishap** □ No. 2 engine oil pressure dropped to below 30 psi. Caused by failure of scavenge pump.

ah1 **Class B mishap** □ (S series) Pilot heard metal-to-metal scraping sound and loud noise, and engine failed. Autorotation was made. Impact was level, and aircraft skidded about 14 feet. Nose swung 30 degrees left and aircraft came to rest on rocket pod. Engine had disintegrated in flight and tail rotor was damaged from engine debris. Skid was broken and transmission mounts were damaged. 8053

Class C mishaps □ (G series) IP was slowly closing throttle to flight idle after landing. As engine rpm decelerated to 6000, engine and rotor needles remained joined. As engine rpm reached 5500, IP noticed rotor rpm dropping fast. Master caution and transmission oil bypass lights came on and rotor rpm continued to decay. IP heard grinding sound from rear of aircraft and felt feedback in controls. Aircraft was shut down and, as main rotor was coasting down, IP was told his tail rotor was not turning. Inspection revealed No. 2 section of tail rotor drive shaft was broken and No. 3 section deformed. Sprag clutch was firmly locked and no freewheeling action could be obtained when turning system by hand. Caused by sprag clutch failure. □ (S series) At termination of low-level, high-speed autorotation during training flight, right rear portion of aircraft settled more than normal. Pilot lifted aircraft to hover and IP hovered to maintenance area for inspection, which revealed broken right aft cross tube and cracked left cross tube.

ch47 **Class E mishaps** □ (B series) Loud bang was heard, immediately followed by loss of torque on No. 1 engine. Crew chief reported fire in No. 1 engine. Engine condition lever and fire control handle were pulled, and No. 1 fire bottle was selected, extinguishing the fire. About 2 minutes later, fire reignited and No. 2 fire bottle was selected, extinguishing fire. Running landing was made. Engine power wheels disintegrated and blew out of tail cone. □ (C series) No. 1 engine torque dropped to zero during flight. Caused by failure of torquemeter drive assembly. □ (C series) Torque split

occurred during flight. No. 1 torque rose to 100% and rotor rpm increased to 250. No. 1 engine a.c. beep was disabled using disable switch. Torques were matched and rotor rpm stabilized at 235 using No. 1 engine d.c. beep trim and No. 2 engine a.c. beep trim. Landing was made to open field. Caused by failure of adjustable resistor.

oh58 **Class B mishap** ☐ (A series) Aircraft yawed left while flying 40 to 100 feet agl. Pilot tried to correct with pedals. Loud squeal was heard and engine failed. Rpm deteriorated as pilot tried to extend autorotation to open area. Aircraft landed hard and tail boom separated. Engine failure may have been caused by failure of No. 5 or No. 6 bearing. 8054

Class C mishap ☐ (A series) Helicopter settled during NOE hover, and main rotor blades hit tree, damaging both blades.

Class E mishaps ☐ (A series) N_2 dropped to 85% during approach for landing. Power was decreased slightly and N_2 fluctuated between 85% and 103% until touchdown. N_2 then stabilized at 99 to 100%. Pilot beeped up N_2 and could only get a maximum of 102%. Pilot did not have fuel boost pump switch in fuel boost position in accordance with safety-of-flight message. ☐ (A series) Master caution and hydraulic pressure lights came on. Caused by broken wire in hydraulic pressure switch cannon plug. ☐ (C series) As SP was increasing engine rpm with throttle while parking aircraft, engine suddenly quit. This was the third time engine had flamed out under similar conditions in a 9-day period. Probably caused by defective fuel control. ☐ (A series) Fluid and smoke were seen coming from battery vent line. Caused by short in battery.

c12 **Class E mishaps** ☐ (A series) Air leak became apparent around upper right corner of copilot's windshield during climb. Muffled bang was heard after level-off. Postflight inspection revealed windshield sealant had separated from aircraft, creating pressurization leak. Windshields had been changed 3 days before flight. Rain and low temperatures were prevalent during required curing period. ☐ (A series) No. 2 engine fire warning light came on. Caused by moisture on fire detector.

ov1 **Class E mishap** ☐ (D series) Master caution and fuel pump warning lights came on. Caused by failure of forward and aft fuel boost pumps.

u21 **Class E mishaps** ☐ (A series) Fuel was seen coming from right wing during takeoff. Caused by failure of right wing inboard fuel cell at interconnecting line entrance. ☐ (A series) Fuel was seen siphoning from nacelle fuel cap during flight. Caused by improperly secured fuel cap.

Maintenance

uh1 **Class E mishaps** ☐ (H series) Excessive cyclic feedback occurred and loud banging noise was heard during landing. Caused by failure of cyclic servo. Tab lock washer was not installed correctly.
☐ (H series) Pilot heard two loud bangs and aircraft yawed during takeoff. Caused by out-of-rig inlet guide vane actuator.

ah1 **Class E mishap** ☐ (G series) Master caution light came on, followed by No. 1 hydraulic system light. Loud squeal was heard from hydraulic pump. Postflight inspection revealed loss of hydraulic fluid from reservoir. Caused by chafed line.

(continued on back page)

Mishap briefs

oh58 **Class E mishap** □ (A series) Engine failed during shutdown. Pilot verified throttle was at engine idle position. Caused by out-of-rig N_1.

ov1 **Class E mishaps** □ (D series) Icing conditions were encountered and engine deice system was activated. VIDS indicated overtemp of No. 1 engine. Caused by dirty compressor section. □ (RV-1D) Right main gear indicated unsafe when landing gear handle was placed in down position. Visual check indicated gear was down but not fully locked. Attempts to lock gear were unsuccessful. Landing was made holding right main gear off runway as long as possible. Once the full weight of the aircraft was felt on landing gear, right main gear locked in down position, and landing was completed without further incident. Bearing rod end required adjustment.

t42 **Class E mishap** After takeoff, pilot noticed fuel siphoning from left auxiliary tank. Caused by loose seal on fuel cap.

u21 **Class E mishap** □ (A series) During engine runup, pilot noticed there were no temperature indications on No. 1 engine oil temperature gauge. Caused by loose cannon plug.

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

More on skid shoe replacement

The article "What's Going on Here?" in the 25 June 1980 issue listed a TM to refer to for procedures for skid shoe replacement. Paragraphs 3-20 and 3-22 of TM 55-1520-228-23-1 give correct skid shoe replacement procedures.

OH-58 questionnaire reminder

If you're an OH-58 pilot and you haven't filled out and mailed the OH-58 questionnaire on insufficient tail rotor thrust in the 9 July 1980 issue, please do so today. We need this information to develop an emergency procedure to be included in the operators manual.

If you didn't get a copy of the questionnaire or need more copies, write or call the Communication Arts Division, U.S. Army Safety Center, Fort Rucker, AL 36362, AUTOVON 558-4479. ■

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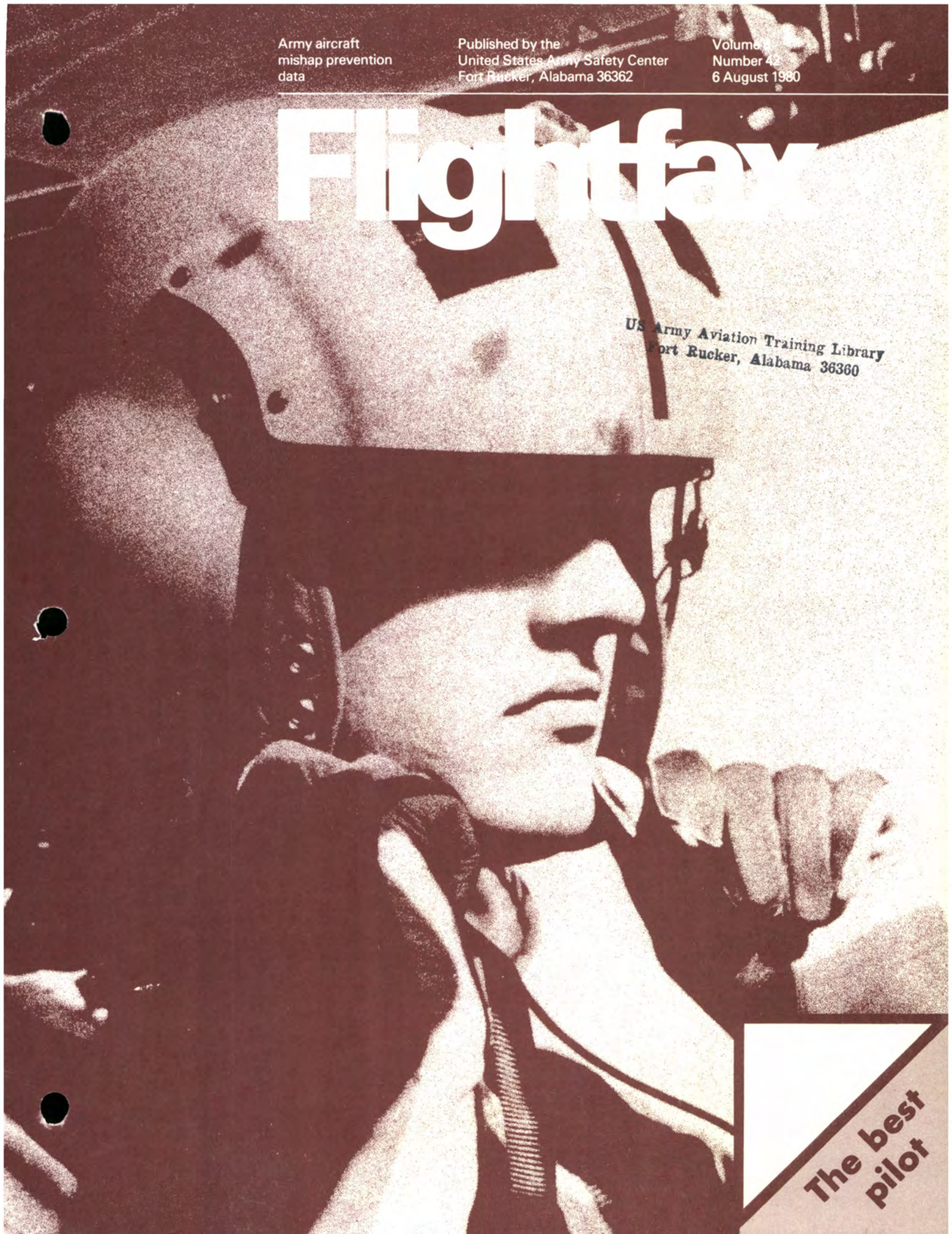


The best pilot

The best pilot in the squadron

Not long ago, as an unproductive hour at the bar wound to a close, several of my flying colleagues and I were gathered around the dregs of the last pitcher, which was rapidly approaching being too flat to drink. As is often the case when aircrewmembers "stand to their glasses," the conversation drifted from war stories through "where is ol' so-n-so," to memories of those no longer with us.

Some had been recruited by the airlines and some had gone to rated sup, but the talk centered on one of our number who had met an untimely end on a desert gunnery range. If there is a special eulogy for pilots, it is not delivered by a chaplain from a pulpit—it is spoken by his messmates in the bar as the happy hour crowd thins out and the beer gets warm. No congregation could be more sad-faced. No higher praise could be given. The ceremony is as predictable as any formal funeral. Sometimes there are even hymns of a sort, and green Nomex is a kind of vestment. It was an unfortunately familiar scene to most of us who had been around for a few years. Inevitably, someone said, "Yeah, he was the best pilot in the squadron." All who knew him nodded their heads in silent accord.

He certainly had been a memorable figure. He had been assigned to standboard as a lieutenant. An academy graduate, his bearing and conduct were exemplary. He knew the operators manual down to the publisher's initials and was an authority on all the "nonboldface boldface" published by the major command on down. Though he got to SEA too late for the hot part of the conflict, he extended until the very end and played a highly decorated part in the evacuations and the Mayaguez affair. He was always chosen to lead the tough missions and earned the total respect of his superiors at all levels. His exploits were legendary. He was the one who went to the development conferences and flew the test program. His physical appearance was striking, he was well ahead in his PME, he was always available when the schedule changed at the last minute, and he more than pulled his weight in the additional duty department. Besides that, he was a nice guy. No one was surprised when he was selected for major below the zone.

He was the best pilot in the squadron.

It does not pay to speak ill of the dead, but wait a minute! If he was so good, why is he dead? At the risk of asking a sacrilegious question, how about those other well-remembered colleagues who have been honored with the posthumous title of "best pilot in the squadron"? Is there something about being the best which is fatal? What good is being the best if it kills you? What good is having the best in the squadron end up in a box when he is needed in the cockpit? Let's take another look at this paragon of pilot virtues.

He was aggressive, ambitious, and confident. These are admirable qualities—in fact, they are requirements for the job. There is, however, an important distinction between confidence and overconfidence, aggressiveness and overaggressiveness, and even achievement may be overdone, or done too fast.

He had required a little command assistance to transition into a new weapons system when he did, and no one was surprised when he got it. That he was killed on a range **was** a surprise. He had a lot of low level experience. He liked being down in the weeds, and he was good at it. The investigators found nothing wrong with the aircraft. It appears that he simply flew into the ground after pulling off the target. He either didn't hear the "knock it off" call or it came too late. In any case, he got low enough to prompt a call and apparently did not react to it prior to impact.

Could there have been a malfunction? He had previously demonstrated exceptional ability to bring the aircraft home when another pilot might have landed at an intermediate point, even though maintenance would have been inconvenient and the squadron would have bought a bunch more down time. He was good enough (and mission oriented enough) to take a bird with minor discrepancies, work around them, and get the job done. He was a mission hacker. "Ya gotta be tough . . ." he had said more than once. It probably wasn't a malfunction. He could have handled any malfunction small enough to be missed by the investigators.

The flight was a late afternoon launch, but there is no reason to believe that he

had been fatigued. He was not a heavy drinking man and he had had no duties which would have conflicted with crew rest. Besides, during the Mayaguez mission he had demonstrated that he could perform when tired. He had flown sortie after sortie, on his own adamant insistence, even though there were more rested pilots available. He kept getting an airplane despite fatigue. After all, he was the best pilot in the squadron, and that was one tough mission. A little fatigue wouldn't have bothered him.

He bought the farm on a checkride, but stress couldn't have been a factor—he always did well on checkrides. In fact, stress may actually have improved his performance. At Kho Tang Island he earned a medal for going in on the hottest objectives. In one case, he went in a third time after being shot off twice. Now, that's stress! No, he was not one to choke under pressure.

In the final analysis the report concluded that the cause of the accident was "pilot distraction" or "disorientation." In other words, what used to be called pilot error. But errors are not something one would expect from the best pilot in the squadron. On the other hand, if he had not "gotten caught," no one would have ever suspected that he had been disoriented or distracted. He had exhibited no such tendencies, or at least none had been recognized.

But it only takes once, and it's hard to make a habit out of having fatal accidents. The diagnosis has to come before the fact in order to do any good, and it's no easy task.

The distinction between the spirit of attack and dangerous lack of caution is not always readily apparent. What passes for aggressiveness may be found to be (or at least labeled) recklessness after an accident. Spirit, however, is a prerequisite, and an excess of caution is self-defeating. A force of timid pilots, reluctant to take any risks, is not acceptable. Neither is a corps with the disdain for death of kamikazes (especially if training flights are required). What is required are pilots with the will to accomplish the task at hand, but the sense to recognize that a given result is not worth the loss of an aircraft and crew. This is especially true in a training environment.

During the early 70's, when Vietnamese aviation cadets were receiving primary training in the United States, one Vietnamese training officer would address each arriving class with the following safety philosophy: Each student must become the best possible pilot. That requires both nerve and skill. Since the mission doesn't end with a single sortie, a good pilot must be available to fight tomorrow. Good pilots bring both themselves and their airplanes home. Dead pilots are bad pilots. The loss of an airplane in training is as detrimental to the war effort as a direct hit from an SA-7. Sometimes it takes nerve to refuse an aircraft or abort a mission. That's part of what it takes to be a good pilot—nerve.

So what does this have to do with the pilot who is the subject of this tale? Little or nothing. Flying safety lectures will do him no good now and apparently didn't do him enough good when he was alive.

All those monthly meetings, special briefings, and bulletin boards weren't enough to keep him alive. Neither were his skilled, highly trained hands and feet, vast knowledge of regulations and procedures, or extensive experience. For all his education, ability, and desirable attributes, his final professional act was costly and wasteful. He destroyed a valuable aircraft and killed its pilot. At the very best, he did not prevent the loss, and he was the last person who could have done so.

The best pilot in the squadron? He's still in the squadron. He, too, knows the books, has the skills of a brain surgeon, and reeks of moxie, but he comes home with his airplane intact. Maybe it's that little bit of extra for Mom and the safety officer. Who knows? One thing is for certain though. The best pilot in the squadron will get the job done without unnecessary losses. While he's there to fly and fight, he knows that broken birds stay on the ground and dead pilots don't defeat anybody.

The pilot's epitaph will, unfortunately, be occasionally intoned in the bar while the ice melts and the happy hour crowd drifts out the door with the smoke. It's a traditional way to honor our dead. But in the meantime, let's be honest—here's to the real best pilot in the squadron. The one who's still with us. ■

—from AEROSPACE SAFETY

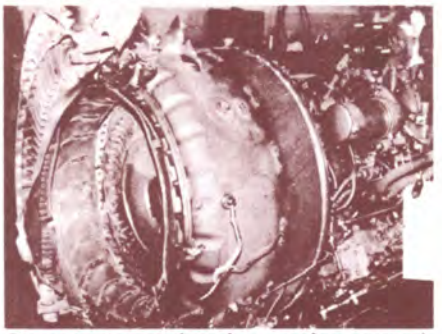
Improper maintenance causes engine explosion

A CH-47 with an 11,000-pound slingload was on final approach to a hillside LZ. Suddenly, there was a loud bang and the aircraft jolted violently. The No. 1 engine fire detection light came on, all No. 1 engine instruments went to zero, and there was a noticeable loss of power from the No. 1 engine. The pilot jettisoned the external load and immediately began to descend. The crewmember in the back told the pilot there was a fire in the No. 1 engine area. The pilot secured the engine, pulled the No. 1 fire control handle, and selected the fire bottle. The fire was extinguished. A single-engine landing was made and the aircraft was shut down.

Inspection revealed that the No. 1 engine had exploded, causing damage to four rotor blades and the aft pylon area.

The engine was sent to Corpus Christi Army Depot for analysis. Inspection showed that the third and fourth power turbine discs, four and five bearing package, and a portion of the power output shaft had exited the engine. It was also found that the power output shaft had failed at the forward splined area where the engine transmission quill shaft is installed. However, this failure was different from the other failed portions of the shaft in that there were signs of fatigue in the splined area. Further investigation showed that a capscrew had not been removed from the engine as required for proper engine/engine transmission interface.

This caused a misalignment of the quill shaft and the power output shaft which resulted in torsional cyclic loading on the power output shaft splines. Eventually, the power output shaft failed. Once the shaft sheared, the engine went into an uncontrolled overspeed condition because the N_2 governor drive gear disconnected. That's the point where the power turbine section exited the engine.



Damage to combustion section caused by third and fourth power turbine discs exiting engine.

The requirement to remove these capscrews for engine transmission installation is clearly spelled out in par. 6-129(d), page 6-104, and fig. 6-64, page 6-105 of TM 55-1520-209-23-2, and in par. 6-131(f), page 6-110, and fig. 6-65, page 6-112 of TM 55-1520-227-23-2.

The crewmembers of the CH-47 were extremely lucky. Most of the engine parts that exited went away from the aircraft and the fire was contained to the No. 1 engine area.

This is another good example of the importance of by-the-book maintenance.

Point of contact at the Army Safety Center is SFC James Wheeler, AUTOVON 558-4202/4198. ■

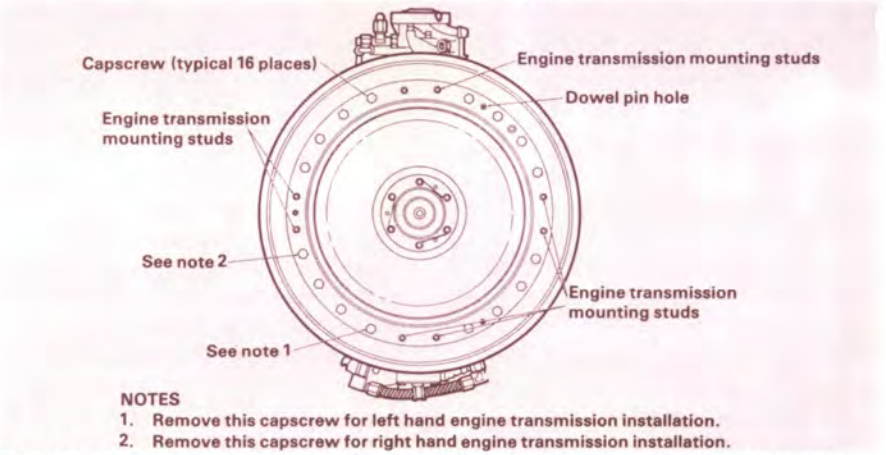


Figure shows capscrews (see notes 1 and 2) which must be removed for proper engine/engine transmission interface.

More on OV-1 lapbelt hazard

A potential hazard exists on OV-1/RV-1 aircraft because of the length of the aircraft seatbelt. A recent PRAM indicated that a precautionary landing occurred because the free end of the pilot's lapbelt was locked in the aircraft canopy and hanging outside.

The lapbelt in question is part of the pilot's parachute harness which he wears and which becomes part of the ejection seat when fastened. When the lapbelt is pulled snug, surplus webbing several inches long extends from the buckle. This length of belt, if locked in the canopy, may prevent successful ejection by twisting the seat on the rails, causing the occupant to strike an overhead structural member, or by reducing the seat velocity below that necessary to clear the aircraft. In an ejection sequence, the pull of the lapbelt end could cause severe injury by causing the belt to tighten across the abdomen with explosive violence.

The aircraft canopy cannot be opened in flight. If attempted, the slipstream would rip the canopy from its hinges and throw it into the propeller. Thus, if a lapbelt is inadvertently locked in the canopy it cannot be freed in flight.

It is recommended that the installation of the lapbelt in each harness be checked to insure that the belt length is appropriate for the crewmember. DARCOM recommends the excess length be folded and tack stitched to prevent any possibility of the belt getting caught in the canopy. ■

Upcoming training exercises

With several training exercises coming up, we thought the following message distributed last September by USAREUR was worth repeating.

"With the fall exercises about to take place, everyone involved with Army aviation must make the prevention of mishaps a prime consideration. Listed below are areas where emphasis should be placed:

• "Wire strikes are a primary cause of Army aircraft mishaps. High speed at low level is the real hazard. Pilots must constantly be reminded to fly slowly enough for conditions while terrain flying.

• "Crew rest policies are established by aviation unit commanders. They must be adhered to by all personnel, particularly during periods of field duty. Changes in eating and sleeping habits in the field environment play an important role. Fatigued personnel can become a real hazard when it comes to maintaining, fueling, and flying aircraft.

• "Respect the weather. Fall is a time of reduced visibility in fog and rain, in addition to the possibility of icing. When the weather gets too bad, land the aircraft and wait it out.

• "Certain operations will have a large number of aircraft operating in a relatively small area. The 'see and be seen' concept can avoid your running into someone else.

"Mishap reporting in accordance with AR 385-40 and AR 95-5 is required both in garrison and the field environment. Safety officers should insure procedures are established to comply with these requirements.

"Realistic training can be safely accomplished. Application of sound accident prevention principles, in all phases of operation, will conserve equipment and personnel resources." ■

Selected mishap briefs

uh1 **Class C mishaps** ☐ (M series) Crew chief saw smoke coming from vent during 2-minute cooldown. Battery overheated, melted, and was destroyed. ☐ (H series) As aircraft was entering airport traffic area, large number of birds was seen. Copilot turned on landing light as recommended by FAA for bird strike avoidance. Aircraft flew through an area apparently clear of birds. Large buzzard hit copilot's upper window, breaking windshield and greenhouse and buckling structural member between windshield and greenhouse. Pilot avoided eye injury by wearing his visor down.

Class E mishaps ☐ (H series) Engine oil temperature rose in excess of 100° C. after topping check was completed. Caused by failure of oil cooler impeller turbine. ☐ (H series) Loud explosion was heard and aircraft yawed left and began to lose altitude on short final for landing. Copilot applied right pedal and collective to cushion aircraft. Caused by engine failure. ☐ (H series) With copilot at controls, aircraft was being positioned to parking area for equipment pickup. Because of blowing sand, copilot initiated forward movement and increased collective to climb to about 10 feet. Before reaching 10 feet, left pedal hit stop and aircraft started slow turn to right and began settling. Copilot increased collective abruptly to arrest sink rate, increasing rate of turn. As aircraft passed through 330 degrees of first revolution, pilot took control. Aircraft completed four revolutions before pilot regained control. Torque exceeded 55 psi for 3 seconds. ☐ (H series) Rotor rpm decreased during simulated engine failure. Caused by defective free-wheeling unit. ☐ (H series) During 180-degree practice autorotation, rotor rpm increased to 358-360 before being noticed by IP or pilot. Overspeed inspection is being performed.

ah1 **Class C mishap** ☐ (S series) Aircraft landed hard during demonstration of standard autorotation, damaging landing gear cross tube and transmission mount.

Class E mishaps ☐ (S series) Cool air was not reaching cockpit from ECU. Caused by slipping ECU impeller shaft. ☐ (S series) Engine oil pressure light came on. Caused by failure of pressure transmitter. ☐ (S series) Master caution and No. 2 hydraulic lights came on. Caused by failure of hydraulic pressure switch. ☐ (S series) Master caution and transmission oil hot lights came on. Caused by failure of oil cooler annular ball bearing.

ch47 **Class E mishaps** ☐ (A series) Crew smelled hydraulic fluid immediately after takeoff and crew chief saw fluid leaking from around forward transmission soundproofing cover. Caused by failure of hydraulic filter O-ring. ☐ (B series) No. 2 engine N_1 and torque dropped to zero during hover. Caused by failure of fuel control. ☐ (C series) Pilot saw hydraulic fluid spraying onto center console and then noticed loss of hydraulic pressure on No. 2 system. Caused by cracked hydraulic fitting. ☐ (C series) No. 1 engine oil temperature went over red line and bounced back to normal. Caused by short in engine electrical cable assembly. ☐ (C series) During approach, No. 2 engine torque needle remained static as thrust rod was moved. Caused by failure of torquemeter transmitter.

oh6 **Class E mishaps** ☐ Aircraft hit wire during approach to landing at refueling site. ☐ Seagull flew through pilot's windshield as aircraft was flying at 1,000 feet and 90 knots.

oh58 **Class E mishaps** ☐ (A series) IP smelled oil during takeoff, returned to airfield, and landed. Oil was flowing out of engine compartment drain line. Pilot had improperly secured chip detector for free-wheeling unit, causing it to work out. ☐ (A series) During low-level autorotation, normal deceleration was insufficient to slow forward speed. Deceleration was increased. Initial pitch was applied at 10 feet and ground speed was reduced. As aircraft was leveled for touchdown, it began to accelerate. Cushion was applied. Aircraft touched down with ground speed above 5 knots and less than 225 rotor rpm. Spike knock occurred. Tower was reporting winds as calm. IP and pilot estimated 10-knot tailwind with gusts. As aircraft was leveled, IP felt tailwind gust. ☐ (A series) Master caution and fuel boost pump lights came on. Caused by failure of fuel boost pump.

c12 **Class C mishap** ☐ (A series) Pilot heard loud noise during engine runup. Engine was shut down and damage to propeller and fuselage was found. Small rock was found in area that matched damage marks on propeller and fuselage. ☐ (A series) Aircraft was being maneuvered between two cells 20 miles apart when it was struck by lightning.

Damage consisted of two holes in top of elevator, two holes in trailing edge of right flap, several small nicks in right propeller, and burned static wick on elevator.

Class E mishap ☐ (A series) During emergency gear extension practice, pilot pumped gear down until receiving three green gear-down lights. On cleanup, gear would not raise. Gear handle was recycled. Postlanding inspection revealed landing gear emergency extension switch assembly was still slightly activated, preventing operation of landing gear relay for up cycle. If engage handle had been moved about 1 inch further, switch would have been deactivated.

u21 **Class C mishap** ☐ (RU-21H) Aircraft was on low-level training flight. Flock of large birds suddenly appeared in flight path. Two of the birds hit right wing leading edge, causing too large dents.

Maintenance

uh1 **Class E mishaps** ☐ (H series) Engine oil temperature passed through red line and egt was higher than normal during cruise flight. Loose P-3 air line to oil cooler was caused by loose lock nut. ☐ (JUH-1) Following runup, check was made to investigate transmission oil seep. Technical inspector noticed a metal component flapping. Further investigation revealed right rear transmission damper mount was broken. Forward mounting screw was not installed in mounting bracket.

ah1 **Class E mishap** ☐ (G series) As aircraft was being refueled at field site, crew noticed strong smell and saw fumes and electrolyte spewing from vents and from inside front battery compartment. Caused by improperly set voltage regulator.

ch47 **Class C mishap** ☐ (C series) Torque split 15%, N_1 split 5%, and rotor rpm dropped from 235 to 225 during landing. As aircraft was taxiing to parking area, loud popping noise was heard from No. 2 engine. Engine nose box cowling hinge pin came loose and was ingested into engine.

Class E mishaps ☐ (C series) Aft transmission pressure fluctuated 10 psi, accompanied by high frequency vibration throughout aircraft. Aft transmission had previously been drained and flushed for water contamination. Transmission oil system had not been completely filled before runup. High frequency vibration was caused by improper aircraft washing procedures. Water was allowed to accumulate in rotor drive shaft. ☐ (C series) Crew chief noticed oil leak in aft transmission area during takeoff. Caused by loose transmission oil supply line lower fitting.

oh58 **Class E mishaps** ☐ (A series) Amp gauge would not decrease below 40 amps during shutdown. Pilot saw steam coming from battery vent. Caused by improperly adjusted voltage regulator. ☐ (A series) Pilot noticed d.c. amp gauge at 50 amps during cruise flight. Voltage regulator check had not been made after previous thermal runaway. Wire was broken to a.c. fail relay. ☐ (A series) Tail rotor thrust was lost during hover, followed by engine surges. Torque varied from 10 psi to 70 psi. Aircraft became uncontrollable and hovering autorotation was made. Lint particles were found in fuel shutoff valve.

c12 **Class E mishap** ☐ (A series) When landing gear was lowered for landing, it jerked and entire aircraft shuddered. Left main gear light did not come on. Gear handle in-transit light remained on. Gear handle was raised and gear retracted normally. Gear was lowered again, with similar noises and shuddering. Three green lights came on and in-transit lights went out. Postflight inspection revealed loose wire on down-limit switch allowed landing gear to start and stop. Screw holding wire was probably not tightened during installation of new gearbox assembly 2 weeks before.

(continued on back page)

Mishap briefs

Messages received

• Safety-of-flight-message concerning UH-60A tail wheel bearings (UH-60A-80-30, 301510Z Jul 80). Summary: The tail wheel bearings of Black Hawk aircraft have been found with no grease, rust, and excessive wear. Message gives special inspection procedures for tail wheel bearings. Contact: Frank Hunleth, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• Safety-of-flight message concerning one-time inspection of all CH-47A/B/C aircraft to inspect engine transmission installation (CH-47-80-08, 232200Z Jul 80). Summary: A recent CH-47C accident resulted from fatigue failure of the engine output shaft. Failure was caused by improper installation of the engine transmission, i.e., the proper capscrew was not removed from the engine/transmission interface before the transmission was mounted. Engine/transmission interface will be inspected for proper assembly. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight message concerning one-time inspection of all CH-47A/B/C aft transmissions (CH-47-80-09, 302010Z Jul 80). Summary: This inspection is to locate aft transmissions with improper self-locking nuts. Those transmissions with improper self-locking nuts are to be removed from service. Contact: Ron Desplinter, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396.

• Safety-of-flight message concerning one-time inspection of UH-60A pressure refueling receptacle bolt torque (UH-60A-80-31, 011900Z Aug 80). Summary: Several instances of fuel leaks around pressure refueling receptacles because of improper torquing of bolt have been reported. TM 55-1520-237-23-6 gives incorrect torque value. Bolts will be inspected by checking torque to 43-48 inch pounds. Contact: Charles Vanartsdalen, AVRADCOM, AUTOVON 693-1661, commercial 314-263-1661.

• U-21/RU-21/UV-18 information message concerning rigging of propeller reversing interconnecting linkage (281915Z Jul 80).

• C-12/U-21F information message concerning installation of a moisture sealed oxygen control cable (281900Z Jul 80).

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

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Putting safety in FTXs

Realistic planning for realistic training

Today, more than ever before, Army tactical aviation units are training in all-weather, all-terrain field environments. And because the Army must be prepared to fight anywhere in the world, field training exercises are conducted in European, Arctic, jungle, and desert conditions. These exercises provide variety and challenge to participating units.

They also provide a variety of new hazards when units move their operations from familiar home installations to new and strange locations.

Many of the risks and inherent dangers of realistic training which are handled routinely and with ease at home can quickly become major safety problems in another training area. Successful management of these "away from home" risks calls for more planning up front, before you get to the field. To do this, you need to know the recurring problems common to previous exercises, particularly those conditions in exercise areas similar to the one you'll be going to.

Safety Center teams have actively participated in many major field training exercises. Based on lessons learned in the field, we have developed some recommendations which, if used during preexercise planning, can put a lot of safety in the exercise without compromising training benefits or inhibiting realism.

• Before going to the training area, study the geographical environment. This includes analyzing the terrain to determine its effects on operations. For instance, in the Mojave Desert, terrain gradually, but not noticeably, slopes from basins upward to mountains. Aircraft flying toward hill masses must constantly add power to maintain terrain clearance. A good terrain analysis must also include a review of climatological data to determine the type of weather to be expected at the exercise area. Not only is it good to know whether it will be hot or cold, wet or dry, but expected wind conditions and nightly illumination are essential items of information. The Safety Center can help by providing what we call a hazard analysis of the area, a listing, in narrative form, of all mishaps that have occurred at the exercise area. This list can be used to determine peculiar aspects of the area that contributed to previous mishaps. This, combined with a geographic analysis, weather data, and information obtained from other safety officers stationed at the exercise area can be a valuable planning tool for exercise mishap prevention.

• If possible, before the exercise, coordination should be made with local civil and/or military emergency authorities to inform them of your presence in the area and your possible needs and to learn where they are and how to contact them. State and local police can also help with convoys and motor vehicle emergencies.

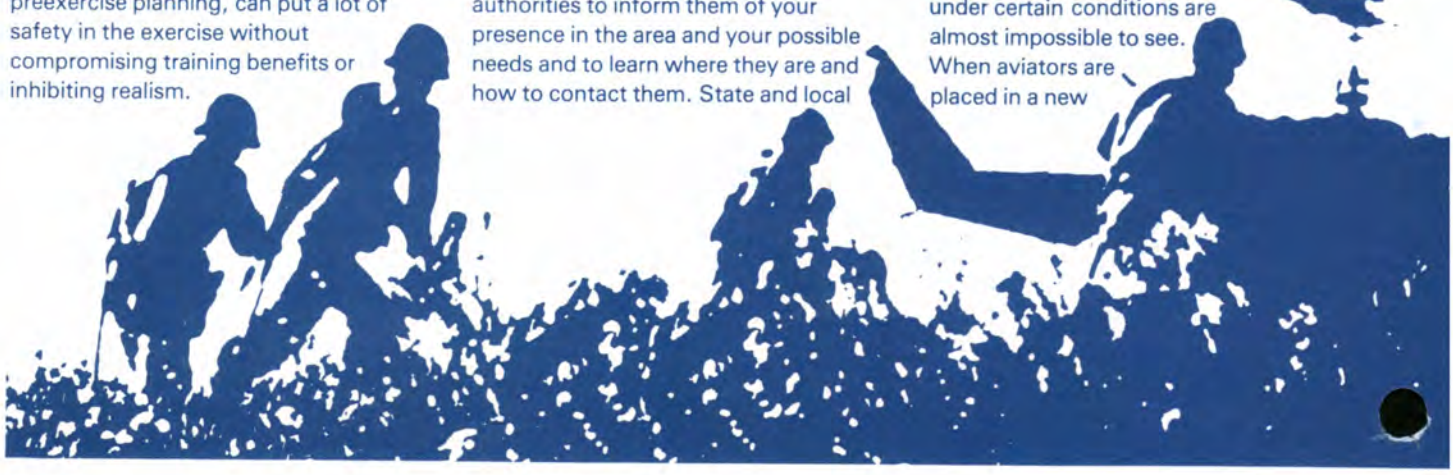
• Preexercise coordination should include the FAA if your operations will significantly increase the air activity in the area.

• Marginal weather conditions or high winds are common in many training areas. Preexercise planning should include measures to obtain timely, accurate weather data.

• Exercise preparation should also include preparing your equipment, i.e., stoves for cold areas, waterproofing for wet areas, overwater or desert survival gear, dust masks, etc.

• Air traffic control elements should coordinate procedures, frequencies, flight operations, and emergency procedures with all participating aviation units. This information should be written out and a copy given to every aviator—then every aviator must comply with it.

• Wire strikes are a constant hazard not only during training exercises but wherever Army aircraft operate. We average about one every two weeks and have for the past nine years. Wires are hard to see anytime and under certain conditions are almost impossible to see. When aviators are placed in a new



environment, they are not familiar with the terrain and don't know wire locations. When flying in an unfamiliar area, pilots must use accurately posted hazard maps and constantly be on the lookout for unplotted hazards.

• Along with wire strikes, flying at high airspeeds, speeds excessive for conditions and mission, has been a recurring problem. Risks multiply as speed is increased at terrain flight altitude for obvious reasons. Most flight hazards are close to the ground, and the distance it takes to react to hazards such as wires, dead trees, or equipment malfunctions greatly increases as speed increases. During all terrain flight and especially over unfamiliar terrain, pilots should go slower as they go lower.

• Task saturation of pilots, especially OH-58 pilots, continues to be a problem.

In an unfamiliar area, pilots must rely on their maps for navigation and for spotting hazards. Flying at terrain flight altitudes, navigating on the map, monitoring instruments, and tuning or talking on the radio simultaneously is more than a single pilot can normally be expected to do well or safely, especially at night. A **qualified** observer is required for terrain flight. If the observer cannot adequately navigate, operate radios, monitor aircraft instruments, etc., then two pilots should be considered for the mission.

• Crew rest also becomes a critical safety consideration in the field when units fly more than normal. Frequent missions, 24-hour-a-day operations, and unfamiliar environmental conditions all contribute to fatigue. Also contributing to the fatigue factor is the fact that in the field crews often don't eat regular, nourishing meals. Contrary to past years, most of our flying today is done at terrain flight altitudes which require the constant attention of the crew. Inattention for even an instant can be catastrophic. Commanders must insure crews get adequate rest and eat regular meals.

• Another area where additional planning is needed is refueling operations. Rapid refueling presents two major hazards—the danger of fire caused by static electricity and fuel contamination. Common hazards are poor grounding systems, fuel spills, uncovered nozzles, no protective equipment for refueling personnel, leaks, and "jury-rigged" systems. Field refueling sites must be closely checked to insure they are safe for both the operators of the site and the equipment and crews that use it. This can be an extremely hazardous area without NCO supervision at all times. Insure that adequate protective clothing and equipment is available and used by POL handlers, and that adequate grounding is available and used every time an aircraft is refueled. Fire extinguishers should be checked before the field problem begins. They should be fully charged and the proper type to extinguish a POL fire. Fuel sampling and testing procedures should be established to detect contaminated fuel before it is put in the aircraft.

These are some of the things that can help prepare a unit for operations in an unfamiliar area. The lessons learned are also applicable to operations at home. The Safety Center can help with many of the tasks suggested. We have a vast amount of information in our data base and files which can help in preexercise planning. We can also provide, on request, an observation team for major exercises or Reserve component annual training when such participation is approved by the major command.

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

Followups

Additional information on mishap briefs previously published

oh58 **Class A mishap** in 6 Feb 80 issue (8021) ☐ Shortly after takeoff, pilot inadvertently entered IMC, became disoriented, lost control of aircraft and crashed. Pilot and two passengers were killed. Pilot was apparently unfamiliar with instrument recovery procedures, and there was no copilot on board to help perform various cockpit tasks. Pilot had logged only 1 hour of hooded flight in the OH-58. The absence of an RMI, which had been removed for maintenance, may have contributed to the disorientation problem.

Class B mishap in 26 Mar 80 issue (8032) ☐ Pilot was making altitude over airspeed takeoff. About 75 feet agl, pilot inadvertently increased collective pitch until engine power applied exceeded available tail rotor authority, causing aircraft to yaw and turn to right. As climb continued, left pedal was increased until full travel was reached, and aircraft began slow spin to right. Pilot failed to recognize loss of tail rotor authority until spin accelerated. When pilot recognized the emergency, he followed the turn, lowered the nose, and reduced collective pitch to try to fly out of the turn. Pilot was not knowledgeable of certain aircraft limitations because of inadequate standardization training by the unit supporting his aviation training needs.

Class B mishap in 14 May 80 issue (8037) ☐ As pilot was making terrain flight approach to tactical field site, he abruptly applied right pedal and right cyclic at an altitude of 15 feet agl. The abrupt 140-degree right turn, with little or no forward speed, placed the aircraft in an approximate 10-knot downwind condition. This improper flight control input resulted in the aircraft settling with power. Pilot was unable to stop descent, and aircraft landed hard.

t41 **Class C mishap** in 6 Feb 80 issue (8024) ☐ Aircraft landed short during simulated obstacle clearance short field landing. Nose wheel hit asphalt berm located on overrun and separated from shock strut. IP, seeing that the pilot's simulated obstacle clearance approach was well short of the intended touchdown site, did not take action to modify the approach. The training facility being used was neither adequately controlled nor maintained.

ov1 **Class A mishap** in 28 Nov 79 issue (8010) ☐ About 16 minutes into training flight, aircraft crashed in wooded area. Pilot did not eject and was killed. Definite cause of mishap could not be determined.

u21 **Class B mishap** in 27 Feb 80 issue (8027) ☐ Right wheel of aircraft hit snow/ice ridge on runway and was torn off. Go-around was made and, about an hour later, aircraft was landed gear-up on foamed runway. Pilot had unknowingly changed his intended point of touchdown from the runway touchdown markings, located 520 feet from the approach end of the runway, to the threshold markings, located 20 feet from approach end of runway. Air traffic controller did not tell crew that the first 500 feet of the runway was closed because of snow and ice. The sleeve bushing in the upper knee landing gear assembly was not installed, and the impact with the ridge caused the assembly to fracture. Right main tire then turned inward and the overstressed drag strut failed. ■

Recap of TSARCOM messages

Following is a list of AIG 8881 addressed messages for the OV-1 and U-21 aircraft and general messages transmitted by TSARCOM (DRSTS-M) from 1 April through 30 June 1980.

OV-1-80-3 Maintenance information message for all OV-1/RV-1 series aircraft concerning ejection seat drogue gun installed life extension

OV-1-80-04 Maintenance advisory message for OV-1 and RV-1 series aircraft on correction of change 2 to TM 55-1680-308-24

OV-1-80-05 Maintenance information message for all OV-1/RV-1 series aircraft on additional installation instructions for kit 1A/TSEC

OV-1-80-06 Maintenance information message on operational instructions for operation of OV-1D/RV-1D series aircraft with vertical instrument display system installed

OV-1-80-07 SOF message on one-time inspection for all OV-1B, OV-1C, OV-1D, and RV-1D series aircraft fuel systems for contamination

OV-1-80-08 Change to SOF message on one-time inspection for all OV-1B, OV-1C, OV-1D, and RV-1D series aircraft fuel systems for contamination

U-21-80-05 Maintenance advisory message on T74-CP-700 engine performance checks

GEN-80-05 Maintenance advisory message on amendments to TM 38-750

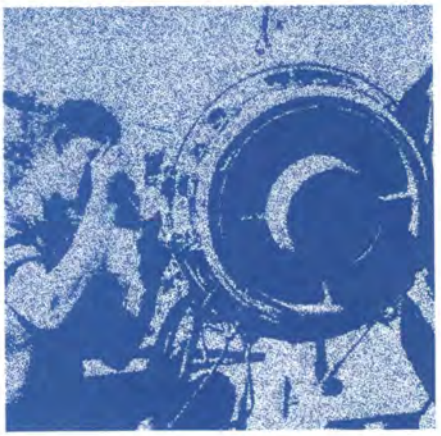
GEN-80-06 Maintenance advisory message on accidental servicing of automotive engine oil into aircraft turbine engines

GEN-80-07 Maintenance advisory message on change to calibration requirements for all fuel quantity testers

GEN-80-08 Not transmitted

GEN-80-09 Maintenance advisory message on clarification of AR 95-16 concerning weighing of new Army aircraft

GEN-80-10 Maintenance information message for all Army aircraft lap seatbelt integrity



GEN-80-11 Safety of personnel and equipment inspection intervals for survival kits and survival vests

GEN-80-12 Safety of personnel and equipment SOF for all aircraft operations using family of helicopter slings

GEN-80-13 Maintenance advisory message on paint, aircraft, crew, interior black

GEN-80-14 Maintenance advisory message concerning helicopters operating in a volcanic ash environment

GEN-80-15 Safety of personnel and equipment inspection intervals for survival kits and survival vests

GEN-80-16 Maintenance advisory message concerning retrograde of engines and dynamic components

GEN-80-17 Safety of personnel and equipment removal of 5-year installed service life on aircrew restraint equipment

GEN-80-18 SOF operational preventive maintenance in volcanic ash environment for all exposed Army aircraft

GEN-80-19 Message will be listed in next quarterly report as it went out in July

GEN-80-20 SOF message maintenance notice on aircraft altimeters, three pointer and counter drum pointer type (message was delayed before being transmitted) ■

Selected mishap briefs

uh1 **Class B mishap** ☐ (H series) During maintenance recovery flight from earlier precautionary landing, N_2 began to bleed off. Pilot lowered collective and went to full rpm increase, and N_2 continued to bleed off. Aircraft yawed left and right. Pilot had 23 to 24 pounds of torque and N_2 was noted at 7200 rpm. Collective was increased and throttle rolled off. Pilot entered autorotation and had to make right turn to landing area. He saw what he believed to be wires and adjusted course, crossing small trees. Aircraft then landed hard. 8055

Class C mishaps ☐ (H series) As aircraft was being hovered backwards and nose was turned left to enter taxiway, aircraft began to yaw to left and right. Collective was lowered and throttle retarded to flight idle. Aircraft landed hard, spreading cross tubes. ☐ (H series) Pilot in right seat was running up engine. Inverter check was being made with engine rpm at 6600. Voltmeter indicated 110 volts so pilot tapped the gauge. As he drew back his hand, the cuff of his glove caught on the emergency governor switch. Pilot and copilot heard engine accelerate and rolled off throttle. Engine rpm exceeded 7200.

Class E mishaps ☐ (H series) Crew had difficulty bringing aircraft to hover with 45 psi torque. On second attempt, skis came loose from mud. Aircraft had been landed in 3 to 4 inches of mud with ski-equipped skids. Postflight inspection revealed cracked right rear saddle strap. ☐ (H series) Cockpit filled with smoke and flames shot up from front of console. Pilot entered autorotation and turned off all electrical power and fuel. After aircraft was landed, fire extinguisher was used to put out fire. Solenoid relay had caught fire. **Well done to the crew for this successful landing.** ☐ (H series) Flight controls became stiff and cyclic started to go to right during night flight. Hydraulic and master caution lights came on. Aircraft became uncontrollable and IP, assisted by student, landed in open field, using landing light. Caused by failure of preformed packing O-ring. ☐ (H series) Master caution and hydraulic pressure lights came on. Running landing was made on dirt road. Caused by failure of right cyclic servo irreversible valve. ☐ (H series) Engine oil temperature exceeded 150° C. Caused by failure of thermal bypass valve. ☐ (H series) Loud noise was heard during hover, and aircraft shuddered. Compressor section of engine had foreign object damage. ☐ (H series) Pilot saw fumes coming from top battery vent. Caused by thermal runaway of battery. ☐ (H series) Fuel gauge went from 1,000 pounds to 1,600 pounds very rapidly during rapid refueling operation. Engine and rotor rpm decreased, engine oil pressure dropped to zero, and engine quit. After coastdown, crew took fuel samples from aircraft and fuel hose and found large quantity of water in system. Fuel bladder at rapid refueling point had split open the previous day, and fuel had filled protective berm and mixed with water from heavy rains. Unit was trying to pump contaminated fuel to 5,000-gallon tanker using pump and filter separator at the site. Before refueling operations were begun, system was purged with clean fuel. Apparently, filter separator had become full of water and water float ball failed to function with excessive amounts of water being pumped with clean fuel into aircraft.

uh60 **Class E mishaps** ☐ During runup, as No. 2 engine was advanced, engine-out audio came on. Attempted restart resulted in only 27% NG. No. 1 engine was put to crossfeed and then quit 20 seconds later. Caused by vapor lock in hydromechanical unit. ☐ No. 1 engine lost power in flight and single-engine landing was made. Engine was replaced. ☐ Master caution, No. 1 and No. 2 generator, No. 1 and No. 2 converter, and a.c. essential bus lights came on. No. 1 generator was replaced, and wiring to No. 2 generator was repaired.

ah1 **Class E mishaps** □ (G series) Engine flamed out after 200 pounds of fuel were added. Caused by excessive water in 10,000-gallon bladder. Sight glass in filter/separator indicated water level exceeding limits of sight glass. POL handler was unaware of the hazard of this condition and failed to take proper action. □ (S series) Postflight inspection at field site revealed about 8 inches of main rotor rubberized erosion guard was missing. Caused by failure of bonding material. □ (S series) Loud grinding noise was heard and high frequency vibration was felt in pedals. Alternator and rectifier caution light came on, and alternator and rectifier went off line. Caused by failure of alternator.

ch47 **Class A mishap** □ (C series) Power loss occurred during flight and aircraft crashed in trees. One fatality, one major injury, and two minor injuries. 8056

Class D mishap □ (B series) About 3 seconds after APU was shut down during engine runup, No. 1 and No. 2 flight boost lights came on, followed by loud banging noises from aft cabin area. Engines were shut down and crew exited. Caused by sheared generator shafts and failure of APU motor pump and aft transmission. IP sustained slight injury to leg and ankle during egress.

Class E mishaps □ (C series) Transmission oil pressure dropped to 0 psi and low transmission pressure light came on. Caused by failure of forward transmission oil pressure transducer. □ (C series) Transmission oil temperature rose to 135° C. and transmission oil hot light came on. Caused by short in wire to temperature bulb.

ch54 **Class E mishaps** □ (A series) First stage servo light came on and pressure indicator dropped to zero. Caused by failure of first stage servo. □ (A series) First stage hydraulic light came on and pressure dropped to zero. Failure of hydraulic manifold caused severe leak.

oh6 **Class E mishap** □ Ammeter went from 0 to 50 amps during hover. Caused by battery failure.

oh58 **Class C mishap** □ (A series) Pilot heard noise during flight that sounded like a seatbelt hanging out door. Pilot landed in field and copilot got out to investigate. After determining seatbelt was not the cause of the noise, copilot walked away from aircraft. As copilot was returning to aircraft, main rotor blade hit his head. Copilot's helmet was destroyed and main rotor blade was slightly damaged. Copilot received minor head injuries. Uneven terrain, tall grass, and possibly an unlevel rotor disc may have contributed to mishap.

Class E mishaps □ (A series) Engine oil pressure gauge dropped to 20 psi during flight. Oil pressure adjustments could not be properly performed because plunger and valve seat that controls pressure were damaged. □ (C series) Five minutes after takeoff, engine oil temperature climbed to 155° C. Caused by failure of engine oil temperature/pressure gauge. □ (A series) During HIT check, aircraft indicated 31° C. high above baseline. Caused by excessive air leak at compressor mounting flange.

c12 **Class E mishap** □ (A series) Autopilot trim fail light came on. Attempts to reengage autopilot were unsuccessful. When manual trim was applied, it was found to be frozen near zero trim indication. Caused by failure of electric elevator trim servo clutch to disengage.

ov1 **Class E mishaps** □ (C series) Torque pressure and oil pressure were lost on takeoff. Single-engine landing was made. Caused by ruptured oil line. □ (D series) No. 1 fuel pressure light came on during landing. Caused by failure of fuel control.

t42 **Class E mishap** □ Left cowl flap was closed as aircraft reached 5,000 feet. Hinge on left outboard engine cowling broke and cowling separated from forward fasteners. Cowling remained attached to aircraft by two rear fasteners. Throttle on left engine was retarded to idle, airspeed was slowed to 100 knots, and aircraft was landed.

u21 **Class C mishap** □ (A series) Main gear collapsed during landing. Main gear lights indicated in-transit.

Class E mishaps □ (A series) Landing gear cycled halfway up on takeoff and would not recycle. Gear was lowered manually. Caused by failure of gear motor. □ (A series) As aircraft was taxiing to runway, IP noticed what appeared to be fuel coming from top of right nacelle around structural panel. Panel had filled with water from heavy rains. □ (A series) Right main landing gear down light went out during final approach for landing. Go-around was made and gear was recycled three times. All gear position lights came on, and aircraft was landed. Inner portion of down-lock switch on right main gear was dirty. *(continued on back page)*

Mishap briefs

Maintenance

uh1 **Class E mishaps** ☐ (H series) After aircraft was landed, fumes were seen coming from battery compartment. Battery had overheated. Voltage regulator was set too high for outside temperature. ☐ (H series) While climbing to 3,000 feet, pilot lowered collective to maintain altitude. Three loud bangs were heard from engine. Caused by out-of-adjustment engine inlet guide vanes. ☐ (H series) During hot refueling operation, copilot saw hydraulic fluid dripping from underside of aircraft. Fluid was leaking from hydraulic filter. O-ring on filter was crimped.

uh60 **Class E mishap** ☐ APU was started for normal shutdown, then stopped due to mission requirement. Two minutes later, pilot noticed backup pump and accumulator low lights were still on. Aircraft was returned to airfield where it was shut down without a.c. electrical power since APU would not crank. Caused by loose depressurization valve cannon plug.

ch47 **Class E mishaps** ☐ (B series) No. 1 engine fire warning light came on. Fire sensing element was chafed by cowling on engine element. ☐ (C series) Excessive popping of bleed bands on No. 1 engine was caused by bleed bands being out of adjustment.

oh58 **Class E mishaps** ☐ (A series) Total power failure occurred during flight at 300 feet agl. Aircraft was autorotated to road. Fitting on governor pressure line between accumulator and fuel control had backed off, causing engine failure. ☐ (A series) D.C. amps gauge indicated 80 amps just before aircraft was landed. Caused by high setting on voltage regulator for outside temperatures. ☐ (A series) N_2 bled down to 97% during landing approach. Shop rag was found in fuel cell.

Urgent changes to OH-58 checklist

Change 2 to TM 55-1520-228-CL (OH-58A) and Change 2 to TM 55-1520-235-CL (OH-58C) were published 20 June 1980.

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

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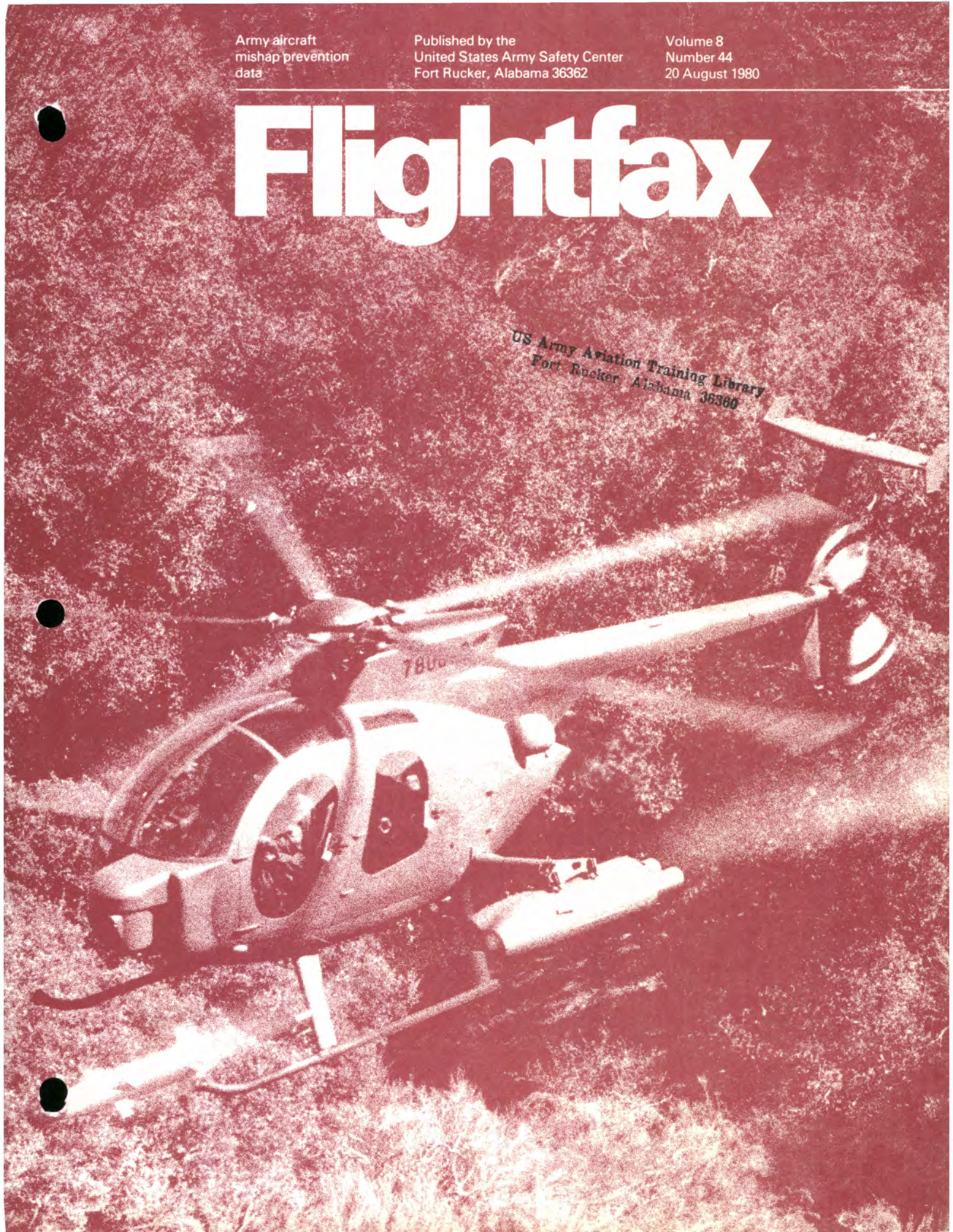

Mishap review

Synopsis

The OV-1D rolled right into a 95° to 100° bank within 865 feet of the ground and entered a high rate of descent. Recovery was initiated too late, and the aircraft crashed. The IP and pilot were killed.

History of flight

The mission, under the control of ground personnel, called for aerial maneuvers at specified altitudes, which included flight below 100 feet agl. The IP and pilot preflighted the Mohawk and flew to the test site. They were told to climb to 10,000 feet msl, perform a split S maneuver, and descend to 7,500 feet where they were vectored through a series of racetrack patterns and S turn profiles at cruise airspeed. The crew was later told to descend to 5,000 feet msl and do a split S maneuver. The IP took control and did the maneuver. Rate of descent reached 15,000 feet per minute.

The flight controller then told the crew to climb to a comfortable altitude for an outbound run. The IP acknowledged the instructions and the Mohawk was seen to enter a climbing right turn. The flight controller was immediately told by the test director that the next run was to be a low-level outbound maneuver. This information was relayed to the crew, and they were told to keep it low.

The crew acknowledged and the aircraft was seen to immediately increase its bank in excess of 90° and enter a high rate of descent from 865 feet agl. The aircraft appeared to be leveling off as it disappeared from sight behind a hill. The aircraft crashed left wing low. The aft portion dragged the ground for 140 feet before the main fuselage hit. The aircraft then began breaking up, strewing wreckage about 1,100 feet.

The accident was nonsurvivable. Both crewmembers stayed in their seats, which were thrown clear of the main wreckage. The pilot was killed on impact. The IP was still breathing when ground personnel arrived at the scene. He died on the way to the hospital.

Crewmember experience

The 31-year-old IP had almost 2,900 rotary wing hours and more than 1,100

fixed wing hours. More than 600 hours were in OV-1Ds. However, he had flown only 3 hours in OV-1s during the past 5 months and was not recently experienced in performing the type of low level and evasive maneuvers required by the mission. His last standardization ride to revalidate his OV-1 IP/AAPART status and aircraft currency was conducted by a unit IP instead of an SIP. The flight was rather short (.8 hour) and did not include an evaluation of all mandatory tasks prescribed by TC 1-144.

The 42-year-old pilot had almost 3,200 rotary wing hours and more than 750 fixed wing hours. More than 130 hours were logged in OV-1D aircraft.

Commentary

Video tapes of the flying events leading up to the accident and an additional video tape retrieved from an onboard recorder which recorded aircraft instruments and the conversations between the IP and pilot were available to investigators.

The IP placed the Mohawk in a steep banked descent too extreme for altitude available and was unable to recover. Altitude and commonsense dictated that aerobatic maneuvers involving a high sink rate be avoided. Regardless, the IP selected a maneuver that simulation flights have proven was too extreme to permit a safe recovery within the altitude available.

When the IP began the steep banked descending maneuver, he probably momentarily channelized his attention on the RMI in relation to the last outbound heading information he had been given instead of maintaining his attention outside of the cockpit. This would have delayed his recognition of and reaction to the high rate of descent that was developing.

The IP was reputed to be highly skilled but somewhat overconfident concerning his flying ability. Early in the flight, though not required by the low-level run being made, the IP did a split S aerobatic maneuver from an altitude of 2,625 feet agl that resulted in a 15,000 feet per minute rate of descent and high g pullout. When the pilot exclaimed that the maneuver had scared him, the IP responded to the remark in a manner indicative of overconfidence.

The IP may have been excessively motivated to "look good." The importance of the mission and the opportunity to exhibit his flying skills to the pilot, ground support personnel, and members of other services observing the flight probably influenced the IP to perform a maneuver he normally would have avoided under other circumstances.

The outbound low-level run was supposed to follow, without delay, the inbound run just completed. Inadequate premission coordination between the test director and the air traffic controller resulted in the controller not being fully aware of this requirement. So two sets of instructions were issued within a few seconds. The IP probably momentarily relaxed his concentration on tasks associated with the next run when given the first instructions. When told to commence his next run a few seconds later, after he had climbed to 865 feet agl, he may have become task overloaded and overreacted with a sense of urgency to lose altitude. ■

Selected mishap briefs

uh1 **Class A mishaps** ☐ (H series) Aircraft was on troop extraction mission and had entered landing zone for second pickup. During attempted takeoff, aircraft lost power and touched down, rotating to right. Retreating rotor blade hit uphill slope and rolled aircraft onto left side. 8057 ☐ (H series) Aircraft pitched up during hover, yawed left, and rolled over. 8058

Class C mishaps ☐ (H series) Postflight inspection revealed damage to rotor blades. Blades probably hit yucca bush during landing or takeoff. ☐ (H series) While pilot was landing in confined area LZ, his attention was diverted because of extremely dusty conditions and a slope at his intended landing area. Aircraft was already below barriers, preventing go-around. Pilot turned to right to land on level road, and main rotor blades hit tree.

Class E mishaps ☐ (H series) IP noticed burning odor. Loadmeter indicated .5 and was fluctuating. Battery was turned off and aircraft landed. It is believed that avionics personnel used battery instead of APU to check radios. Battery had been recharged by generator. Fast recharge and temperature of 34° C. caused battery to overheat. ☐ (H series) Rotor rpm exceeded 339 during practice autorotation with turn.

Ground mishap ☐ (H series) While climbing down from aircraft, servicemember placed his hand on pilot's greenhouse window, causing it to crack.

Aviation-related ☐ Servicemember was mowing the grass around aircraft. When he moved the lawn mower next to aircraft to cut grass underneath the nose, left handle hit right chin bubble hard enough to knock 4-inch hole in plexiglass. ☐ Operator was backing fuel truck. As he turned right, truck hit helicopter, breaking chin bubble and damaging lower center airframe structure.

ah1 **Class C mishap** ☐ (G series) Postflight inspection revealed tree strike damage to main rotor blades.

Class E mishaps ☐ (TH-1G) During cruise flight, while being radar positioned for GCA, student pilot noticed cyclic was resisting lateral movement. SP asked IP if he was on controls or if forced trim was on. IP took control and found cyclic lateral movement virtually frozen. Approach control directed a right turn and descent to 2,000 feet. IP declared emergency and, by using both hands and bracing his body against the seat, established a shallow right turn toward runway. Cyclic suddenly broke free during turn, causing controls to almost hit right lateral stop. Level flight was instantly regained with lateral movement again frozen. This action aligned aircraft with runway. With both hands on cyclic and with help of SP, IP made running landing to runway at 100 knots. Careful scan during emergency of all cockpit indicators revealed nothing abnormal. No unusual sounds, vibrations, nor odors were detected. Decision to hold 100 knots was made because it was not known what effect any changes in speed or attitude might have on marginal control. No reason for the problem could be found and condition could not be duplicated. ☐ (G series) Master caution and No. 2 hydraulic pressure lights came on. Caused by failure of hydraulic pressure switch.

Aviation-related ☐ Fuel truck was backed into right synchronized elevator of aircraft. Ground guide was improperly positioned.

ch47 **Class C mishap** ☐ (C series) Crew heard thumping sound during flight. Postflight inspection revealed lower rescue hatch door was missing from aircraft. Gearbox actuator had been installed before flight. Gears inside were stripped, allowing door to be pulled off in slipstream.

Class E mishaps ☐ (C series) Utility hydraulic systems gauge indicator dropped to zero and APU flamed out. Flight engineer told pilot there was an

excessive hydraulic leak in aft pylon area. Caused by cracked elbow tube at utility hydraulic pressure reducer. ☐ (C series) Forward speed trim failed in extended position. Caused by malfunction of actuator.

Aviation-related ☐ Ground handling stand was moved too close to aircraft, hitting and knocking hole in windshield.

oh58 **Class C mishap** ☐ (A series) Aircraft descended into trees during NOE hover, and main rotor blades were damaged from tree strikes.

Class E mishaps ☐ (A series) Throttle stuck at flight idle during maintenance

test flight. Pilot continued autorotation to runway. Caused by failure of fuel control spring. ☐ (A series) Master caution and engine chip detector lights came on. Pilot landed and heard grinding noise from engine during coastdown. Engine then seized. Caused by internal failure of N_1 section. ☐ (A series) Engine chip detector light came on. Caused by electrical wire shorting against cannon plug housing.

Aviation-related ☐ Aircraft had just been moved into hangar. Individual decided to move aircraft and pushed tail to left. Tail skid hit and punctured right chin bubble of OH-58 parked nearby.

c12 **Class E mishaps** ☐ (A series) Two pilots undergoing transition training were preflighting aircraft. Oil level on No. 1 engine was found to be lower than allowable limit. Pilot replaced dipstick but did not lock it and left door open. He then told crew chief to add oil to engine. Crew chief told pilot that engine normally indicated low and if engine was motored dipstick would indicate normal. Pilots continued preflight and crew chief closed dipstick cowling door. After takeoff, oil was seen on No. 1 engine cowling. Aircraft was landed and inspection revealed engine had lost 4 to 5 quarts of oil. Dipstick was not checked for security when preflight was continued after interruption. ☐ (A series) During descent, torque on No. 2 engine began to increase as power lever was retarded. Power lever was advanced and torque began to decrease. As power was reduced for landing, torque again increased. Caused by binding fuel control actuator lever. ☐ (A series) After takeoff, copilot saw left engine cowling was loose. Caused by defective cowling latch.

Aviation-related ☐ As aircraft was being moved by tug, left wing tip hit hangar door. Driver of tug was drunk and was driving too fast.

ov1 **Class E mishaps** ☐ (C series) When extended, right main landing gear indicated unsafe. Pilot used emergency gear system and landed. Contact plunger was missing from landing gear microswitch. ☐ (D series) No. 2 engine rpm increased beyond normal limits during takeoff roll. Caused by failure of propeller control.

t42 **Class B mishap** ☐ Loud bang was heard during takeoff. Nose seemed to rise a little before it settled to runway. Engines, propellers, and landing gear doors were damaged. 8059

u21 **Class E mishap** ☐ (A series) Left fuel boost pump and crossfeed lights came on. Caused by failure of boost pump.

Maintenance

uh1 **Class E mishaps** ☐ (H series) Before flight, crew chief drained oil from transmission to relieve overfill. Oil drain line pet cock was left ajar. During flight, oil began to drain from transmission. ☐ (H series) Preflight inspection revealed excessively tight tail rotor pitch change link. Link and crosshead were probably overtorqued. ☐ (H series) Master caution light flickered and transmission oil pressure fluctuated. Postlanding inspection revealed transmission was 4 quarts low in

(continued on next page)

Mishap briefs

oil and oil was leaking from bottom of aircraft. Transmission oil line to oil cooler was chafed. □ (M series) Aircraft vibrated abnormally when airspeed exceeded 80 to 90 knots. Caused by loose rocket pod.

ch47 **Class E mishap** □ (C series) No. 1 engine torque fluctuated. Normal engine trim and emergency engine trim failed because of separation of N_2 actuator control rod. Pilot then controlled what appeared to be N_2 governor failure with No. 1 engine condition lever and made running landing. Safety was not installed on N_2 control actuator rod.

oh58 **Class E mishap** □ (A series) Engine oil bypass light came on. Postlanding inspection revealed lube line to No. 1 bearing pack and front hub support was leaking where line exits N_1 accessory gearbox. Caused by overtorque of oil line fitting.

Messages received

• AH-1 information message concerning additional information on emergency egress system (052000Z Aug 80).

Urgent change to OH-58 operators manual

Change 6 to TM 55-1520-228-10 was published 6 June 1980.

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

Recap of AVRADCOM messages

Following is a list of AIG 8881 addressed messages for the UH-60 transmitted by AVRADCOM from 1 April through 30 June 1980.

UH-60A-80-12 SOF one-time inspection for UH-60A Black Hawk aircraft push rod

UH-60A-80-13 Technical information message for stabilator actuator tie rods

UH-60A-80-14 Maintenance information message for main rotor blade tiedown

UH-60A-80-15 Maintenance information

message for replacement of droop stop bushing

UH-60A-80-16 Maintenance information message for tail rotor inboard retention plate cones/tail rotor gearbox shaft/cones

UH-60A-80-17 SOF one-time inspection for main transmission housing flight control locator dowel pins

UH-60A-80-18 SOF one-time inspection for main rotor spindle assembly

UH-60A-80-19 Maintenance advisory message for cargo door handles

UH-60A-80-20 Maintenance advisory message for transmission main module oil level dipstick

UH-60A-80-21 Maintenance advisory message for main generator wiring installation

UH-60A-80-22 SOF one-time inspection for main rotor head assembly

UH-60A-80-23 Maintenance information message for main rotor spindle assembly

UH-60A-80-24 SOF one-time inspection for drag beam/axle assembly

UH-60A-80-25 Maintenance advisory message for T700-GE-700 engine overtemperature removal limits

UH-60A-80-26 Maintenance advisory message for main rotor spindle inner race

UH-60A-80-27 SOF operational message for cargo hook weight limitation ■

Stacom

Landing mishaps

The Army fixed wing aviator is generally a mature and highly experienced flyer. Yet he has been troubled lately by the reemergence of embarrassing types of aircraft mishaps—the gear-up landing and landing short of the runway.

Without a doubt the gear-up indicates improper use of the checklist and a lack of standardization. Too often these mishaps involve an instructor pilot who is conducting training while simulating an engine failure. Knowing this fact, the prudent instructor should be doubly alert to the distractions that can overload the student and ultimately himself. Division of attention between the checklist, the attendant indicators and warning systems will prevent our aircraft from coming to a screeching halt without the benefit of an extended undercarriage.

Mishaps involving aircraft landing short of the runway during ideal daytime weather conditions are really mystifying. One would think that the aviator was attempting to land on an exceptionally short runway which necessitated putting the aircraft on the numbers, but this was not the case. There were two recent mishaps of this type, and in both instances the runway available to the aviators was six times the length required for landing. It appears that "make the first turnoff" syndrome is responsible for this type of mishap. Let's go back to the basics: Check the appropriate ATM and the operators manual, fly a proper traffic pattern, and position the aircraft on a sensible final approach to the **runway.** ■

New distribution plan for Aircrew Training Manuals

Pinpoint distribution of revised ATMs is scheduled to be completed by AG Publications Center, Baltimore, MD, by FY 81-2.

TC 1-134, Commander's Guide for Utilization of ATMS; TC 1-139, ATM, Cargo Helicopter; TC 1-144, ATM, Surveillance Airplane; and TC 1-145, ATM, Utility Airplane, are to be distributed during FY 81-1.

TC 1-135, ATM, Utility Helicopter; TC 1-136, ATM, Attack Helicopter; and TC 1-137, ATM, Observation Helicopter, are to be distributed during FY 81-2.

To be sure that sufficient copies of the ATMs are received, units are advised to update Block 8, Army Aviation Techniques and Procedures, of DA Form 12-11A, Requirements for Army Doctrinal Publications, by indicating initial requirements on the basis of one ATM per assigned aviator.

NOTE: Inasmuch as TC 1-134 is scheduled to be distributed prior to revised TCs 1-135, 1-136, and 1-137, the administrative instructions in revised TC 1-134 will supersede instructions in second draft TCs 1-135, 1-136, and 1-137. Revised ATMs will be effective upon receipt. However, implementation date will be at the discretion of the MACOM.

POC is MAJ Lovejoy, AUTOVON 558-7113/4619. ■

Night vision goggles

Attention all you NVG users. The new operators manual, TM 11-5855-238-10, dated 14 April 1980, is in distribution channels at this time. This TM contains general information, equipment description, operation, and maintenance instruction for night vision goggles AN/PVS-5 and AN/PVS-5A. ■

Relative humidity

We are all aware of the effects of humidity on the body during hot summer days, and aviators are generally aware of the effects of humidity on aircraft and powerplant performance. Do you know how much actual water is involved under different humidity, pressure, and temperature conditions? Here are a few facts that may help you understand the situation better:

- Water is definitely more dense than air, but water vapor is a gas and is less dense than air. Therefore, a mixture of dry air and water vapor is less dense than an equal amount of dry air.
- Water vapor weighs approximately five-eighths as much as an equal volume of dry air.

(*continued on back page*)

Stacom

• A relative humidity of 100 percent does not mean that the air is entirely made up of water vapor. Rather, the condition indicates that the air is holding all the water vapor it is capable of holding at the temperature and pressure in existence at the time.

• As air is heated, its ability to hold water increases dramatically. For each 10° C. (18° F.) increase in temperature, the capacity of the air to hold moisture doubles. For example:

Temperature	Capacity
10° C. (50° F.)	X
20° C. (68° F.)	2X
30° C. (86° F.)	4X
40° C. (104° F.)	8X

According to the above table, air at 40° C. (104° F.) can hold eight times as much water as air at 10° C. (50° F.). ■

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.

Hotlines

Got a problem? Can't find the answer? Use the hotline!

Hotline services have been so successful in the past that more agencies are now providing this service. The following hotline numbers can be called on official business after duty hours.

		AUTOVON	COMMERCIAL
Aviation Ft. Rucker, AL		558-6487	205-255-6487
Engineer Ft. Belvoir, VA		354-3646	703-664-3646
Field Artillery Ft. Sill, OK	ARTEP	639-2064 639-4020	405-351-5004 405-351-4020
Infantry Ft. Benning, GA	ARTEP	835-4487 835-4759	404-545-4487 404-545-4759
Intelligence Ft. Huachuca, AZ		879-3609	602-538-3609
Missile & Munitions Redstone Arsenal, AL		746-6627	205-876-6627
Ordnance Aberdeen Proving Ground, MD		283-5542	301-278-5542
Quartermaster Ft. Lee, VA		687-3767	804-734-3767
Signal Ft. Gordon, GA		780-7777	404-791-7777
Transportation Ft. Eustis, VA		927-3571	804-878-3571

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Costly, bothersome, and senseless

Costly, bothersome, and senseless

More than 30 years ago, the driver of a weapons carrier backed his vehicle to an aircraft to load some equipment. In his zeal, he backed up too fast and applied the brakes too late. The weapons carrier rammed the fuselage, causing extensive damage to the aircraft.

About 20 years ago, a mechanic stood on the hood of his jeep to inspect the propeller hub of an aircraft. When he finished his inspection, he climbed into his vehicle, started the engine, and began to back away. Only the jeep didn't back up. Instead, it lunged forward into the aircraft, damaging the engine cowling. In his haste, the mechanic neglected to put the jeep in reverse.

Recently, another mechanic parked his tug a couple of feet away from a UH-1 so he could use the vehicle as a workstand. When he completed his work, he tried to move the tug. However, when he placed the shifting lever of the automatic transmission in reverse and released the brake, the vehicle would not move. The transmission remained in neutral. He then recycled the shifting lever three times to the reverse position. Without warning, the tug lurched forward and hit the aircraft, causing damage to the aircraft that cost nearly $800 to repair. The tug transmission linkage was out of adjustment.

So what's new?

Over the years, equipment has changed and personnel have been replaced, but ground mishaps have remained basically the same. A look at some of these mishaps shows most stem from inattention, carelessness, disregard for established procedures and regulations, or simply from a lack of knowledge.

Movement of aircraft

One of the greatest problem areas concerning ground mishaps is associated with the towing or repositioning of aircraft. During this phase of operation, vehicles or towing equipment either strike and damage aircraft or aircraft hit some object, sustaining various degrees of damage. Cause factors are numerous and varied.

- A driver was backing a tractor to a tow bar attached to a UH-1. When he applied the brakes, the tractor did not immediately respond. The operator became excited and frantically pumped the brakes four or five times. In the process, his foot struck the accelerator twice. The tractor hit the aircraft, causing $1,475 in damages.

Unfamiliarity with the towing equipment being used was instrumental in causing this mishap. Although the driver was accustomed to operating a tractor, the one he was using had been borrowed from another unit, and he was not familiar with its braking action. The brakes were functioning properly.

- A tug driver was positioning his vehicle to attach a tow bar to it. His foot slipped off the brake pedal and hit the accelerator. The tug then crashed into the nose of an aircraft, causing $12,000 in damages.

- A forklift was being used to position a CH-47 in a hangar. As the forklift eased the aircraft into the hangar, the aft blade hit the hangar door and was damaged beyond repair. The cost: more than $35,000.

Although this mishap appears to stem from a simple case of carelessness or inattention, actually several cause factors combined to cause it. A forklift was being used because the unit's tug was not operational. And while the operator was

licensed to tow aircraft with a forklift, the one being used did not permit ample visibility. Also, the doors on the side of the hangar being used could not be fully opened, restricting the entrance way. Further, the ground guides were not using proper hand signals, and the forklift operator could not hear any voice commands because of the required hearing protection he was wearing.

Other ground handling mishaps have resulted because personnel failed to follow standard procedures.

• The crew was moving an OH-58 into a hangar. They misjudged the door opening, allowing the horizontal stabilizer to hit the door edge. As a result, the stabilizer had to be replaced. This error in judgment occurred because a minimum crew of three, as required, was not being used to reposition the aircraft.

Finally, external conditions can combine with other factors to cause ground mishaps.

• A driver was using a ¼-ton vehicle with side curtains installed to tow an OH-58 into a hangar. As the aircraft neared the hangar doors, the ground guide positioned at the tail of the aircraft saw the aircraft was going to strike the hangar. However, before he could warn the driver, he slipped on a layer of ice and fell. Since the vehicle operator could not see him, the ground guide began yelling for the driver to stop. However, the vehicle noise drowned out his warning and the driver did not stop until he felt the aircraft strike the hangar. The cost to repair the OH-58 was nearly $6,000.

The prime cause factor in this mishap was failure to insure that the ground guides were always within the vehicle operator's field of vision. Even though cold weather prevailed, the side curtains on the vehicle should have been removed before towing operations were begun.

While collisions are the main hazards associated with the movement of aircraft, they are not the only ones.

• Recently, ground crewmen were preparing to move a CH-47 from the flight line to the hangar. In the process, they untied five of the rotor blades but overlooked the sixth one. When the aircraft was moved, the blade tied down sustained extensive damage. Costs for repair: $34,000.

Since this mishap, the unit involved has developed a CH-47 ground handling checklist, and crews have been briefed on the procedures they are to follow.

Tools and equipment

But aircraft do not have to be moved to be damaged. They are often inadvertently

challenged by a variety of tools and equipment right where they stand, whether on the flight line, ramp, or in the hangar.

• Personnel placed a portable light set between two helicopters parked on a PSP ramp. The ramp sloped downward toward the aircraft. After positioning the light stand, personnel set the brakes. However, they did not chock the wheels. High winds, gusting to 25 knots, coupled with the rotorwash of an operating helicopter nearby caused the light stand to move about 20 feet into one of the parked helicopters. Damage to the pilot's chin bubble exceeded $1,400.

• A mechanic was positioning a maintenance workstand beside the tail boom of an AH-1. The stand hit the right spiral antenna of the radar signal detecting system. The cost for replacement: $830.

Inexperience and a desire to please combined to produce this mishap. The mechanic had just completed MOS training and was working at his first job assignment.

Cobra vs shovel

Another Cobra fared even worse. This proud AH-1, capable of obliterating enemy personnel in its path, demolishing convoys, and knocking out tanks and artillery, found itself in the embarrassing position of being temporarily KO'd by an EM armed with a shovel. It happened like this: The EM was standing near the aft section of the aircraft when he was handed a shovel and nonchalantly swung it over his shoulder. You guessed it! The shovel struck a tail rotor blade, damaging it beyond acceptable limits. The cost to replace the blade: $1,761. An expensive shovel!

Whether a result of carelessness, negligence, or inexperience, failure to

(continued on next page)

Costly, bothersome, and senseless

properly handle equipment around aircraft can be depended on to produce damage. It's merely a question of how much and how soon.

Aircraft on jacks

Ironically, some ground mishaps are caused by the very safety aids intended to prevent them. Aircraft damage occurring during jacking operations is a prime example.

• Mechanics preparing to jack an AH-1 roped off the area and leaned an "Aircraft on Jacks" sign against the nose of the aircraft. As the aircraft was raised, the sign slipped under the nose. When the aircraft was lowered, the sign punctured a hole in the skin under the nose. Damage cost: $250.

• A mechanic was placing "Aircraft on Jacks" signs around a fixed wing aircraft when one sign tipped over and knocked a hole in the chin bubble of an adjacent UH-1. Damage cost: $994.

In the first case, a free-standing sign was not used. In the second one, the sign was of a free-standing design but was unstable. New signs to be used by this unit will be constructed along the lines of sawhorses to insure stability. However, while in both instances the signs were not completely suitable, indifference and inattention on the part of maintenance personnel contributed to these mishaps.

This mishap associated with jacking operations is typical of the mishaps that can occur when available safety devices are not used. The left side of a UH-1 was jacked up to replace the skid tube. After the old skid was removed, the aircraft fell off the jack stands and landed on the cross tubes and belly. The cost for repairs exceeded $9,000.

This aircraft was raised on a frozen, icy surface, and no secondary restraining devices were used.

Egress

While most ground mishaps do not pose a serious threat to the safety of personnel, some can be extremely hazardous to both personnel and equipment. Mishaps that involve explosive egress systems obviously fall in this categroy. Following is one example which, fortunately, did not produce any serious injuries. But it could have.

• A sheet metal worker was to make repairs in the pilot's station of an AH-1G. Not being familiar with how to open the pilot's canopy, he made no attempt to gain entrance but returned to the hangar for instructions. After receiving instructions, he went back to the aircraft and tried to follow them. However, he was still unsure as to how the canopy was to be opened, and his attempt was unsuccessful. He did not seek other instructions. Instead, after noting some wires extending from the jettison handle in the gunner's station, he assumed this was the red door handle. He then proceeded to pull the pin and then the handle, "blowing" the canopy. The cost: nearly $11,000.

The worker was experienced in his job, but he was not familiar with the aircraft on which he was to perform maintenance. All maintenance personnel should be thoroughly briefed on systems that affect their safety as well as the integrity of aircraft. Supervisors have a prime responsibility in this vital area of safety.

Costly mishaps

Ground mishaps are not only a constant source of irritation but are also costly in terms of materiel resources, time, and dollars. For example, the dollar cost for 20 randomly selected ground mishaps amounted to nearly $ ¼ million, for an

average cost of about $11,000 per mishap. Of this randomly selected group, the most costly mishap required $55,000 for repairs and the least costly, $250.

But even when we disregard repair costs, damages inflicted on aircraft during ground handling produce other, more far-reaching effects. A damaged rotor blade of a CH-54B, for example, means the temporary loss of a $3 million aircraft—and its capabilities. Similarly, a damaged elevator or aileron on an OV-1D means that a $2½ million aircraft, along with its capabilities, has been removed from the inventory just as effectively as if a hostile shell had done the job. The same can be said about our other aircraft—our $3 million CH-47C, or our new $2¼ million Black Hawk.

The consistency of aviation ground mishaps indicates that these mishaps have somehow come to be something expected and accepted. Yet, considering the high cost of modern aircraft, their capabilities, the need to be in a constant state of readiness, the time required to make needed repairs, the added workload placed on skilled mechanics, plus the cost for these repairs, no one has to be hit over the head to realize it is high time to put a stop to these mishaps. And the beauty of it is that of all types of aircraft mishaps, ground mishaps are probably the most easily preventable. The cure lies in three key areas: knowledge, responsibility, and supervision.

Knowledge

Obviously, the first requirement is for ground handling personnel to be thoroughly familiar with both the equipment they will be using and the aircraft they will be handling. They must also be proficient in the use of such equipment. Among other things, this means experienced drivers to operate tugs or other towing vehicles and trained personnel who know the cautions and warnings associated with the types of aircraft they will be handling. Ground handling crews must be fully aware of the hazards associated with egress and other aircraft systems that can produce injuries as well as damage.

In addition, personnel must know the procedures to be followed to safely accomplish each type of task they may be called on to do. This includes any safety precautions associated with each individual job.

Responsibility

While knowledge of equipment and its use is a definite must, personnel must also insure that all equipment to be used is functional and suitable for use.

Recently, a refueler preparing to service a UH-1 set the emergency brake of the tanker and started to walk to the rear of the vehicle to chock the wheels. However, the vehicle began to roll toward the aircraft. The driver immediately ran to the cab and applied the brakes, but not in time to prevent the tanker from hitting the right elevator. Granted, the tanker was improperly parked or it would not have rolled into the aircraft. Nevertheless, if the emergency brake had been functioning properly, the vehicle would not have rolled in the first place.

But it doesn't matter whether the equipment is a vehicle, an APU, a tow bar, jacks or whatever, it is the responsibility of the using personnel to insure it is operational and suitable for the job to be done.

Similarly, it is one thing to know the correct procedures and cautions to be observed when doing a job, and another to follow these procedures and observe all the cautions. Again, this is the

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Costly, bothersome, and senseless

responsibility of the ground crews. But how do you insure that ground crews have the necessary knowledge and experience and are exercising their responsibilities? That's where the third element comes in.

Supervision

It is a function of supervision to make sure ground personnel receive the necessary training and gain any needed experience before being assigned jobs. Supervisors must further insure these personnel are thoroughly familiar with the aircraft they will be handling and know what safety precautions must be followed. Other supervisory responsibilities include the development of SOPs and checklists, if needed, relevant to ground handling of aircraft and the enforcement of all approved procedures and policies.

Since equipment and personnel change periodically, an ongoing OJT program is essential. This training should relate to day-to-day routine job assignments as well as to emergency procedures to be implemented in time of need. For example, where and how are aircraft to be secured for maximum protection in the event severe weather prevents their timely evacuation?

In short, all functions related to training, experience, job skills, issuance of directives, establishment of policies and the enforcement of such directives and policies are the responsibilities of supervision.

To all this, perhaps we can add a word of advice. Anticipate the unexpected. Even though everything appears to be in order, always be on the lookout for any possible loopholes in your aviation ground safety program. Sometimes, the darndest things can happen to foul up even the best laid plans.

Take, for example, the aviation unit that received a timely weather warning, indicating they could expect heavy rain, a decrease in temperature, and high winds. Personnel immediately went to work, securing aircraft, loose equipment, etc.—all by the book. To insure compliance with SOPs, the unit commander drove his POV to the flight line, parked it in an authorized area, and set the parking brake before conducting an inspection of the facilities. Everything was in order. Nothing was left undone.

As predicted, the rain came, the temperature dropped, and the wind blew. As a matter of fact, it blew the commander's car a distance of approximately 125 feet—right into a parked UH-1.

Because of the low temperature and precipitation, a layer of ice had formed on the ground, allowing the high winds to move the vehicle onto the flight line.

Maybe we can borrow a bit of philosophy from an old story concerning an 85-year-old man who appeared before a judge, seeking a divorce from his wife of more than 65 years. Skeptically, the judge studied the elderly gentleman, then curiously inquired: "Why in the world do you want a divorce at this stage of your life after having lived with your wife all these many years?"

Without a moment's hesitation, the elderly man replied, "Well, your honor, enough's enough!"

Costly and senseless ground mishaps have gone on far too long. But the fact is they don't have to keep going on any longer. It's time to adopt the old man's philosophy and decide once and for all that as far as ground mishaps are concerned, enough is, indeed, enough. ■

Selected mishap briefs

uh1 **Class C mishap** ☐ (H series) Pilot heard decrease in engine noise during flight at 70 knots and 50 feet agl. N_2 rpm dropped to 5500 and egt was 800° C. Because of mountainous terrain, the only available landing area was to the left rear of the aircraft, forcing the pilot to extend his glide to reach the area. During final descent, main rotor blades hit small tree. Aircraft was landed in plowed field. Cross tubes, skids, and main rotor blades were damaged.

Class E mishaps ☐ (H series) Transmission oil pressure fluctuated from 0 to 100 pounds. Caused by broken wire from pressure transmitter to airframe. ☐ (M series) IP rolled throttle off to demonstrate forced landing and engine quit. IP tried to regain rpm by increasing throttle, then by selecting emergency governor position. Power could not be restored and forced landing was completed. Rust/pitting on flight idle solenoid plunger allowed throttle to close to fuel cutoff position. ☐ (H series) Aircraft began to vibrate excessively during flight. Caused by separation of blade on trailing edge. ☐ (B series) Strong pungent odor and blue smoke entered cockpit. Main generator ammeter indicated full scale deflection. Caused by failure of battery.

uh60 **Class E mishap** ☐ No. 2 engine oil pressure light came on. Caused by loose oil cap.

ah1 **Class E mishap** ☐ (S series) N_1 went to 15% and did not go any higher during start. Tgt rapidly rose from 300° to 1,000°. Abort start procedure was initiated at 800°. Tgt stayed at 1,000° for 5 seconds. Time from start to complete shutdown was 20 seconds.

ch47 **Class B mishap** ☐ (A series) Aft rotor system hit runway during 2-wheel, nose-high taxi. Aft rotor blades were damaged. Three spectators were injured. 8060

Class C mishap ☐ (C series) During cruise flight, crew chief noticed piece of fiberglass falling through aft transmission area. Aft rainshield had come apart. Two rotor blades were damaged.

Class E mishaps ☐ (C series) Flight engineer heard noise which appeared to be loose hanger bearing, and aircraft was landed. Caused by defective spring in resilient mount. ☐ (C series) No. 1 SAS caution light came on, followed by loss of No. 1 flight control hydraulic pressure and illumination of No. 1 flight boost light. Caused by failure of elbow fitting on No. 1 SAS filter pressure line. ☐ (C series) During runup, crew saw fluid leaking in vicinity of transmission input seal. Caused by failure of seal.

oh58 **Class E mishaps** ☐ (A series) Copilot was reading "before starting engine" procedures from checklist. Pilot told copilot to check throttle closed. Copilot read the rest of the checklist and start was attempted. Copilot noticed turbine outlet temperature was rapidly rising and tried to get pilot's attention. Pilot saw what was happening and tried to motor starter because he thought throttle was closed. Copilot pressed flight idle release button and closed throttle. Pilot continued to motor starter. TOT reached 950° for 1 second. Crew was not using their checklist properly (call-response method). Both assumed the other had closed the throttle. ☐ (A series) Low rpm audio and light activated. Pilot saw N_2 rpm descending through 95-97%. Caused by failure of double check valve assembly. ☐ (A series) Tail rotor chip detector light came on. Caused by failure of tail rotor gearbox. ☐ (C series) N_2 fluctuated and bled off to 95% during takeoff. Older-type governor droop lever, P/N 206-061-737-17, which is made with a rivet, was binding, causing governor to malfunction. **TSARCOM recommends the old-type droop lever be replaced with a new one-piece lever, P/N 206-061-107-1, as soon as possible.**

th55 **Class E mishaps** ☐ Main rotor blades dephased during hover/taxi. Caused by faulty main rotor dampners. ☐ Engine

(continued on back page)

Mishap briefs

could not produce enough power to maintain 3-foot hover. Caused by failure of piston rod. □ Rough running engine was caused by faulty servo fuel injector.

c12 **Class E mishap** □ (A series) Aircraft entered cloud layer and started collecting light rime ice. About 4 minutes later, lightning struck close to right wing tip, burning outside of aileron static wicks.

u8 **Class C mishap** □ (F series) Pilot was being directed to parking spot by ground guide. As right turn was made, pilot lost sight of 50-pound fire extinguisher, and left propeller hit fire extinguisher. Ground guide gave stop signal, but it was either too late or pilot did not react fast enough to keep prop from hitting fire extinguisher.

u21 **Class E mishap** □ (A series) Pilot saw fuel spilling from right nacelle during flight. Caused by failure of fuel cap to seat.

Maintenance

uh1 **Ground mishap** □ (H series) Improper device was used to track tail rotor blade, causing insufficient safety margin between operating tail rotor and tracking device handle. Tail rotor blade was damaged.

Class E mishaps □ (M series) Popping sound was heard during hover, and No. 2 hydraulic light came on. Incorrectly positioned hydraulic light connecting hydraulic filter to servo had chafed and ruptured. □ (H series) Loud popping sound was heard, and hydraulic system failed. Clamp chafed through metal braid on outside of hose assembly and forced one of the sharp ends into hose. □ (H series) During runup for blade track, oil was seen running from transmission well. Caused by failure of transmission oil filter gasket. Improper hardware was used during installation of transmission filter, and hardware was improperly torqued.

ah1 **Class E mishaps** □ (G series) Pilot's door opened in flight and could not be relatched. Pilot held door closed and IP landed. Caused by improperly adjusted rod end bearing on rear latch. □ (S series) Intermittent operation of battery during start was caused by overtorqued screw. Screw came loose and shorted out battery.

oh58 **Class E mishaps** □ (A series) Transmission oil hot light came on. Postlanding inspection revealed improperly crimped sending wire to transmission oil temperature probe had come loose. □ (A series) Crew smelled smoke and odor of burning wires during takeoff. Wire to searchlight shorted against aircraft frame.

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

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Settling with power
"Out of nowhere, we lost all sorts of lift . . . we hit the ground hard."

Down and out

During a service mission to transport two passengers to a tactical field site, the pilot of an OH-58 began a circling approach as he reached the landing area. He then made his final approach with the aircraft oriented into a 10- to 15-knot wind. About 15 feet agl, he suddenly decided to change his heading so as to land near a parked AH-1. He applied right pedal and a slight amount of right cyclic, turning the aircraft approximately 140 degrees to the right while maintaining 3 to 5 knots of forward groundspeed. With the aircraft in a downwind position, the pilot noted he had to apply a slight amount of aft cyclic to prevent a nose-low attitude. He also noted the aircraft was descending. Although he applied 95 to 100 percent power to check the descent, the aircraft continued its downward movement until it finally hit the ground.

In the pilot's words: " . . . Out of nowhere, we lost all sorts of lift. I didn't think we could lose that much lift. I immediately applied power and aft cyclic as the aircraft began to settle. The rate of descent kept on increasing as I continued to pull in power in an attempt to cushion the landing. We had a little forward airspeed as we hit the ground . . . we hit the ground hard.

"I believe the power I had pulled in earlier had just begun to take effect because we came back off the ground . . . the aircraft began a very slow, gentle clockwise turn. I thought it was the wind. I was not very concerned at that time. I was in the process of adding forward cyclic to stop the aircraft's slight rearward drift. The left rear skid dug into the ground and we rocked back and to the left . . . the aircraft hit again, and I believe that is when the tail rotor separated from the aircraft because at that point we started spinning. We were spinning just above the ground. The spin was very rapid. I can't tell how many times we went around. At least twice, if not more. I put the collective down and the aircraft came back down to the ground and to a halt . . . I cut the fuel off and turned the battery off. All three of us then exited the aircraft."

Although no injuries resulted from this mishap, the cost to repair the damaged aircraft exceeded $11,000. And the cause? Settling with power. As one investigator more precisely stated it: "The pilot, while executing a terrain flight approach to a tactical field site, exercised poor judgment by abruptly applying right pedal and the right cyclic at an altitude of 15 feet agl, contrary to the guidance provided in the OH-58C operators manual, TM 55-1520-235-10, par. 8-41, and the Aircrew Training Manual, TC 1-137, task 5010. The abrupt 140-degree right turn, with little or no forward speed, placed the aircraft into an approximate 10-knot downwind condition. This improper flight control input resulted in the aircraft settling with power. The pilot was unable to stop the descent, and the aircraft landed hard."

Nothing new

Settling with power is not a new expression. It has been around a long time and alludes to a condition that is taught to every Army aviator during school training. Yet, sometimes "true" settling with power is confused with other conditions that mimic it. Basically, for a helicopter to settle with power, the following three conditions must be present simultaneously: The airspeed must be less than 12 knots, at least 20 percent power must be applied, and the rate of descent must reach or exceed 300 to 400 fpm.

As a refresher, take a look at the figures that illustrate the types of vortex systems present during the different conditions of

Damaged OH-58 rests after encounter with ground, following settling with power.

zero airspeed climb, hover, settling with power, and autorotation.

During a climb, air flows downward through the rotor. Although three distinct vortex systems exist in the wake of any propeller or rotor, the system can be simply depicted as shown in figure 1.

When the helicopter is hovered, the airflow is still downward through the rotor system. However, this air is picked up from a lower level, as shown in figure 2.

When a helicopter settles with power, the usual vortex systems are altered, and a separate one emerges. It lies in the plane of the rotor and is a continually recirculating one. This condition, commonly referred to as the vortex ring state, can cause severe turbulence. It is depicted in figure 3.

The final situation occurs during autorotation, also referred to as the windmill brake state. During descent of the aircraft, the airflow is upward through the rotor system as shown in figure 4.

A look at some examples of mishaps commonly (but erroneously) attributed to settling with power can help you to better understand this phenomenon so that you can avoid it.

First, consider a helicopter that takes off into a 20-knot headwind on the lee side of a slope. After reaching an altitude of 50 to 75 feet and attaining an airspeed of about 50 knots, the pilot begins a 180-degree turn. As he completes the turn, the aircraft begins to lose altitude. The pilot reduces airspeed and applies full power, but the aircraft continues to lose altitude until it finally crashes.

In this example, the pilot made a sharp turn in a known downdraft area. During a turn, more lift is needed to maintain altitude. This can be done either by sacrificing airspeed or by increasing pitch. The pilot tried both but was

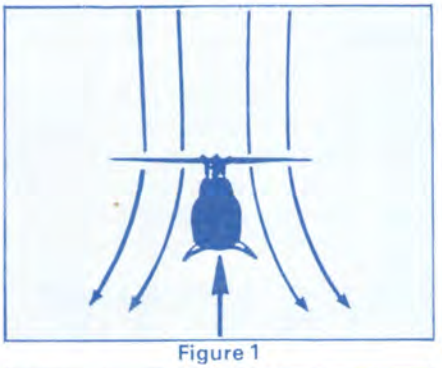

Figure 1

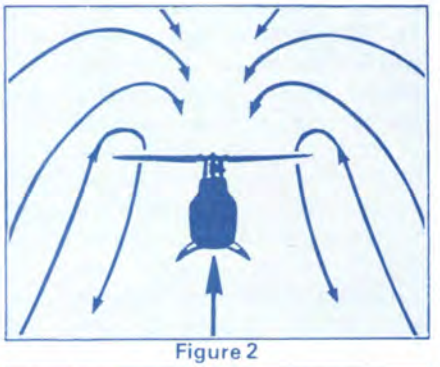

Figure 2

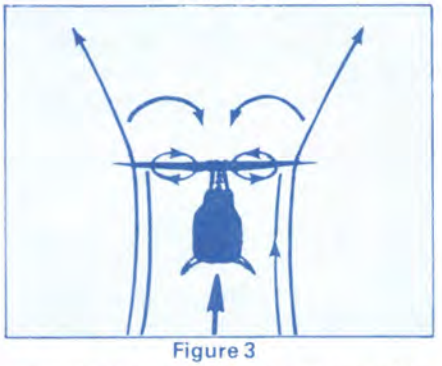

Figure 3

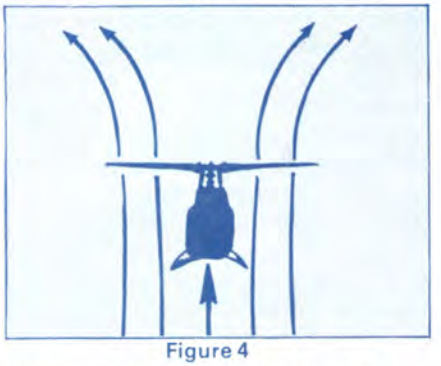

Figure 4

unsuccessful—because he was operating in a downdraft. Consequently, poor judgment can be blamed for this mishap. The pilot should have reached a safe altitude and built up sufficient airspeed while operating in a known region of a downdraft before attempting a turn. This was not a true case of an aircraft settling with power.

In a second example, we find a pilot performing a test flight to check the effectiveness of the tail rotor. The pilot zeroes the airspeed and enters autorotation at 1,000 feet above the airfield while headed into a 15-knot wind. He then elects to make a series of small turns while traveling backwards over the ground instead of making 360-degree turns. At 400 to 500 feet agl, he senses he is falling too fast and he applies power. At about 150 feet agl, he starts to apply pitch. When the aircraft is about 25 feet above the ground, the pilot notes the rate of descent is excessive, and he applies full pitch and power. The aircraft crashes.

The facts

Let's examine the facts. At an altitude of 500 feet, the rate of descent was approximately 2,400 fpm. At 150 feet, the rate was the same. This meant the aircraft would reach the ground in 4 seconds. It is doubtful if any pilot could have made a successful autorotation or power recovery under these circumstances. Beginning the maneuver at an altitude of only 1,000 feet, delaying power recovery, and failing to regain airspeed before reaching a minimum of 500 feet showed poor judgment. However, here again, the true cause was not settling with power.

But didn't the aircraft in both of these examples actually settle with power? In all probability they did shortly before they hit the ground. This is true because the three requirements for settling with power were

(continued on next page)

Down and out

present in both instances. However, these requirements were not evidenced until just before the aircraft hit the ground. So, settling with power was not the actual cause of these mishaps.

Finally, let's look at a third mishap. This one occurred a number of years ago and involved a Royal Australian Air Force pilot. The importance of this mishap lies in its ability to show the three conditions required for true settling with power, and how readily they can occur simultaneously during flight when pilots fail to remain consciously aware of them.

This pilot was making an approach to a pinnacle. However, this approach was steeper than he intended it to be, and he allowed his airspeed to decrease below 10 knots while the aircraft was still 30 feet in the air. At this time the aircraft began to settle to the ground, and no amount of power could stop its descent.

In this instance, two conditions conducive to settling with power were present during the first part of the approach. The rate of descent was more than 400 fpm, and more than 20 percent power was being applied. When the airspeed decreased below 10 knots, the third condition was satisfied, and the aircraft promptly settled with power.

In summation, the following is quoted from this mishap report: "The phenomenon of settling with power manifests itself under conditions applying at the time, and involves high vertical rates of descent and reduced cyclic control effectiveness. This condition is entered following a low-speed, partial-power descent where the airspeed is inadvertently zeroed.

"The characteristics of settling are very similar to the feel of stall in a conventional aircraft. The recovery procedure is also approximately the same, i.e., drop the nose and accelerate into forward flight. If this cannot be done, recovery can also be made by reducing collective pitch to a minimum, which results in considerable altitude loss."

The point is clear. Applied power, airspeed, and rate of descent are the three prime factors associated with the condition known as settling with power. Any time you let your airspeed decrease below 12 knots while you are applying 20 percent, or more, power and you allow your rate of descent to reach or exceed 300 to 400 fpm, you can expect your aircraft to settle—regardless of any remaining power you might then choose to add.

Should you find yourself in this predicament, and your altitude is insufficient for recovery, you can be sure of one thing: You are going to come down, and in all probability, your aircraft is going to be out of commission for repairs. Stay aware of the conditions that lead to settling with power, and avoid this trap. The place for your arcraft is up in the air and in commission—not down and out! ■

FY 81 USASC aviation safety courses

The Aviation Safety Officer Course (7K-F12) is an 8-week aviation/ground accident prevention course with emphasis on technology, aviation medicine, psychology, management, communications, reporting and investigating. Active Army and Reserve component commissioned officers and warrant officers and DA civilians may attend. Commissioned and warrant officers must be rated aviators and presently assigned or programed for assignment as an aviation safety officer. Obligated service for active duty commissioned and warrant officers is 1 year.

ASO Course Schedule

Class	Report	Start	Close
81-1	14 Oct 80	15 Oct 80	12 Dec 80
81-2	29 Jan 81	30 Jan 81	27 Mar 81
81-3	30 Apr 81	1 May 81	26 Jun 81
81-4	30 Jul 81	31 Jul 81	25 Sep 81

The Aviation Mishap Prevention Management Course (7K-F13) is a 2-week course on mishap prevention concepts and programs, with emphasis on preaccident planning, airfield surveys, investigation, human factors, and aircraft design and performance. Active Army and Reserve component enlisted personnel in grades E6 through E9 in aviation-related MOSs performing at first-line supervisory level in Army aviation units and staffs may attend the course. DA civilians in grades GS-7 through GS-10 and Army contract maintenance supervisors may also attend. Obligated service for active duty enlisted personnel is 9 months.

AMPM Course Schedule

Class	Report	Start	Close
81-1	1 Dec 80	1 Dec 80	12 Dec 80
81-2	19 Jan 81	19 Jan 81	30 Jan 81
81-3	2 Mar 81	2 Mar 81	13 Mar 81
81-4	13 Apr 81	13 Apr 81	24 Apr 81
81-5	14 Sep 81	14 Sep 81	25 Sep 81

The Aviation Mishap Prevention Course (7K-F14) is a 2-week course on the fundamentals and techniques inherent in the daily performance of the aviation safety officer's job. The course examines man, machine, and environmental factors bearing upon safety in aviation operations, planning, and supervision. Active Army and Reserve component commissioned and warrant officers, DA civilians, and contract maintenance civilians may attend. Commissioned and warrant officers must be rated aviators. There is no obligated service.

AMP Course Schedule

Class	Report	Start	Close
81-1	29 Sep 80	29 Sep 80	10 Oct 80
81-2	5 Jan 81	5 Jan 81	16 Jan 81
81-3	30 Mar 81	30 Mar 81	10 Apr 81
81-4	6 Jul 81	6 Jul 81	17 Jul 81

Other information on Army Safety Center schools can be found in DA Pam 351-4, dated January 1980. ■

Selected mishap briefs

uh1 **Class B mishap** ☐ (H series) Aircraft landed hard during termination of autorotation, and main rotor blade hit tail boom. 8061

Class C mishaps ☐ (H series) While UH-1 was hovering at field site, rotorwash caused main rotor blades of AH-1 to flex down and damage tail rotor drive shaft. ☐ (H series) While contour flying at 80 knots and 25 feet, IP tried to fly between two wooded areas. Main rotor blades hit tree, damaging tip caps.

Class E mishaps ☐ (H series) During engine shutdown, rotor rpm continued to decrease after throttle was reduced to engine idle. Caused by failure of quill assembly. ☐ (H series) Loud noise was heard during start. Inspection revealed disfigured battery case in forward position of aircraft. Battery case was probably highly overpressurized. Battery vent line was clear but may have been crimped.

uh60 **Class E mishap** ☐ Engine would not reduce below 80% during shutdown. Caused by failure of support assembly, low demand cable.

ah1 **Class A mishap** ☐ (G series) Crew had finished their mission and returned to parking area for shutdown. Members of the armament section began servicing aircraft during shutdown. Armament specialist ran into tail rotor while performing his duties and was killed. 8062

Class B mishap ☐ (S series) Engine failed and aircraft landed hard. Blade flexed down into tail rotor drive shaft cover. 8063

Class C mishap ☐ (S series) Student pilot applied initial pitch too high during standard autorotation. Aircraft ballooned and fell through from about 10 feet. IP took control just before aircraft landed. Hard landing resulted in main rotor blade hitting No. 3 drive shaft cover, which severed drive shaft. Both main rotor control tubes were bent and main rotor blades were damaged.

Class E mishaps ☐ (G series) During preflight, pilot noticed cracks on spacer washer of 212 tail rotor blade. Five of the unit's aircraft had hardware with cracks or stress lines forming. Forty of 50 spacer washers checked from stock were cracked or had stress lines. ☐ (G series) Transmission oil pressure and oil bypass lights came on. Caused by cracked elbow to oil cooler. ☐ (G series) No. 1 hydraulic light came on, and running landing was made, Caused by malfunction of pressure switch.

ch47 **Class A mishap** (B series) Aircraft, with 500-pound sling load and 22 passengers, was en route to landing zone. According to weather report, weather was good at LZ. Aircraft was rising to cross ridge line when poor visibility was encountered. Pilots decided to make left turn and abort mission. Visibility became worse and turbulence became moderate to heavy. Aircraft started descent down ridge line. Load was jettisoned, and aircraft hit ground. Thrust was pulled, rotor rpm decayed, and aircraft passed 75 feet above powerlines. Crew smelled smoke and turned left into wind. Aircraft hit the ground a second time and rolled downhill, coming to rest on right side. After crew and passengers left aircraft, it was destroyed by fire. 8064

Class E mishaps ☐ (B series) No. 2 hydraulic and SAS lights came on, followed by zero indication on No. 2 flight boost pressure gauge. Caused by failure of O-ring on top 3-way fitting on No. 2 flight boost manifold. ☐ (C series) During ramp check, crew chief saw oil leaking from utility hydraulic cooler fan. Caused by failure of fan motor.

oh58 **Class A mishap** ☐ (A series) As aircraft was being landed from a hover to a sloping area, it rolled to right and was destroyed. 8065

Class E mishaps ☐ (A series) Door handle fell off during hover. Caused by broken roll pin and door handle. ☐ (A series) While flying at 50 knots and 50 to 100 feet agl, pilot turned east into sun and rotor blades cut through three

powerlines. Aircraft vibrated severely and pilot landed in open field. ☐ (A series) During autorotation with turn, rotor rpm went to 400. Collective was increased and rpm returned to normal.

th55 **Class C mishap** ☐ During first supervised solo approach to landing, student pilot made collective pitch control adjustment at about 100 feet. Rpm rose above 3000 and throttle engaged antioverspeed device. Aircraft yawed to left. SP tried to stabilize rpm and overcorrected. Aircraft began to spin to right. Student lost control and aircraft settled in from 30 to 35 feet, damaging tail rotor, tail rotor drive shaft, skid, center frame, and landing gear.

ov1 **Class E mishap** ☐ (D series) Gear handle was placed in down position during approach. Left gear indicated unsafe. Postlanding inspection revealed failure of left main gear down lock microswitch.

u21 **Class E mishaps** ☐ (F series) No. 2 engine torque fluctuated during descent for landing and aircraft vibrated severely. Caused by failure of fuel control assembly. ☐ (RU-21H) Aircraft, flying in clouds, was hit by lightning. Left wing pod antenna and right lower VHF dipole antenna were damaged.

Maintenance

uh1 **Class E mishaps** ☐ (H series) When hydraulic control switch was turned off for simulated hydraulic failure, aircraft pitched up abruptly to 25° and rolled left. IP turned switch on and regained control. Incorrect hydraulic piston axial pump was installed on aircraft. Pump used was for C and M model Hueys. ☐ (H series) Cyclic displaced 15° to left during straight and level flight. Cyclic rigging was out of adjustment.

uh60 **Class E mishaps** ☐ Master caution, reservoir, hydraulic pump, and tail rotor servo lights came on during takeoff. Caused by chafed hydraulic pressure and return lines. ☐ Stabilator did not program up during takeoff. When manually slaved up and replaced in auto mode, stabilator went to full down position. Stabilator was manually slaved to neutral and aircraft was landed. Caused by out-of-adjustment accelerometer.

ch47 **Class E mishap** ☐ (C series) Aft transmission oil pressure light came on and transmission pressure gauge dropped to 15 psi. Mechanic had removed aft transmission oil filter for cleaning and failed to replace oil lost during process. Trapped oil at sight gauge gave false indication on preflight.

oh58 **Class E mishaps** ☐ (A series) Pilot heard loud whine and saw hydraulic caution light come on. Feedback was felt in controls. Postlanding inspection revealed fitting on hydraulic line between pressure filter and servos had backed off. Fitting was improperly torqued. ☐ (A series) Pilot noticed partial power loss and was unable to regain operational rpm. Caused by incorrect N_1 adjustment on engine fuel control.

ov1 **Class E mishap** ☐ (D series) Left main gear showed unsafe during landing. Gear was recycled six times and left down on sixth attempt. Emergency gear extension procedures were followed and gear still indicated unsafe. Landing was made without

(continued on back page)

Mishap briefs

incident. Caused by broken down lock microswitch wire at drag brace joint.

u21 **Class E mishap** □ (RU-21D) Gear warning horn sounded during landing and gear handle lights came on. Gear indicator lights showed gear down and locked. Tower personnel said gear appeared to be down and aircraft was landed. Caused by improperly adjusted nose gear down lock switch.

Urgent change to OH-6 maintenance manual

Urgent change 11 to TM 55-1520-214-23, dated 8 Aug 80, has been released.

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

Blade skin separations increasing

The number of UH-1 precautionary landings (Class E mishaps) caused by main rotor blade skin separation is increasing at an alarming rate. The number of such mishaps in FY 79 was twice the number occurring in FY 75, and the number to date for FY 80 is almost four times as great.

A recent teardown analysis of a UH-1 main rotor blade which had a skin tear along the scarf joint revealed the presence of a large amount of surface corrosion. The examination further revealed that corrosion caused debonding between the aluminum casting and skin, resulting in separation of the skin covering the blade.

Daily inspections of the main rotor blade by the crew chief or maintenance personnel are required by the PMD checklist. Also, the operators manual requires pilots to check the condition of their aircraft's main rotor blade during preflight and thru-flight inspections. Inspections should include checking both upper and lower surfaces of the blade and blade tips for damage, cracks, and visible indications of voids and bond separation. The blade should also be inspected for nicks and dents on the trailing edge and scarf joints and for erosion or corrosion.

Aviators and maintenance personnel are urged to look more carefully at their rotor blades. Failure to detect blade skin abnormalities on the ground could lead to a very hairy experience in the air. ■

Landing gear problems

Several mishaps involving landing gears have occurred during FY 80. Gears weren't put down, maintenance personnel assembled them incorrectly, switches were not properly adjusted, and actuators, motors, and switches failed.

Pilots, do you know the emergency procedures? Do you follow the checklist every time? Mechanics, do you assemble the gear by the book? Do you know what can happen if you incorrectly install or adjust a component of the landing gear system?

Because so many malfunctions can occur in a landing gear system, operators must be familiar with how the system operates and the emergency procedures, and maintenance personnel must know correct maintenance procedures. ■

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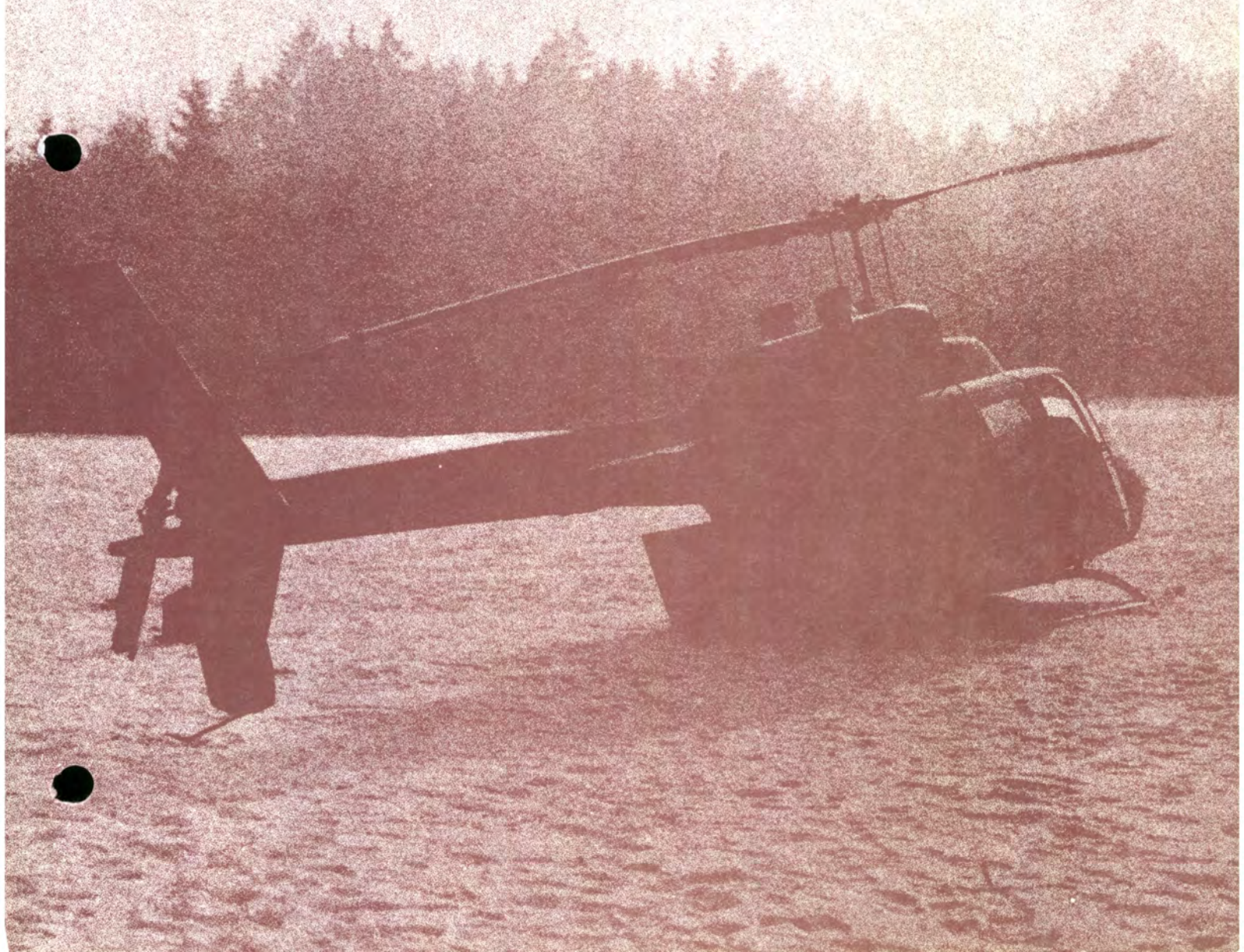
Cold weather coming . . .

Successful winter operations demand advanced planning and preparation



Cold weather alert

Those of you stationed in Southern geographical areas are probably still sweltering from high summer temperatures, and thoughts of winter operations may seem remote. But for those of you in the arctic and subarctic regions, winter is right around the corner, so the time to plan and prepare is now—before the onset of cold weather.

Winter presents a multitude of hazards for both aviation personnel and aircraft operation—especially in Alaska and in other areas of the world where frigid temperatures prevail.

And while conditions associated with cold weather operations are probably more severe in Alaska, similar conditions exist in varying degrees in other parts of the world.

Pre-snow training

Among the numerous cold weather problems that plague Army aviators, rotor-induced whiteout during operations close to the ground is the most common. When encountering loose, powdery snow during flight, helicopter pilots often find themselves in the middle of a ball of swirling, visually cueless atmosphere. This is an ideal condition for inducing serious disorientation which often leads to the wrong flight control input or pilot freeze-up on the controls. Minimizing whiteout from rotorwash requires special techniques. Fortunately, these techniques can and should be practiced before the first snowfall. The thrust of this training is to provide pilots the experience they need to handle blowing snow without actually experiencing whiteout.

The following techniques should be followed during both pre-snow training and snow operations.

• Takeoff should vary somewhere between a maximum performance takeoff when the flight path is clear of obstacles all the way to a near vertical takeoff when obstacles are present. For example, takeoff could involve a near vertical lift until clear of the snow cloud, a transition to a maximum performance takeoff until clear of the obstacles, and then a transition to normal climbout to en route altitude.

• Landing over loose, powdery snow is probably the most demanding phase of snow operations. The approach is almost a normal one with a slightly concave effect close to the ground and an appearance that the aircraft will land short of the actual touchdown point. This technique, coupled with a slightly higher airspeed on final, allows the pilot to stay ahead of the snow cloud until just before touchdown.

• Taxiing can be safely done in one of two ways. When in close proximity to other aircraft or buildings, the pilot's only choice is to keep the skids on the ground and proceed slowly in the desired direction, stopping as necessary to allow the visibility to clear. When room permits, aircraft should be flown to a hover and taxied at a faster rate than normal (about 10 to 15 knots). This method will keep the snow cloud behind the aircraft and provide good visibility.

• Formation flying over snow has taken its toll on aircrews and aircraft. Depending on the nature of the terrain and condition of the snow, 5 to 10 seconds (about 200 meters) separation should be maintained during en route flying. As a rule, separation should be extended to at least 15 to 30 seconds just before arriving in the LZ to prevent having to land in a snow cloud produced by other aircraft. However, prevailing conditions such as extreme low temperatures could require a much greater interval (3 to 5 minutes) between aircraft landing in a small LZ.

All pilots, including unit IPs and SIPs, lose a certain amount of winter flying proficiency after several months of summer operations. Therefore, at the onset of the first snowfall, blowing snow refresher training should be conducted IP with IP or IP with the most experienced pilot.

Icing

Icing poses a serious hazard to both rotary and fixed wing aircraft. Icing in Alaska presents both bad and good news. The bad news is that icing can be very severe. The good news is that except for about 3 to 4 weeks at the beginning and end of winter it is usually too cold and dry for icing. Compared with Alaska, icing is a continuous threat in other areas of the world because of less severe temperatures and higher humidities. But regardless of the area of operation, icing conditions must be evaluated during weather briefings. Take, for instance, one Huey pilot who encountered unforecast icing less than one-half mile from the end of the runway. Within 30 seconds, while the pilot was turning back to the airfield, ice had obscured windshield visibility except for two 6-inch squares in the lower left and right corners. Only instant realization of the severity of this probem saved the crew from facing more serious danger than they had already experienced during the 1-minute flight.

(continued on page 4)

The cold facts

Obviously, a downed aviator is not likely to find a warm room, hot bath, water, fire, or any kind of prepared shelter awaiting him after he lands his aircraft or ejects over snow-covered wilderness. If he is not prepared to cope with the elements, his chances of making it back to civilization alive are about the same as those of the proverbial snowball in that hot place. All preparations must have been completed **before** takeoff, but deciding what preparations are in order is not always a simple matter.

It is pretty hard for an aviator in an area of relatively mild winter weather to envision what he should wear in 4-foot snowdrifts and a -20° temperature. Yet this may be exactly what he must do. In some parts of the Southwest, for example, he may be in a desert area where the thermometer registers a sultry 90 degrees, while not far away, the temperature may be below freezing.

Nor should he forget the chill factor. The higher the wind velocity for any given temperature, the lower the equivalent temperature. At 5° F under no-wind conditions, a person can remain reasonably comfortable with normal precautions. With a 2-mph wind, he will experience discomfort, particularly on overcast days. If the wind velocity reaches 8 mph, it becomes bitterly cold and uncomfortable even on clear sunny days. At 16 mph, the wind can cause exposed human flesh to freeze and life in a temporary shelter to become highly disagreeable. Should wind velocity rise to 35 mph, exposed flesh will freeze in less than 1 minute and stringent survival efforts will be required to sustain life. **All preparations for winter survival should be based on the worst weather conditions that can be expected along the proposed flight route.**

What should you do if you are downed in freezing weather? Heading the list are four big DO's.

- Stay near the aircraft.
- Get out of the wind.
- Build a fire.
- Keep dry.

Having the capability to build a fire is most important.

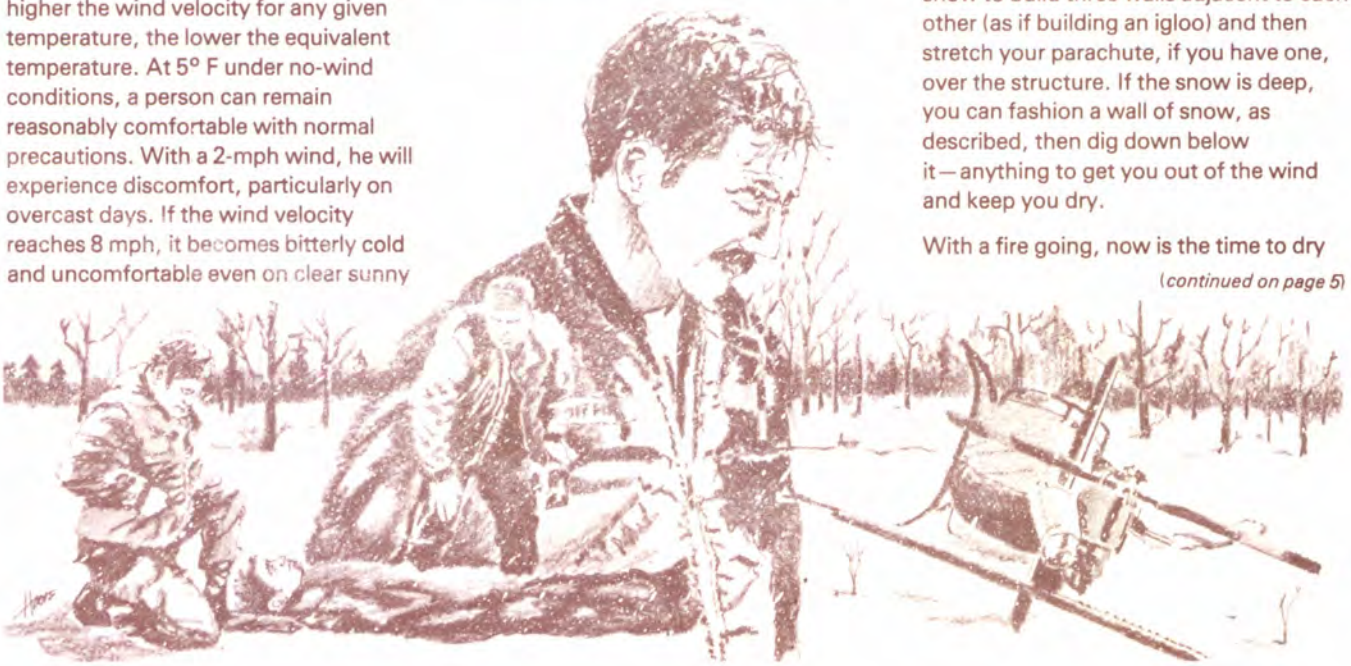
Although you will have to survive the elements, you also want to be rescued as soon as possible. It is generally much easier to locate an aircraft than to spot individuals. So stay with the aircraft unless you **know** you can reach help. But **don't** stay **in** the aircraft. It will be like a deep-freeze unit.

Next, get a fire going—before your hands and fingers get so numb you can't even strike a match. Standing dead trees make the best firewood because they are reasonably dry. They also produce less smoke. Once you get a fire started, you can use damp wood, if necessary. To get maximum benefit from your fire, you should make some sort of reflector to radiate the heat toward you. One can be fashioned from trees, logs, metal from the aircraft, or from virtually any material that is available.

A shelter is another necessity. It is needed to protect you from both wind and rain. It does not have to be elaborate. A simple lean-to will do the job. You can also use snow to build three walls adjacent to each other (as if building an igloo) and then stretch your parachute, if you have one, over the structure. If the snow is deep, you can fashion a wall of snow, as described, then dig down below it—anything to get you out of the wind and keep you dry.

With a fire going, now is the time to dry

(continued on page 5)



Cold weather alert

Preflight and postflight requirements

Winter operations demand additional preflight and postfight requirements.

- Extended warmup time is required for drive train and electrical equipment.
- Flight controls should be thoroughly checked for ice buildup and complete freedom of movement before runup.
- Sufficient time should be allowed before hub system checks are attempted to avoid damaging brittle seals.

Many more requirements and suggestions can be found in the applicable aircraft operators manuals and TC 1-12.

Static electricity

The danger posed by static electricity is much greater during cold, dry seasons than during warm, humid ones. Static electricity can be generated by the movement of the aircraft through the air or by brushing snow and ice from aircraft surfaces. It is especially dangerous during refueling operations since friction generated by fuel flowing through the hose and past the filler neck can produce an electrical charge sufficient to cause a fire or explosion. Consequently, during servicing, it is extremely important to properly ground the aircraft as well as bond it to the refueling vehicle. As an additional precaution, the nozzle should be fully inserted into the filler neck at all times. Also, before refueling aircraft, individuals should discharge any static charges built up in their bodies. They can do this by touching a properly grounded conductor.

Survival training and gear

Hopefully, aircrews will never find themselves in a cold weather survival situation. But no matter how sophisticated our weather reporting abilities, no matter how good our crews, no matter how well equipped and well built our aircraft, nature can get to us now and then. Thus, we must think about the unthinkable—survival.

If you have never been stationed in Alaska, it may be hard to imagine temperatures that range from 30 to 60 degrees below zero for weeks on end, winds that average 35 knots for 10 to 12 days, or a storm that piles snow into 8-foot drifts in a single night. Since Alaska presents an arctic-type cold climate, all crewmembers are required to attend the 4-day Air Force Cold Weather Survival School during their first year in Alaska. But for those of you in other areas of the world where this type of schooling may not be available, your best bet is to acquaint yourself with survival hazards contained in applicable cold weather FMs and TCs. After all, the alternative to being a fatality in a survival situation is to be properly clothed, to know exactly what to do, and to have the necessary gear to handle the emergency.

Units operating in cold weather areas are responsible for conducting a thorough and well organized training program. This training must be geared to instill confidence, to develop skills in all areas of cold weather operations, and to insure safety. The buck begins with the unit commander and travels down through the chain of command.

The key to successful winter operations is advanced planning and preparation—before Ole Man Winter sets in. ■

Captain George J. Kerrigan
U.S. Army Safety Center

The cold facts

off. Getting dry and staying dry are important in preventing cold injuries—and death—from freezing temperatures. But don't lie on bare ground. You need insulation beneath you as well as above you. Line the ground with plenty of boughs and place your sleeping bag on top of them. Also, deep snow makes an excellent insulator. Bear in mind that pine and spruce, which are most abundant in northern classes, will cast an abundance of sparks a distance of 5 or 6 feet when burned. Also, the smoke produced from a fire in a closed shelter can cause severe headaches and swollen and inflamed eyes. Headaches, however, will disappear after a short time outside. Unless you are alone, it's a good idea to always have someone awake to tend the fire and act as fireguard.

You may also be faced with other problems. Statistics show that in survivable crash landings, approximately half of the aircraft's occupants will sustain some type of injury. Broken bones and shock are common to crash victims. Don't attempt to set broken bones. Instead, immobilize them by fashioning splints. Keep an injured person warm to protect him from freezing as well as to treat or prevent shock. Here, again, the sleeping bag or a facsimile (rolled up parachute) can be a real lifesaver.

Remember, also, that a person in shock will require more water than he would normally need. Unless a supply is available, always melt snow to get water. Eating melted snow not only will cause chapped lips, faces, and tongues, but since snow contains little water, it will actually increase thirst and bring on parched and burning throats. If you have no utensils, one way of melting snow is to heat a flat rock that has a depression in it, then pile snow on top of it.

Obtaining food may be a problem, especially if you are not rescued soon. If you have a firearm, good. If not, you can fashion snares and traps to catch small animals. Weakness from exhaustion and lack of nourishment is a common occurrence. To help minimize it, avoid walking or working in deep snow as much as possible. If the snow is deep and you must move about, fashion some type of snowshoes. Trying to walk through deep snow without them will require a great expenditure of energy, promoting exhaustion.

Despite your best efforts, your chances of surviving may hinge on one important factor—your mental attitude. Its importance can be dramatically shown by briefly reviewing the case history of an aviator forced to bail out over frozen wastelands. This man landed safely and did everything right. He established a campsite, built a fire, etc. All he had to do was wait to be found. Instead, from despair, loneliness, and possible thoughts of the futility of his predicament, he used his .45 to commit suicide. Rescuers reached him within 24 hours after he had bailed out of his aircraft.

With proper knowledge, clothing, and survival equipment, chances are overwhelmingly in your favor that you can survive the most bitter cold. But the time to make preparations is now! ■

Mishap review

Synopsis

The OV-1D was seen flying low near the pilot's house. It left the area and headed toward an open valley. Shortly afterward, it was seen to make a short, steep climb, change directions, and descend. The aircraft was destroyed on impact, and the pilot and technical observer were killed.

History of flight

The mission was a routine training flight for the pilot to get some hood time for ATM requirements. The pilot and technical observer took off and flew toward the pilot's house. About 5 minutes after takeoff, the Mohawk was seen making an extremely low-level pass over the pilot's house in an easterly direction. The aircraft continued easterly and crossed a highway, reportedly flying about 100 feet agl.

Witnesses said the aircraft entered a steep climb to a near vertical position and, at the highest point in the climb, rolled to an inverted nose-down position and crashed, bursting into flames.

Crewmember experience

The 44-year-old pilot was current and qualified as an IP in the OV-1D. He had more than 5,000 fixed wing flight hours, with more than 1,600 in OV-1s and almost 500 in OV-1Ds.

Witness accounts

Witnesses living near the pilot said the pilot had buzzed his house on other occasions.

A summary of witness accounts revealed the pilot was a proficient OV-1 pilot, but he was overconfident in his flying abilities. He had on several occasions violated unit SOP. However, on all but one of the occasions his actions were not considered unsafe and were not reported through command channels. The one reported incident involved the continuation of a flight into icing conditions in a UH-1. Command action was taken for what was considered poor judgment on the part of the pilot.

Several times the pilot was heard to remark that his way was the right way because he had flown all those years and had never had an accident.

Commentary

A low-level flight course and a designated aerobatic training area were established for the purpose of conducting ATM task requirements. Aerobatic flight maneuvers were to be conducted above 1,500 feet agl. Nonstandard upper air maneuvers were prohibited in mission-configured aircraft. Coordination with the airfield tower was required before the performance of low-level flights or aerobatic maneuvers in the designated training areas. The flight was not conducted in either training area, the aircraft was mission configured, and no coordination was made with tower personnel.

Evidence strongly indicated that the pilot was violating federal aviation regulations and unit policies on low-level flight just before the climb. The climb itself was a violation of these policies since it met the definition of aerobatic flight. There was insufficient altitude to recover when the pilot inadvertently stalled the aircraft during the steep climb.

The aerobatic maneuver at low altitude may have been a spur-of-the-moment decision in which the performance capabilities of the aircraft in a heavy mission configuration were not fully considered. However, the decision to perform the unauthorized airshow-type of flying was not a spur-of-the-moment decision. He flew directly to the area of his house after taking off from the airfield and made several orbits in the area. Ther was ample time for him to consider the ramifications of his decision. ■

Selected mishap briefs

uh1 **Class C mishaps** □ (B series) Left chin bubble hit top of tree during NOE flight. Chin bubble was broken and main rotor blades were damaged. □ (H series) During entry to low-level autorotation at first point of deceleration, white tail rotor grip failed and tail rotor blade separated from hub. Red tail rotor blade then pulled 90-degree gearbox from vertical fin. Red tail rotor blade, grip, yoke, and hub assembly separated from 90-degree gearbox. Landing was made without further damage. Failure of grip was probably caused by corrosion fatigue. □ (H series) IP was demonstrating touchdown autorotative landing. Aircraft seemed to fall through at touchdown and required abnormal amount of collective pitch application. Aircraft landed hard, damaging cross tubes, skid tubes, and stinger.

Class E mishaps □ (H series) Aircraft was on mission to pick up target devices from range where tow missiles had been fired. When pilot landed to pick up device, he noticed wire across greenhouse. When copilot got out, he saw several strands of wire around swashplate. Maintenance inspection revealed no damage. □ (H series) Aircraft hit wire during authorized NOE training flight. Wire was marked on hazards map in airfield operations and on aviator's map in aircraft. IP was in left seat, pilot was in right seat, and navigator was in jump seat. Aircraft, equipped with glass windows, was flying between 20 and 30 knots. As soon as pilot saw wire on windshield, he raised nose and increased pitch to keep it from sliding over cabin and into rotor system. Wire snagged on wipers, then broke. Both pilots said bright sunlight was a definite factor in their inability to see wire. Windshield was scratched and nose compartment was slightly damaged. □ (H series) Five minutes after takeoff, egt was seen at 610°-615° C. and engine oil temperature at 95°-98° C. Postlanding inspection revealed failure of deice valve. P-3 line (used as pilot's handhold) was leaking where braided line is swaged into sleeve. **Some people are not recognizing the difference between hoses and handles. Hoses are not made for handholds. If it isn't a handle, keep your hands off of it.** □ (H series) Master caution and fuel filter lights came on. External fuel filter was clogged. Fuel was contaminated with grease. Seal on outside of hose reel on fuel truck failed, allowing grease to mix with fuel.

ah1 **Class C mishap** □ (S series) Aircraft hit tree during tactical training flight, damaging main rotor blades.

Class E mishaps □ (TH-1G) Master caution light came on. Caused by faulty master control panel. □ (TH-1G) Hydraulics failure was caused by defective filter return line. □ (S series) Master caution and No. 1 hydraulic lights came on during landing. Caused by failure of hydraulic pressure switch.

ch47 **Class E mishaps** □ (C series) No. 1 engine rpm climbed to 246 during hover check. Crew regained rpm control with No. 1 emergency engine trim. Caused by malfunction of No. 1 engine N_2 control box. □ (C series) No. 2 engine condition lever was positioned to ground to simulate single-engine failure. After rpm was stabilized at 235 for 10 seconds, it increased to 245. Engine would not respond to normal engine beep trim. Caused by failure of adjustable resistor. □ (C series) Cyclic stick would not move to right during flight. When pilot pushed control centering button, cyclic worked in all quadrants and aircraft was landed. Caused by badly worn control centering spring rod.

oh58 **Class A mishap** (A series) Pilot was transitioning from low-level to contour flight, intending to terminate at OGE hover above ridgeline. At about 40 feet agl and near-zero groundspeed, while increasing collective pilot applied full left pedal, which was insufficient to maintain directional control. Aircraft began to spin to right, became uncontrollable, and

(continued on back page)

Mishap briefs

crashed on slope. Pilot and copilot sustained minor lacerations. 8066

Class E mishaps ☐ (A series) High frequency vibrations occurred during flight. Caused by defective tail rotor drive shaft bearing. ☐ (A series) Master caution and fuel filter lights came on. Caused by clogged external fuel filter. Fuel was contaminated with grease. Seal on outside of hose reel on fuel truck failed, allowing grease to mix with fuel. ☐ (A series) Fuel boost pump light came on during landing. Caused by failure of fuel pump assembly.

c12 **Class E mishap** ☐ (A series) Pilot saw fuel leaking from left engine during flight. Caused by failure of preformed packing.

ov1 **Class E mishaps** ☐ (D series) Postflight inspection revealed broken No. 2 engine forward and center cowl latches and bent cowling. Caused by failure of hinge pin. ☐ (D series) No. 2 torque gauge circuit breaker tripped in flight and could not be reset. Caused by failure of torque indicator.

t42 **Class E mishap** ☐ No. 1 engine ran rough and fuel pressure fluctuated during flight. Caused by failure of fuel pump.

Maintenance

uh1 **Class E mishap** ☐ (H series) Cyclic feedback occurred during flight. Running landing was made. Washer tab lock and retaining cap on right cyclic servo were installed improperly, allowing servo to move about 1 inch on mounting bracket.

uh60 **Class E mishaps** ☐ Stabilator failed to program in auto mode during takeoff, followed by flight path stabilization and accelerometer filter light. Stabilator was controlled manually and aircraft was landed. Caused by out-of-adjustment accelerometer. ☐ No. 2 engine oil pressure light came on and engine oil temperature increased. Caused by improperly secured oil filler cap.

ah1 **Class E mishaps** ☐ (S series) Crew noticed fuel fumes in cockpit and fuel gauge was showing excessive fuel consumption. Postlanding inspection revealed O-ring was missing from fuel control ☐ (G series) Crew of No. 2 aircraft in flight of three saw vertical fin drive shaft cover of No. 1 aircraft fly open. After aircraft was landed, inspection revealed all five dzus fasteners were broken. Dzus fasteners were probably the wrong size.

oh58 **Class E mishap** ☐ (A series) Low rpm audio sounded and rotor rpm light came on during hover. Inspection revealed airline fitting at governor had backed off, causing power loss.

c12 **Class E mishap** ☐ (A series) Fuel was seen leaking from right engine upper inspection panel during flight. Postflight inspection revealed fuel line nut fitting had backed off.

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

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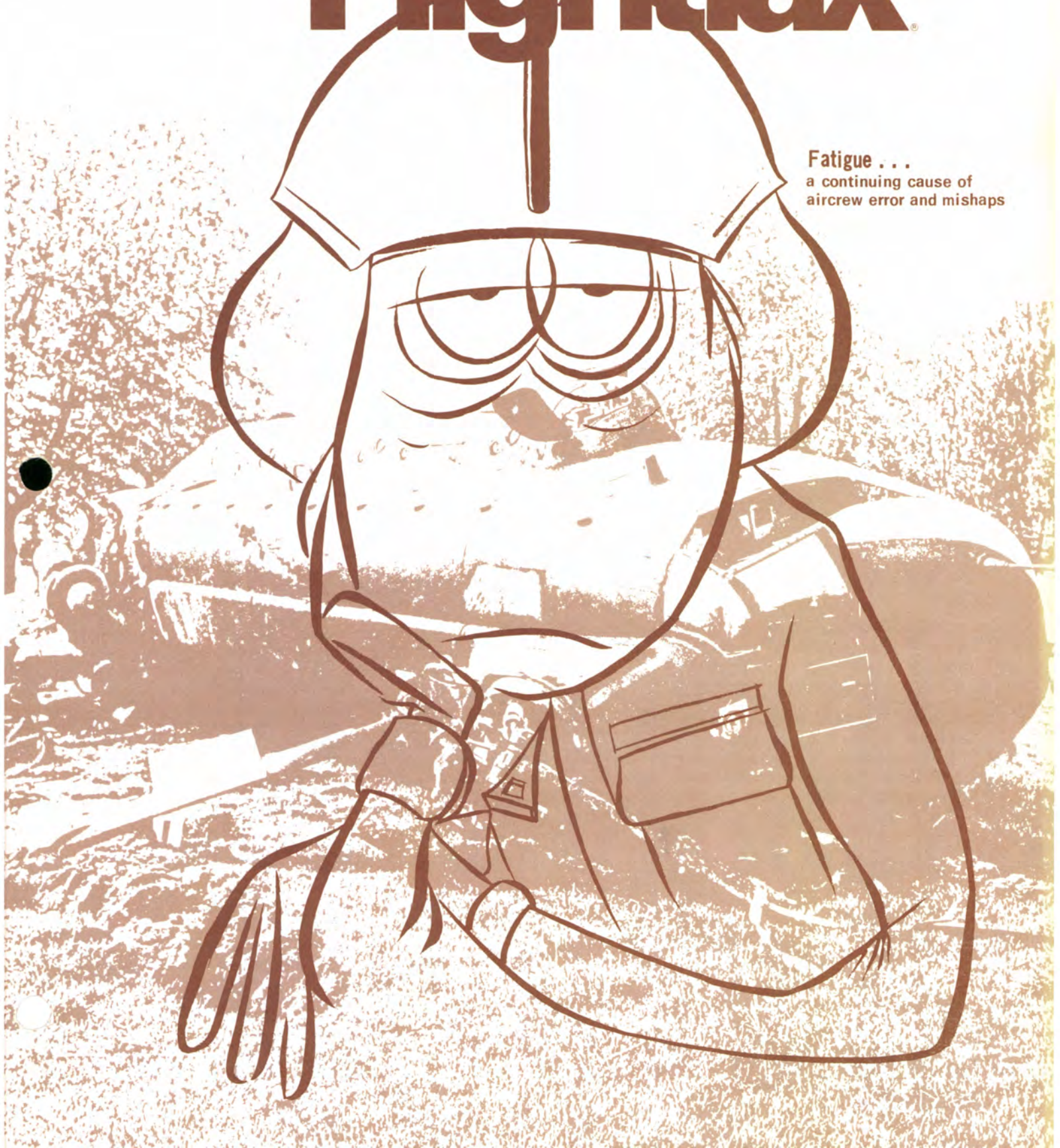

Fatigue . . .
a continuing cause of aircrew error and mishaps

Fatigue facts

Fatigue was reported as a factor in 81 Army aircraft mishaps from FY 77 through June 80. While this number alone is cause for serious concern, in all likelihood, it represents only the tip of the iceberg. There's no way of knowing how many times fatigue contributed to a mishap but was not recognized.

Sleep loss, self-regulated crash diets, missed meals, jet lag, long duty hours in extremely hot weather, excessive flying and duty time, and failure to properly use crew rest time have all been cited as causes of aircrew fatigue in mishaps.

Other ingredients setting the stage for mishaps are altered work/sleep cycles, boredom, task oversaturation, hypoglycemia, recent illness, and emotional problems.

Fatigue reduces perception, coordination, reaction time, planning, and judgment. It leads to overconfidence and mistakes. Consider the following recent fatigue mishaps:

• An OH-58 pilot and instructor pilot were on a tactical training mission, flying at 65 knots below 50 feet agl. The IP was flying when the aircraft hit wires and crashed.

During the three days the unit had been participating in the field training exercise, the IP had flown 23½ hours of terrain flight with only 13 hours of sleep. Fatigue caused a reduced sense of awareness and contributed to the IP's decision to fly too low and too fast for the conditions.

• An AH-1 pilot on a ferry flight, realizing he was about to enter instrument meteorological conditions, made an abrupt, uncoordinated right turn. This caused the aircraft to lose altitude, hit some trees, and crash.

The pilot and IP had exceeded crew rest limits, and both were heavy smokers. They had been flying for 30 minutes at an indicated altitude equivalent to a physiological altitude of 12,500 feet msl. The combined effects of fatigue and hypoxia probably caused the pilot's visual acuity, reaction time, and motor skill levels to be degraded to a degree that he became uncoordinated.

• A UH-1H copilot on a night flight was flying 20 to 25 feet above trees at about 70 knots. He was trying to keep up with the flight leader, who was flying 75 to 100 feet above the trees at 80 to 85 knots. When a tall pine tree appeared in their flight path, the crew could not avoid it. Both chin bubbles were broken by the tree strike, but the crew was able to land without further damage.

The pilot and copilot had been awake almost 19½ hours at the time of the mishap.

• An OH-58 pilot on a tactical training mission hovered his aircraft at 2 to 5 knots and 2 to 5 feet agl over snow-covered terrain. As a result, the aircraft became engulfed in rotor-induced recirculating snow and crashed.

The pilot had exceeded day/night flight and total duty limits in table 5-1, AR 95-1. He said he was momentarily confused as to what he should do when he lost outside visual reference. By the time he

IP of this OH-58, which hit wires during tactical training mission, had flown 23½ hours of terrain flight with only 13 hours of sleep.

decided to add power and climb above the recirculating snow, the left skid had dug into the terrain.

Fatigue during FTXs

Inadequate crew rest enforcement policies are common among some units during field training operations. Adequate crew rest programs in the field should consider maximum flying hours, maximum duty hours, and the physical environment which affects the ability of the crewmember to get enough sleep. A situation where an aviator must sleep on the ground, in a pup tent, on a hot day, in an area where there is a lot of vehicular or helicopter traffic is not conducive to sleep, but it is a common occurrence.

When units go to the field, commanders often expect to "win the war" in the first 2 or 3 days rather than plan for sustained combat operations. This results in crews becoming fatigued after the first couple of days, and crew-rest-related mishaps occur.

Fatigue produces division of attention problems. When aviators are fatigued, for whatever reason, they often become "fixed" on one particular thing. During terrain flight, such fixation can cause mishaps. Tree strikes are good examples because they often are caused by aviators concentrating their attention on one thing such as tuning a radio, landing to a light, etc., without focusing on what is going on elsewhere. Four tree strikes occurred during a recent exercise. At least two of them were related to inadequate crew rest. These caused damages exceeding $100,000, putting the aircraft involved out of service for more than 2 days. One pilot had only 6½ hours of sleep in the preceding 48 hours.

This OH-58 crashed after it became engulfed in rotor-induced recirculating snow. Pilot had exceeded flight and total duty limits specified in AR 95-1.

Safety is really another word for conserving resources. Had 2 flying days been scheduled for crew rest, the same number of aircraft would have been available for missions and, conceivably, there would have been a significant savings in manpower and materiel.

While tree strikes seldom produce fatalities, in high aircraft density areas there is also high midair collision potential, and these types of mishaps are almost always catastrophic.

(continued on next page)

Fatigue facts

Controlling fatigue

Fatigue will always be a part of aviation. There's no way around it. No work, especially work as demanding as flying, can be done without some degree of fatigue-producing stress. But while the prevention of all fatigue is impossible, it can be reduced and controlled, and held to acceptable, relatively safe levels.

There are two basic types of fatigue—acute and chronic. Acute fatigue is more common and is caused primarily by excessive mental or physical activity. It is temporary, lasting only minutes or hours—and can usually be relieved by a period of sleep or rest and relaxation. When acute fatigue is not relieved, but is prolonged from day to day, it can lead to chronic fatigue, which is more serious and incapacitating. Unfortunately, this type of fatigue is not generally relieved by periods of sleep and rest. It usually requires an extended period of time for recuperation.

To reduce the likelihood of the development of chronic fatigue, the following measures should be taken:

• Crewmembers should be encouraged to maintain good physical conditioning through beneficial forms of recreation. Controlled physical conditioning improves mental outlook and increases the likelihood that sleep will be natural and protective.

• Crewmembers must be given the opportunity for adequate rest and natural sleep—sleep without the aid of medicine. This is the best deterrent to fatigue.

• Supervisors must consider crew rest/fatigue in mission planning and crew assignments. That "all-important" mission might not be that important when weighed against the loss of the crew, aircraft, and all aboard.

• Commanders and supervisors should set the example and discourage conditions which would enable the development of bad habits such as heavy smoking, alcohol overindulgence, exertion, moonlighting, etc.

• Commanders, flight surgeons, and aviation safety officers must monitor individuals for signs of fatigue, a difficult task indeed. To accomplish this, they must have an intimate knowledge of their personnel. This can only be achieved by frequent participation in their duties and missions and by close surveillance of their responses to stress.

• Aviation safety officers should insure that crewmembers are educated in the effects of fatigue and how to control fatigue-producing stresses.

• Comply with paragraph 5-9 and the crew rest scheduling guide in AR 95-1.

• Ultimately, the responsibility for minimizing fatigue and maintaining maximum performance rests with each crewmember. Individuals must properly manage their off-duty time. It is the moral and military responsibility of each individual crewmember to get sufficient sleep and proper nourishment and not to engage in off-duty activities which would prevent him from reporting for duty fully rested and mentally alert. It is also the responsibiilty of each crewmember to tell the supervisor or commander when he has reached or is approaching the prescribed flight-time limits. It is extremely difficult for commanders to remain constantly aware of the status of each individual crewmember in regard to scheduling standards.

Yes, fatigue will always be a part of aviation operations, but it doesn't have to be a mishap cause factor. ■

Mishap review

Synopsis

An AH-1G on a ferry flight was flying over rising terrain. As visibility decreased, the pilot, realizing he was about to enter IMC, tried to turn 180 degrees to the right. The aircraft lost altitude, hit some trees, and crashed.

History of flight

A pilot and instructor pilot were ferrying a Cobra from one state to another. They flew more than 8½ hours the first day. The next day, they took off, flew for an hour, and stopped to have the aircraft serviced.

About 2 hours later, the aircraft took off for the last leg of the flight. At departure, the crew reported good visibility of 20 to 30 miles. Entering higher terrain, the crew had a navigational problem and admitted to some geographic disorientation. They were south of their proposed route of flight when they identified a highway and turned. They were about 400 feet agl in patchy fog and light rainshowers.

A few minutes later, the aircraft crested a hill and the crew saw a heavy wall of scud or ground fog. The pilot began a 180-degree right turn to try to avoid entering IMC. During the turn, the aircraft began to descend. As the turn was almost completed, the pilot rolled level and tried to stop the descent. The aircraft settled into some trees and crashed, coming to rest on its left side.

The pilot's canopy popped open and he was able to exit unassisted. The IP's mike cord caught on the right side of the armored panel as he was exiting, and the pilot pulled it loose and helped him out.

Crewmember experience

The 30-year-old IP had almost 3,000 rotary wing hours, with more than 2,000 in AH-1s. He was on orders as a unit IP in the AH-1G and was logging time as an IP, but he did not perform IP duties during the flight. He had performed IP duties only one other time since his assignment to the unit.

The 40-year-old pilot had more than 1,300 rotary wing hours, with more than 650 hours in AH-1s. He did not have a current standardization flight evaluation.

Commentary

Teardown analysis indicated there were no discrepancies that would cause a loss of power or power interruption.

The pilot, because he didn't want to enter IMC and didn't know what was in front of him, made a steep right turn. During the turn, he used incorrect antitorque control, resulting in the application of full right pedal which caused the beginning of a descent. As he was only about 200 feet agl when he started the turn, the descent needed to be stopped immediately. Trying to roll out and stop the descent, the pilot used all the power available. Because there was not enough power to stop the descent, the engine rpm began to decay and the aircraft lost altitude.

The IP did not take timely corrective action because of his preoccupation with navigating in the reduced visibility and his lack of confidence in himself as an IP.

The crew did not see the fog bank until they crested a small hill which had masked their view. They were looking at their maps because they were disoriented. A light rainshower, combined with paint overspray on the windshield, reduced visibility.

The pilot and IP exceeded crew rest limitations. They had slept only 12 hours in the preceding 48 hours. The day before the mishap, they had flown more than 8½ hours and been on duty almost 16 hours. They had been awake 11 hours at the time of the mishap.

Both crewmembers were moderately heavy smokers and had been flying for 30 minutes at an indicated altitude equivalent to a physiological altitude of about 12,500 feet msl. The pilot's visual acuity, reaction time, and motor skill levels may have been degraded to a degree that he became uncoordinated. ■

Selected mishap briefs

uh1 **Class A mishap** ☐ (H series) Tail rotor hit tree during NOE approach. Initial investigation indicates tail rotor separated from aircraft and directional control was lost. Aircraft crashed and burned. Copilot sustained minor contusions. 8067

Class C mishaps ☐ (H series) Aircraft fell through during landing and hit hard enough to damage skid cross tubes and mounts. ☐ (H series) During high recon of LZ, IP determined area was suitable for landing. On short final, outside visual reference was reduced because of blowing sand. During termination of approach, main rotor blades hit tree limbs extending over landing area.

Class E mishaps ☐ (H series) Pilot could not recover from shallow right turn because of binding in controls. Copilot

got on controls with pilot, and landing was made. Postlanding inspection revealed water in both cyclic servos. ☐ (H series) Nose dropped during flight. Pilot applied aft cyclic and moved pedals to see if he had tail rotor control. Pilot determined he did have control and landed. Caused by four inserts pulling loose from fuel cell panel. ☐ (B series) Main generator loadmeter rose during flight, and aircraft was landed. Battery was smoking and dumping fluid overboard through vents. Battery contained two bad cells.

uh60 **Class E mishap** ☐ No. 1 aircraft of flight of three was flying at 70 knots and 25 feet agl on tactical mission. Pilot leaned over to adjust radio, and aircraft hit tree, breaking chin bubble.

ah1 **Class C mishap** ☐ (S series) Main rotor blades hit tree during NOE flight, damaging both blades.

Class E mishaps ☐ (S series) Landing was made because of leaking fuel filter valve. ☐ (TH-1G) Master caution light came on. Caused by faulty engine oil pressure switch.

ch47 **Class E mishaps** ☐ (C series) Flight engineer saw hydraulic fluid dripping from pylon area. Postlanding inspection revealed pressure line from No. 2 flight boost system aft swiveling actuator was leaking at swedge fitting. Fitting was cracked. ☐ (C series) High frequency vibration during flight was caused by failure of combining transmission.

ch54 **Class E mishaps** ☐ (A series) Transmission oil pressure low light came on, and oil pressure dropped to 10 psi during descent and landing. Caused by failure of O-ring in transmission oil filter. ☐ (A series) Transmission oil pressure dropped and oil pressure low light came on. Caused by failure of transmission oil pump.

oh58 **Class E mishaps** ☐ (A series) Following initial pitch-pull, aircraft was leveled at 15 feet and cushioning pitch was applied until touchdown. Rotor rpm dissipated below 225 before touchdown. IP noticed greater than normal amount of blade flapping. IP fatigue was listed as a possible cause factor. ☐ (A series) Master caution and fuel boost pump lights came on. Caused by failure of fuel boost pump. ☐ (A series) Fuel filter caution light came on during engine start. Caused by failure of differential pressure switch.

t42 **Class E mishap** ☐ Grinding noise was heard as landing gear was being lowered. Pilot made low pass over field and ground observer visually checked gear. Landing was made without incident. Flight publication bag

(continued on back page)

Standardization Communication | Directorate of Evaluation & Standardization USAAVNC, Fort Rucker, Alabama 36362 | STACOM 60 17 Sep 1980

Stacom

Col Newton new Director of Evaluation and Standardization

COL George F. Newton has been designated the Director of Evaluation and Standardization, succeeding COL Charles S. Wingate, who will retire 30 September 1980.

COL Newton is eminently qualified for his new position, having had numerous staff and command positions of great responsibility in Army aviation. A Master Army Aviator, he received his aeronautical rating in November 1959 and is both fixed and rotary wing qualified. COL Newton's previous assignment was Director of Training Developments, U.S. Army Aviation Center, Fort Rucker. ■

The Dog Days of August

The month of August is associated with that time of year commonly referred to as the "Dog Days"—that part of the summer noted for its hot sultry weather. It is also a month of heavy flying activity, accompanied by more than the usual number of aviation mishaps. This past August was typical in all respects. The hot sultry weather materialized, as did the flying activity and the mishaps. There were 8 Class A mishaps—a total reached in only one other month in the past 4 years.

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.

Here are two examples of August mishaps that occurred under conditions that were not the best.

• A CH-47 with 22 combat troops on board, a crew of 4, a 500-pound sling load, and a normal fuel load could not negotiate a ridgeline at an altitude of 10,000 feet when marginal weather was encountered. The aircraft crashed and burned. Fortunately, there were only two minor injuries.

• Preparing for NOE training, the pilot of an OH-58 brought his aircraft to an OGE 50-foot hover on a ridgeline. The prevailing wind was from his left rear at approximately 10-15 knots. Full left pedal was applied, but the aircraft began turning to the right. Corrective actions by the pilot were to no avail; the aircraft continued spinning to the right and crashed. Although the aircraft was demolished, the crew sustained only minor injuries.

These two examples suggest that performance planning data which indicate operations to be within extreme parameters would prompt prudent operators/supervisors to recompute load factors and sorties for operation under more favorable conditions. Until such action is taken by operators, this type of mishap will continue to plague Army aviation. ■

Questions and answers

Question: When computing DD Form 365F's for typical loads, change 10 to TM 55-405-9 states for reference 9 (takeoff fuel) to "enter the number of gallons and weight of fuel." There is no reference to the takeoff fuel being adjusted to indicate fuel for warm-up and hover/taxi. Is this adjustment required?

Answer: The Weight and Balance TM does not set a requirement for such an adjustment. However, most fixed wing dash 10's state that the weight of fuel used in warm-up and taxiing should not be included. Therefore, whenever the dash 10 outlines a certain procedure it must be followed. In the absence of specific instructions, the weight and balance officer/technician and pilot are at liberty to apply their own interpretation of takeoff fuel. In all instances it is essential that aviators be knowledgeable of the procedures used to determine takeoff fuel weight and moment for aircraft assigned to them.

Question: What is the difference between the best "angle-of-climb" speed and the best "rate-of-climb" speed? It appears that the two phrases are different ways of saying the same thing.

Answer: Not so; the phrases are indeed different and their definitions are different. The best **angle-of-climb** speed results in the greatest climb in a predetermined distance. The best **rate-of-climb** speed results in the greatest climb in a predetermined length of time. Knowing the difference is important when attempting to clear obstructions after takeoff. The best **angle-of-climb** speed should be used when obstacles must be cleared after takeoff inasmuch as distance from the lift-off point is the main factor in clearing the obstruction. ■

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

apparently hit emergency gear extension handle, causing handle to engage.

c12 **Class E mishaps** ☐ (C series) Oil was seen seeping from No. 2 engine cowl during flight. Single-engine landing was made. Pin hole was found in No. 2 engine oil pump housing. ☐ (A series) Rapid rise in torque on No. 1 engine was noticed during engine runup. Torque exceeded 110 percent. Caused by fuel control failure.

u21 **Class E mishaps** ☐ (RU-21H) No. 1 and 2 breaker on main power distribution panel would not stay in. Caused by failure of relay solenoid. ☐ (A series) Fuel was seen siphoning from left nacelle fuel cap during flight. Pilot did not properly secure fuel cap during preflight.

Maintenance

uh60 **Class E mishap** ☐ Passenger noticed sparks coming from overhead electrical panel. A few seconds later, master caution light came on, followed by No. 1 converter and stabilator lights and stabilator horn. Caused by wires in electrical overhead panel rubbing a metal surface.

ch47 **Class E mishaps** ☐ (C series) Flight engineer saw excessive hydraulic leak from No. 2 hydraulic flight boost line. Pinhole leak was caused by another flex line rubbing against tube assembly. ☐ (C series) No. 1 engine oil low light came on. Caused by loose engine oil line.

oh58 **Class E mishaps** ☐ (C series) N_1 went to 25%, engine-out light came on, and low rpm audio activated. Power-on landing was made. Caused by loose N_1 tachometer generator cannon plug. ☐ (A series) During postflight inspection, pilot saw fluid on engine deck. When battery and fuel boost pump were turned on, fuel leaked from engine-driven boost pump. Caused by loose fuel line fitting. ☐ (A series) Vertical vibration occurred during climbout. Caused by out-of-track main rotor blade.

u8 **Class E mishap** ☐ (F series) No. 1 engine ran rough and failed to develop power. Cylinder head temperature dropped to 75 degrees. Single-engine landing was made. Caused by out-of-adjustment fuel injector pump.

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

FAA regulations

AR 95-1, par. 3-1, states that subparts A or B of FAR 91 with AR 95-1 and host country regulations govern general flight rules and operations of Army aircraft.

Since it is required by AR 95-1, FAR 91 must be available to aviators. FAA regulations can be obtained by procurement action from: FAA Aeronautical Center, ATTN: AAC-23, P.O. Box 25461, Oklahoma City, OK 73125. ■

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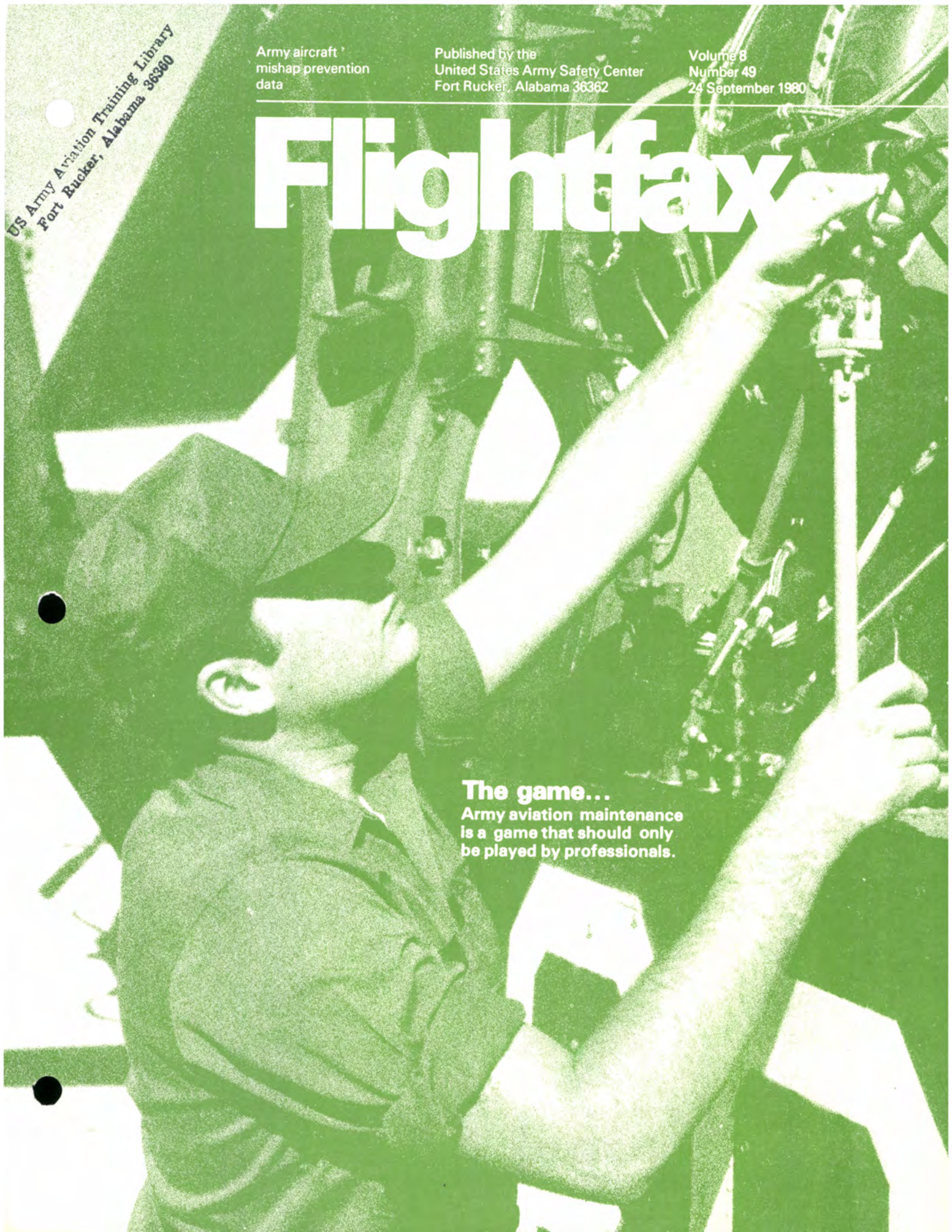

The game...
Army aviation maintenance is a game that should only be played by professionals.

The game

Two of the definitions of the word "game" are: "A contest covered by set rules" and "a test of physical or mental prowess." With these two definitions in mind, is it possible to consider such an enormous operation as Army aviation maintenance a game? Yes, it's a game. It's a game played 8 hours a day, 5 days a week by some; 24 hours a day and 7 days a week by others. To play, you should be a professional. Regrettably, it is sometimes played by individuals who never attain a standing higher than amateur. It's a game you can sometimes play, merely by being present when a player is needed. It's played by people who lack training and coaching. It's a game that is all too often influenced by very special spectators called commanders whose constant prodding and unrelenting pressure induce haste, handicapping the players. A win is considered adequate and a loss deplorable. There are no cheers for the winner and the loser can only endure. It's a game where praise is scarce and criticism abundant.

A recent study of 63 months of Army aircraft mishap experience showed that improper maintenance caused or contributed to 21 percent of all the accidents and more than 11 percent of the total mishaps. Maintenance-related mishaps during the 63 months increased steadily in rotary wing aircraft.

The game has rule books, but they are not always used. The pressure to produce often doesn't allow the wealth of carefully gathered information to be used as directed. As an alternative, the coach and players use short cuts and choose other ways to play than those prescribed by the books. After all, if the play doesn't succeed, they can always try again.

The players in this game often attain professional standings, but are all too soon lost to civilian player leagues. Inequitable conditions within their own league encourage transfers. Why be a team member if they won't let you play? The coach is constantly pleading the fact that he is short of players, but other people desire their services elsewhere—services such as helping in the kitchen, guarding equipment, etc. "All part of the training," these others say. But a player wonders why, after going through all those fine schools, he is only allowed to sit on the sidelines.

As time goes by, the game becomes more complicated and the plays more demanding. Simplicity is lost amid advanced techniques and procedures. The players have to maintain their professional standings or the game is lost. The coach's burden is a heavy one. He constantly reminds his players they are concerned only with the present and the future. The past is only a means of noting errors and providing improvements for the future.

The players are always confronted with a formidable and aggressive opponent called mother nature. All too often, the game must be played in mud, dust, dirt and even snow and rain. Drop the ball and there can be no excuse, no complaints. Complaints only fall on deaf ears. Isn't the game supposed to be played that way, if necessary? There can be no games called because of weather!

At, times, the game falters for lack of supplies. When this happens, the coach and his players are forced to employ a strategy play called "scrounge." Whether they are labeled moochers, spongers or beggars, the game goes on. The supply coach, surrounded by punch cards and computers, somehow escapes the wrath heaped on the playing coach when the game grinds to a halt. The computer is his guardian, providing him a sanctuary by

forever spitting out words like "due in" and "due out."

This game requires no secret plays or hidden talents. It is managed and played by commanders and supervisors alike, down to the lowest ranking member of the team. As in all games, each individual is responsible for doing his part. In no other contest could teamwork be more important for producing desired results.

If the game is lost, blaming the loss on one individual alone is a passing play called, "Who gets the buck?" Commanders and supervisors have to instill discipline and esprit de corps among their players. Discipline must result in proper conduct and technical integrity, both held together by a high level of esprit. Discipline will relax if esprit is low and this, in turn, can lose any ballgame. If the players are untrained, you must train them. It's all too easy to bemoan the fact they are rookies and do nothing about it. If discipline is lacking, there is a need for better supervision. Supervise by setting standards. This has a direct bearing on the quality of players whose attitudes we help to shape and whose character we help to mold.

Army aviation maintenance is a game that should only be played by professionals. What is a professional in this game? The real pro in any contest is one whose performance consistently sets him apart from the average or run-of-the-mill competitor. While each type of contest calls for particular natural talents, great talent alone does not gain admission to the select circle. Nor does average talent mean one is automatically excluded. The real test is how the individual makes use of whatever natural talent he has. A real pro gets that way because he always makes use of his natural talents. He never stops practicing, never stops learning, never stops improving in every aspect of the game. He becomes one of the best, not so much by natural ability, as by acquired ability.

Whatever position you may play in this game, stop and ask yourself, "Am I doing my part? Am I a professional?" ■

Mishap review

Synopsis

Shortly after takeoff, an OH-58 pilot inadvertently entered IMC and became disoriented. Control was lost and the aircraft crashed, killing the pilot and two passengers.

History of flight

The pilot was on a service mission. He picked up two passengers and flew them to their destination where they were to attend a briefing. It was dark by the time the briefing was over.

The passengers boarded the aircraft for the return flight to their home field. The pilot hovered to the northeast side of the helipad, took off, and then turned east. A few seconds later, the pilot called flight following and said he had entered instrument meteorological conditions and was climbing straight ahead. He then acknowledged a transmission from flight following indicating a frequency change. No further transmissions were received from the pilot.

During the conversation, the aircraft began a sustained right turn to the south. Shortly afterward, control was lost and the OH-58 slammed into the ground.

Crewmember experience

The 27-year-old pilot had more than 300 rotary wing hours, with more than 100 hours in OH-58s. He had recorded 14 hours in the UH-1 SFTS, 1 hour of hood in the OH-58, and 5 ½ hours of night flying in the past 6 months.

Commentary

The pilot lost control of the aircraft because he was unable to transition from flight under VMC to flight under IMC and experienced a form of spatial disorientation known as the coriolis illusion. He called flight following immediately after perceiving himself to be in instrument meteorological conditions instead of performing the five C's in the correct order (control the aircraft, coordinate, clearance or climb, course, and then call). Further, he told flight following he was changing frequencies, indicating a lack of familiarity with instrument recovery procedures.

The fact that he told flight following he was changing frequencies and that the UHF radio was set to an unlisted frequency indicates an attempt was made to change frequencies. As explained in TC 1-20, FM 1-5, and the Army Flight Surgeon's Manual, the coriolis illusion involves a pilot turning his head while in a prolonged turn and causes several very surprising and overwhelming illusions of change in aircraft attitude. To change frequencies on the UHF radio in the OH-58, the pilot would have had to turn his head down and to the left. At that point, the pilot probably began to rely on the false information provided by his body senses instead of the information presented to him by his flight instruments.

From witness accounts and the conversation between the pilot and flight following recorded on ATC tape, it was obvious the pilot was experiencing difficulty in transitioning to his instruments once outside visual reference was lost. This was evidenced by the tone of his voice, his long pauses indicating

difficulty in concentrating, and his apparent confusion as to which frequency he wanted to change to.

Many witnesses heard varying changes in engine rpm, indicating difficulty in establishing a positive rate of climb. This was, in part, due to the pilot's relatively low experience level and the fact that he had logged 14 hours in the UH-1 SFTS and only 1 hour of hooded flight in the OH-58. It was further aggravated by the absence of the radio magnetic indicator (RMI), which had been removed for maintenance and not replaced. It had been placed on a deferred work order until the next scheduled phase inspection.

To determine and maintain aircraft heading, the pilot would have had to include the magnetic compass in his crosscheck. Since this instrument is located on a support which is attached to the right side of the cabin structure forward of the pilot, it is not in the normal sequence of crosscheck.

Several factors probably contributed to the pilot's losing visual reference outside the aircraft.

The existing weather conditions, although marginal VFR, included a 400- to 500-foot ceiling, light drizzle, and fog. There was a scattered layer of scud at 100 feet. The light drizzle would have caused an accumulation of water droplets to form on the windshield, reducing visibility. Since the OH-58A has no system for rain removal, the aircraft would have to be accelerated through 40 to 60 knots to dissipate the droplets from the windshield.

The pilot used his landing light while he was hovering and during the first part of the takeoff, degrading his night vision significantly. When he turned off his landing light after clearing some trees, he probably lost all visual reference outside the aircraft and perceived himself to be in instrument meteorological conditions.

The copilot's windshield was badly scratched, further reducing visibility to the left front of the aircraft during takeoff. Although the actual intensity of the console lights could not be determined (the console light rheostat was inoperative), it was established that the lights were less than full bright but more than fully dimmed. These two factors may have combined to produce a glare within the cockpit.

The fact that the mission was scheduled to be flown single pilot in marginal VFR conditions during the hours of darkness with several aircraft discrepancies (lack of an RMI, inoperative console light rheostat, and badly scratched windshield) indicates questionable judgment on the part of the pilot and his chain of command. The pilot could have refused the aircraft, and the chain of command should have considered the use of two rated OH-58 pilots for this particular mission. ■

Selected mishap briefs

uh1 **Class C mishap** □ (H series) As aircraft was hovering into parking area, rotorwash and gusty winds caused maintenance workstand to blow into OH-58 chin bubble, damaging bubble.

Class E mishaps □ (H series) Crew heard loud squeal and engine quit. Caused by seizure of power turbine section. □ (H series) Airframe vibration during flight was caused by failure of No. 4 hanger bearing assembly. □ (H series) Loud banging sounds were heard from engine and N_2 fluctuated during approach. Caused by stripped threads in variable inlet guide vane actuator control arm rod end bearing, allowing inlet guide vane to close. □ (H series) Loud popping sound was heard during takeoff. Main rotor blade skin had separated 4 inches from tip of blade. □ (H series) Rpm audio and light activated during NOE flight. Caused by corrosion on internal contacts of cannon plug connectors to rpm warning box. □ (H series) During climbout, egt increased 40° C. and engine oil temperature began to rise. Caused by defective deice valve. □ (H series) N_1 fluctuated during hover. Caused by failure of fuel control. □ (H series) Engine oil pressure fluctuated between 0 and 100 psi. Caused by failure of engine oil pressure gauge.

ah1 **Class E mishaps** □ (S series) Vertical vibration in flight was caused by frozen feather bearings. □ (S series) Postflight inspection revealed weights were missing from No. 2 drive shaft. Caused by failure of adhesive. □ (TH-1G) Hydraulic failure occurred during hover. Caused by defective hydraulic pump.

ch47 **Class E mishaps** □ (C series) During simulated icing spray mission, flight engineer noticed hydraulic fluid leaking from hydraulically-operated water pump. Water pump was shut off, but hydraulic fluid continued to leak out. Attempt to raise spray boom was not successful because leak had depleted utility hydraulic system. Pilot flew to airbase, hovered over taxiway, and started forward hovering descent to try to raise spray boom. When aft wheels touched down, flight engineer got out and chocked wheels, and pilot completed landing on forward landing gear. The only damage was to nine tips of the spray nozzles. Leak was caused by broken seal on hydraulic water pump. □ (C series) When pilot moved No. 2 engine condition lever to ground during HIT check, actuator would not respond. Engine was shut down with manual fuel shutoff valve. Caused by failure of No. 2 engine N_1 control box. □ (C series) Hydraulic fluid was seen leaking from utility hydraulic cooler during flight. Caused by cracked inlet line on hydraulic cooler.

oh6 **Class E mishap** □ Master caution light came on and engine oil pressure dropped. Caused by cracked line.

oh58 **Class E mishaps** □ (A series) Muffled bang was heard from fuselage area. Postlanding inspection revealed KY-28 had bottomed out because of deteriorated mounts. □ (A series) GPU was disconnected because of malfunction. Decision was made to try battery start. IP misread N_1 (interpreted 7% as 17%), and told pilot to open throttle. As throttle was being opened, IP noticed rapid rise in TOT and told pilot to close throttle. Instead, pilot opened throttle more. IP could not react in time to prevent hot start. Pilot, recognizing his error, retarded throttle and shut down aircraft. □ (A series) Postflight inspection revealed string, believed to be from kite, wrapped around mast and

push-pull tubes. ☐ (A series) Master caution and engine oil bypass lights came on. Caused by loss of engine oil. Fitting from N_1 accessory case to No. 1 engine pack was stripped out.

th55 **Class C mishap** ☐ During shutdown, student pilot noticed pedal safety pin was loose. When power was reduced, pin disengaged and fell out, allowing pedal to come off mount and hit and break bubble.

c12 **Class E mishaps** ☐ (A series) Loud bang was heard during climb. Pilot's outer side window was found cracked. ☐ (A series) Flap lever was placed in full-up position during taxi and flaps remained in down position. Caused by electrical failure of flap switch.

ov1 **Class E mishaps** ☐ (D series) Landing gear would not retract during takeoff. Caused by tripped dump valve. ☐ (B series) Airspeed was slow to respond during takeoff and climbout and altimeter responded erratically. Erratic instrument indications were caused by dead insects and insect eggs in right and left static air ports. ☐ (D series) Egt reached 760° during takeoff. Takeoff was aborted.

t42 **Class E mishaps** ☐ Landing gear would not retract. Caused by failure of landing gear switch. ☐ Pilot locked right brake during rollout, causing tire to skid and blow out.

Maintenance

ah1 **Class E mishap** ☐ (S series) Transmission oil pressure fluctuated from 0 to 100 psi. Caused by loose cannon plug on transmission oil pressure transmitter.

ch47 **Class E mishaps** ☐ (C series) Flight engineer told pilot No. 2 generator was throwing off sparks. Postlanding inspection revealed oil line was chafing against generator. ☐ (C series) No. 2 engine fire control handle light came on, and smoke was seen coming from engine. Caused by fire detection harness chafing against engine.

oh58 **Class E mishap** (C series) Crew smelled fumes from battery vents during takeoff. Caused by improperly adjusted voltage regulator.

u21 **Class E mishap** ☐ (A series) When approach flaps were selected, flaps split. Flap motor circuit breaker failed and could not be reset. Flap drive actuator had been improperly installed.

Messages received

- Safety of personnel and equipment message concerning disposition instructions for medical materiel (GEN 80-24, 111500Z Sep 80).
- Maintenance notice concerning change in engine start procedures for AH-1S (MOD) aircraft (AH-1-80-19, 111610Z Sep 80).
- U-21/RU-21 information message concerning inspection of wing center section and outboard wing panel (111600Z Sep 80).

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

EIRs needed

Routine EIRs are required in those cases where a flight abort results from a materiel failure or malfunction. Many of the PRAMs we receive do not show that these EIRs are being submitted. EIRs are very important in helping TSARCOM identify materiel problem areas.

TM 38-750 governs the submission of EIRs. ■

U.S. AIR SERVICE OPERATION REGULATIONS 1920

1. Don't take the machine into the air unless you are satisfied it will fly.

2. Never leave the ground with the motor leaking.

3. Instead of turning short when taxiing have someone lift the tail around.

4. Never get out of the machine with the motor running.

5. Pilots should carry hankies in a hand position to wipe off goggles.

6. Riding on the steps, wings or tail of a machine is prohibited.

7. In case the engine fails on take-off, land straight ahead regardless of obstacles.

8. Do not trust altitude instruments.

9. If you see another machine near you, get out of its way.

10. No machine must taxi faster than a man can walk.

11. Hedge-hopping will not be tolerated.

12. Before you begin a landing glide, see that no machines are under you.

13. No spins on back or tail slides will be indulged in, as they unnecessarily strain the machine.

14. Pilots will not wear spurs while flying.

15. If an emergency occurs while flying, land as soon as possible.

AIR FORCE INSPECTION & SAFETY CENTER, Norton AFB, California 92409

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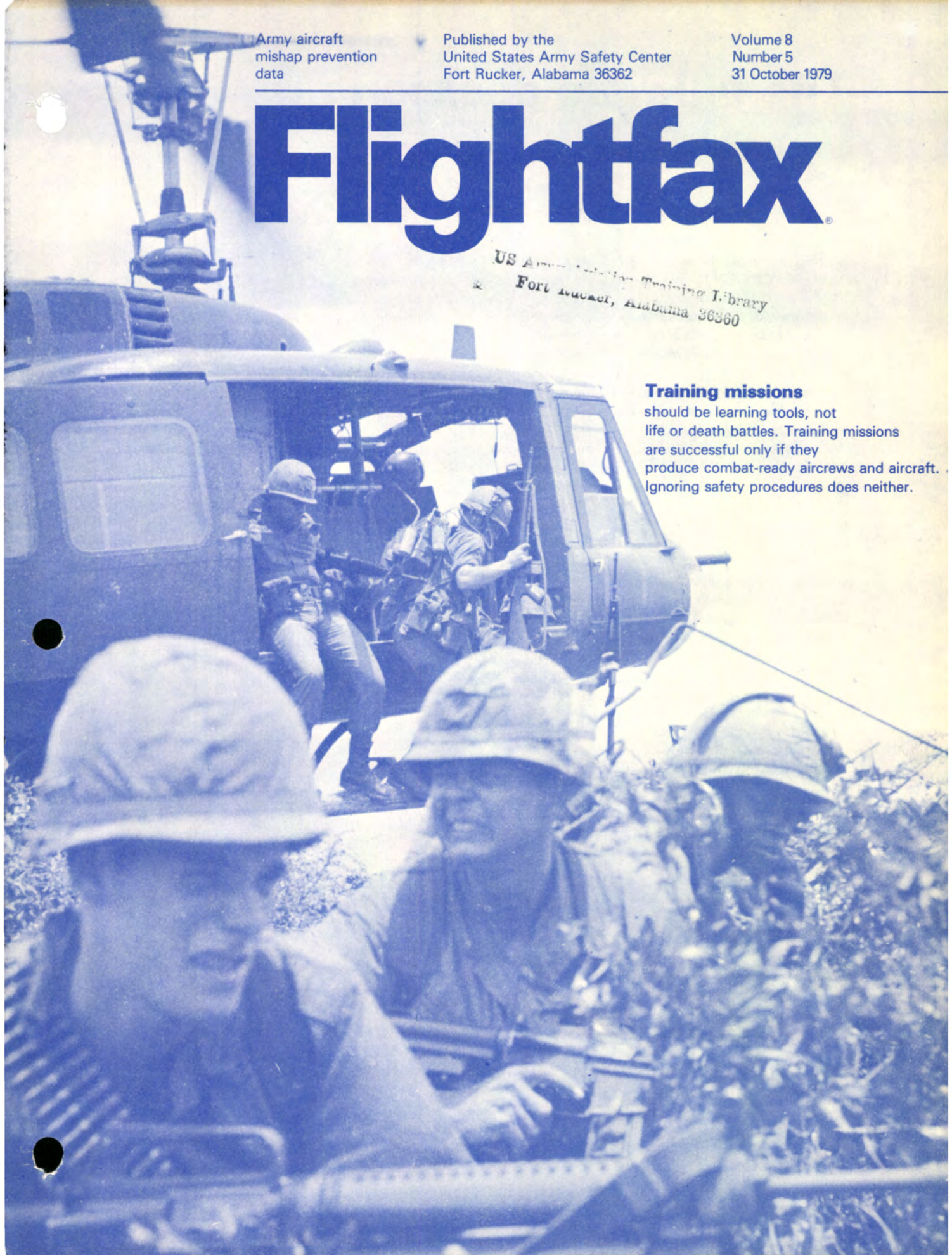


Training missions should be learning tools, not life or death battles. Training missions are successful only if they produce combat-ready aircrews and aircraft. Ignoring safety procedures does neither.

The ultimate decision

Writing in a recent issue of AEROSPACE SAFETY magazine, Major Roger L. Jacks, Directorate of Aerospace Safety, discussed the currently high USAF aircraft accident fatality rate and some things crewmembers can do to raise the odds against being "a troop who rode one in." Major Jacks' message is also appropriate for Army aircrews.

I have heard a lot of reasons given for the high fatality rate, such things as inexperienced crews, a lack of qualified instructors, mass exodus of pilots, poor and/or inexperienced supervision, too many additional duties, poor scheduling, inadequate training, not enough flying time, more demanding missions, crew overloading and realistic training scenarios. A lot of these are valid problems and staff agencies at all levels of the Air Force are actively seeking a solution. But let's discuss some things the crewmember can do now to raise the odds against being "a troop who rode one in."

In anything we try, attitude, knowledge, and ability are the key factors. The flying game is no exception. Attitude (or motivation) is probably the most important factor, followed by knowledge and ability which we can translate into experience. During a typical tour in a weapon system, a crewmember's motivation and experience levels usually demonstrate some dynamic changes. During initial checkout, one studies hard to learn the new job. Although experience level is low, motivation is high. By the time he is operationally qualified, his confidence factor is high and he is quite capable of handling the basic mission and straightforward emergencies. His experience level, however, is still relatively low. A prudent crewmember in this situation would be aggressive while keeping in mind his limited experience.

It's easy to overextend yourself when you're trying to establish yourself as a top notch crewmember. To be the best, we must be aggressive, but also realistic about our abilities and use our judgment and common sense to keep a check on runaway pride or an inflating ego.

After a couple of years experience, it's easy to look back on those earlier days and realize just how limited our skill level really was during that initial qualification period.

Most of us are at our best during the 2- to 5-year period. Experience levels are high and so is motivation as crewmembers in this bracket are competing for instructor slots, flight leads, standboard and other leadership positions. After the 4- or 5-year point, however, some crewmembers' motivation may begin deteriorating and complacency may start to show its ugly head. It is easy at this point to take on an attitude that all of the experiences of an old head will get a guy through a future sticky situation. Will it? Don't bet your life on it!

Each year we have mishaps where an old faithful work horse manages to dazzle the crew by providing them a mind boggling, hair raising experience. It always amazes me that an aircraft can be in the inventory fo 10 years or better and we still discover things about the system we didn't know. Often it takes a new, inquisitive guy checking out in the aircraft to discover the oddity; or, sometimes it unfortunately takes a costly mishap. Lip service to studying aircraft procedures won't hack it. No matter how much time one has in an aircraft, it's essential to routinely hit the books!

After studying the dash one and, in particular, the emergency procedures, it's smart to sit back and think about making that decision on when to abandon the aircraft. Mentally review possible egress situations and how procedures change as the aircraft transitions from one flight profile to another. Take a look at decision timing when pitted against absolute altitude, airspeeds, sink rates, vertical velocities and bank angles. In our new aircraft we have the best escape systems ever and yet far too many crews are not getting out. Why?

The answer may be linked to the mission. Tactics have dictated edge of the performance envelope maneuvering as well as extremely low flight profiles. With tactics such as these, the new escape systems are not as reassuring. Edge of the envelope ejections with seconds to make key lifesaving decisions become overriding factors.

Under these circumstances, we need a good game plan to insure survival. It's easy to develop tunnel vision and focus all of our attention on saving an aircraft that, in reality, is an impossible task. Situational awareness, along with a game plan that dictates a cutoff point where saving the aircraft is abandoned and saving ol' Ish becomes paramount, is essential. In a multiposition aircraft, it is important that the crew get together and discuss aircraft egress decisions.

Thorough, proper training is all important. In these days of limited budgets and minimum flying hours, last minute pencil whipping of quarterly requirements doesn't get it. We have to get all the practice we can and make every effort to get the training in a timely recurring fashion (event scheduling). If the scheduling system doesn't work the way that it should, we need to tell the squadron and wing chain of command. We can't settle for inadequate and poorly timed training. With the emphasis on realistic exercises, we can't afford to shortchange ourselves.

Especially for the newer troops: Don't intentionally exceed your ability in an effort to save your pride or feed your ego. In a training environment it's better to "live to fight another day." Training missions should be used as learning tools, not as a life or death battle.

I'm not telling you to scuttle the mission for safety. I am saying that training missions are just that, training! It's easy to get carried away and attach tremendous importance to the mission. Sure, training missions are important but for different reasons than mission accomplishment, no matter what. They are for practicing, for developing experienced crews (old heads if you will), for checking out aircraft and systems and determining system reliabilities.

Training missions are successful only if they produce mission-ready aircraft and crews. Smoking craters do neither, not to mention the most important aspect—the loss of our friends and fellow fliers. ■

Broken Wing Award winners

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 1979.

• **CW2 Ronald Bartlett, Troop B, 3/5 Cav, Fort Lewis.** CW2 Bartlett was about 45 minutes into a training flight when his low rotor rpm light and audio activated. Unable to maintain cruise flight, Bartlett entered autorotation and landed his OH-58 with no damage on a dirt logging road. The road was rutted and sloped about 3 degrees in the direction of landing. Trees lined both sides of the road and there was less than 1 foot of clearance from the main rotor blade tips to the trees. Some of the trees had to be removed before the aircraft could be recovered.

• **CW2 Gary L. Bivens, USAAVNC, Fort Rucker.** CW2 Bivens was the IP on an OH-58 instructor pilot training flight. The student pilot had not flown in more than 4 months. During deceleration for a low-level autorotation, Bivens noticed the student was not properly controlling the aircraft and started giving him verbal instructions. When the student did not respond, Bivens tried to take control at about 40 to 50 feet. The controls were stiff, but Bivens thought this was because the student was fighting him on the controls. As initial collective pitch was pulled about 10 feet agl, the master caution light came on. Not having time to check the cause of the light or to initiate a power recovery, Bivens managed to land with complete hydraulics failure. Hydraulic pressure was lost instantly and totally because of a ruptured line.

• **CW2 Gary A. Buhler, 377th Med Co (Air Amb), APO SF 96301.** CW2 Buhler was on a UH-1H training flight when his master caution and hydraulic segment lights came on, followed immediately by extreme left rearward pressure on the cyclic. This was followed by extreme right forward pressure and severe rotor system vibration. Buhler selected a forced landing site because of the lack of control ability and distance to nearest prepared landing surface. About 35 to 40 seconds later, extreme pressure eased somewhat, but rotor system vibration continued. Buhler landed his Huey without damage in a water-filled rice paddy surrounded by dikes and footpaths.

• **CW3 Lloyd A. Drennon, USAAVNC, Fort Rucker.** CW3 Drennon was the IP on an OH-58 tactical instrument training flight. The student at the controls was under the hood. About 400 feet agl, a high-pitched, whining noise was heard. The noise became louder and about 10 seconds later an explosion occurred in the power turbine section of the engine, projecting metal particles throughout the engine compartment and engulfing the engine in flames. The aircraft yawed violently and shuddered. Drennon took control and, recognizing that rotor rpm was rapidly decaying, initiated a right autorotative turn to regain minimum safe rotor rpm. He then landed in a freshly plowed field. As the students exited, they saw flames coming from the engine compartment. Drennon exited, assessed the fire, sent the students a safe distance away, took the fire extinguisher, and extinguished the flames.

• **CW2 William T. Kate, 237th Med Det (RA), Fort Ord.** CW2 Kate was on a medical evacuation mission in a UH-1H. During climbout, fuel control failure caused a surge in engine and rotor rpm. Kate regained control and established an autorotational glide. Normal engine and rotor rpm was regained by using manual throttle with the governor in the emergency position. Because of weather conditions, the only suitable landing site was an airfield 13 miles away, where the weather was 200 feet overcast and one-half mile visibility. Kate made a PAR approach to the airfield and landed without damage.

• **CW3 Norman D. LePage, Troop D, 3/5 Cav, Fort Lewis.** CW3 LePage was the IP aboard an AH-1G on a training flight over the Fort Lewis reservation. Two hundred feet above the trees in a heavily wooded section, oil pressure dropped to zero, and the engine began winding down. The only available landing site was an oval clearing about 200 feet x 600 feet, over which LePage had just flown from north to south. The clearing was bordered on all sides by tall pines. A river ran along the eastern edge of the clearing. To complicate matters, the south end of the clearing was obstructed by field gear laid out in orderly rows, indicating the presence of personnel in the area. With the engine failure, LePage immediately entered autorotation and set up an approach over the river from south to north to dogleg into the clearing from east to west, thus avoiding the possible personnel on the south end of the clearing. He turned final about two-thirds of the way up the eastern edge of the clearing and aimed for a gap in the trees at the edge of the clearing. LePage began a deceleration, passing about 20 feet over a set of sandbagged benches that were hidden on final by the brush at the river bank. At this point, some people stepped in front of the aircraft from the trees on both sides of the flight path. Realizing he would hit the people and that there was no room to maneuver because of the proximity of trees and the low altitude, LePage raised the collective and passed over the people, reducing rotor rpm to the point where he could no longer make a successful deceleration on his autorotative approach. He maneuvered to the ground in a running landing, touching down on the far side of the benches. The aircraft traveled 50 feet along the ground before it stopped. The only damage was a bent right skid tube and a broken tail stinger. The loss of engine oil was caused by an improperly secured No. 4 coupling from the engine oil reservoir to the engine oil line. The people in the area were ROTC students on a summer training exercise.

• **Captain Gene R. Petryk, 205th Trans Bn, APO NY 09165.** CPT Petryk was on an AH-1 test flight. About 800 feet agl over spotted forests, a loud grinding noise was heard from the engine or transmission area. As Petryk spotted a possible landing site, the rpm audio sounded and N_1 and rpm needles decreased toward zero. Petryk initiated an emergency autorotative glide to the nearest landing site, which was a freshly planted barley field. Rotor rpm was regained and the autorotation was successfully completed. Because of the uneven terrain, the aircraft rocked forward on touchdown, causing cracks in the fiberglass fairing surrounding the nose turret. On-site inspection of the aircraft revealed about 3 pounds of compressor blade material in the tailpipe and surrounding area of the engine compartment.

• **CW2 Brady N. Robinson, 118th Avn Co, 25th Combat Avn Bn, 25th Inf Div, Schofield Barracks.** CW2 Robinson had just completed a test flight of an AH-1G with a new engine and called for landing instructions. Soon afterward, the engine oil bypass and master caution lights came on. Robinson decided to make an immediate precautionary landing to a golf course instead of flying to the airfield, which was one-half mile away. The terrain between the golf course and the airfield was very rugged. A 180-degree turn was made and an autorotation glide with power established. Engine oil temperature began rising and engine oil pressure fluctuated 40 psi. Deceleration was initiated 140 feet agl to slow forward movement. About 30 feet agl, the low rpm audio and warning light activated. A scan of the instruments revealed the engine was not producing power. A high frequency vibration was felt in the airframe as rotor rpm began decaying. The aircraft touched down with no damage, but it was completely engulfed in smoke. The fire truck arrived within 2 minutes, but there was no fire. Had CW2 Robinson continued the flight to the airfield, when engine failure occurred he would have been over an area where a safe landing would not have been possible.

• **Mr. Audra R. Stern, Jr., Bell Helicopter Textron, Amarillo, Texas.** Mr. Stern was flying an OH-58C when complete engine failure occurred at 300 feet agl. Stern autorotated to an open field with drainage ditches and landed with no damage. ■

Selected mishap briefs

uh1 **Precautionary landings** ☐ Low audio warning system activated during takeoff. Caused by malfunction of audio system. ☐ Egt gauge fluctuated during pretakeoff check. Caused by loose wire.

ah1 **Precautionary landings** ☐ Aft fuel boost pump light came on. Caused by failure of fuel pressure switch. ☐ Engine oil temperature was 105° during landing. Caused by failure of oil cooler fan bearing. ☐ Master caution and fuel filter lights flickered. Caused by sediment in fuel filter. ☐ Cockpit filled with smoke during flight. When ECU was turned off, cockpit cleared. Inspection revealed transmission blower quill was leaking due to wear.

ch47 **Precautionary landings** ☐ Large buzzard hit pilot's windshield during climbout. Windshield cracked, and pilot was hit with flying splinters of glass. No injury occurred because pilot's helmet visor was down. ☐ In cruise flight, fuel check showed 800 pounds of fuel in left aft auxiliary tank after showing empty on previous check. All fuel pumps on left side were turned off and landing made. After shutdown, fuel gauge indicated 1,300 pounds in left aft auxiliary tank. Cell was inspected and fuel cap removed. Tank was empty. Caused by failure of fuel gauge. ☐ Passenger noticed smoke coming from ramp area. Investigation by flight engineer revealed sparks, smoke, and bits of metal coming from hanger bearing between Nos. 8 and 9 drive shaft sections. Caused by failure of hanger bearing. ☐ Transmission chip detector light came on. Caused by failure of aft vertical shaft. ☐ No. 2 engine was out of tolerance on HIT check. Caused by deficient hot air valve.

oh58 **Precautionary landings** ☐ Oil bypass light came on. Postlanding inspection revealed oil tank filler cap was not fully locked. ☐ Vibration in airframe was caused by failure of seal between blade grip reservoir and TT strap housing. ☐ Spike knock occurred during touchdown from autorotation. ☐ Whining noise was heard from transmission area. Inspection revealed oil leaking from aft freewheeling seal.

th55 **Forced landings** ☐ Engine and rotor dropped to 2500 rpm during takeoff. Crossbeams and tail skid were bent during landing. Caused by failure of No. 4 cylinder fuel injector line. ☐ Engine failure at hover was caused by failure of fuel injector servo.

c12 **Precautionary landings** ☐ (A series) Outer panel of passenger window cracked in flight. ☐ (A series) Oil was seen coming from No. 2 engine. Post-flight inspection revealed engine oil dipstick was not properly secured. ☐ (A series) Noise was heard during climb, No. 2 engine torque dropped, and tgt rose. Maximum torque available without exceeding temperature limits of 685° C. was 65% and N_1 96%. Caused by failure of low pressure bleed valve. ☐ (A series) No. 2 engine began smoking and vibrating at 10,000 feet. Pilot turned off air conditioning unit and landed. Caused by failure of air conditioner clutch.

u8 **Precautionary landings** ☐ (D series) Left main safe light remained on after landing gear was retracted. Caused by corroded and worn microswitch. ☐ (F series) When pilot reduced power to 2600 rpm and 25 inches Hg. for descent, manifold pressure fell to 18-19 inches Hg. and rpm surged on right engine. Pilot advanced throttles to cruise power and surging stopped. Postlanding inspection revealed engine oil level at 1.2 gallons, down from 3.2 at start of flight. Loss of oil pressure occurred when throttles were reduced, causing prop to surge. Garlock seal on vacuum pump failed, causing loss of oil.

u21 **Incident** □ (A series) After takeoff, pilot was told wheel had been found on runway. Aircraft was landed on foamed runway. Inboard flaps, right engine oil cooler, and cowling were damaged during landing. Failure of wheel bearing caused loss of right main landing gear wheel.

Precautionary landings □ (H series) Fuel cap on No. 2 engine nacelle vented fuel during takeoff. Caused by improperly secured fuel cap. □ (H series) Copilot, noticing windshield had frost on inside, turned on windshield anti-ice system and pulled out defrost air knob. Pilot turned on all anti-ice and deice switches except nacelle lip ice boots. Copilot noticed through a hole in windshield that it was snowing moderately hard. Aircraft then yawed right, and No. 2 engine failed. Power was applied to No. 1 engine, but no response was felt. Torque gauge on No. 1 engine was indicating 250 pounds with prop rpm at 1900. No. 1 engine then regained power and aircraft was landed at home base. It is believed moisture was injected into both engines at the same time. When No. 2 engine was test started on the ground, it started but discharged about 2 quarts of water from exhaust stubs.

Maintenance

uh1 **Accident** □ As aircraft was hovering during maintenance test flight, it rolled to right. Main rotor blades hit ground, and aircraft rolled over and came to rest inverted. Caused by improperly rigged tail rotor. 8003

Precautionary landings □ Loud noises were heard, aircraft yawed left and right, and N_1 and N_2 fluctuated. Caused by bleed band actuator in-line filter being installed backwards. □ Smoke was seen coming from battery vents during runup. After new battery was installed, aircraft was run up to check voltage regulator output. Voltage regulator was putting out 30 volts, while cockpit gauge indicated only 28 volts. Prescribed procedures for voltage regulator checks were not adhered to. □ Pilot felt feedback and high frequency vibration in tail rotor control pedals. Inspection revealed pressure line fitting attached to pressure port at tail rotor servo was improperly aligned. □ Crew chief noticed fuel leak from internal engine fuel filter during start. Caused by stripped fuel filter. □ Master caution light came on during hover, and transmission oil pressure dropped to zero. Oil was seen spraying from transmission after shutdown. Improperly installed internal transmission oil filter gasket caused loss of fluid and pressure.

oh58 **Forced landing** □ Rpm warning light and engine audio activated, and engine lost power. Caused by loose pneumatic line at engine double check valve.

Precautionary landings □ Pilot smelled fumes from battery vent during refueling operation. Thermal runaway was caused by improper inspection of battery. □ Fore and aft cyclic binding during hover was caused by overtorque on cyclic servo and hydraulic line elbow fittings.

ov1 **Precautionary landing** □ (D series) During cruise flight, technical observer noticed top left portion of No. 2 engine cowling was missing. Stud assembly holding cowling in closed position was loose and did not securely latch cowling.

Messages received

• Maintenance advisory message concerning inspection of OH-6A main rotor blade attachment lugs (OH-6A-79-02, 161615Z Oct 79). Hughes Helicopter Company notified TSARCOM that some main rotor blade attachment bearings were installed in undersized holes, resulting in extremely tight fit and potential stress corrosion and cracking. The defects were found on commercial aircraft only. Sequences 2.23 and 2.31 of TM 55-1520-214-PMS and TM 55-1520-214-23, chapter 5, should be followed during inspection of main rotor hub and main rotor blade assembly. If cracks, etc., are found, submit QDR on defective item. Contact Mr. Clifford Neff, TSARCOM, AUTOVON 693-0396, for more information.

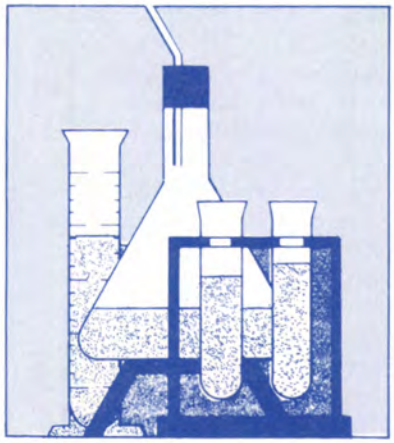
For more information on selected mishap briefs, call AUTOVON 558-3903/3913.

Batteries and deodorant bars don't mix

When a well-meaning mechanic at Fort Eustis noticed a very strong and offensive odor coming from the battery compartment of a U-8F, he decided to correct the situation. Sometime in the past, the aircraft battery had overheated. After cleaning the compartment, the mechanic placed a deodorant bar, similar to those used in washrooms, in the compartment.

A few days later, the aircraft was sent to the maintenance facility where an electrician, Mr. Martin Myer, opened the battery compartment and discovered the deodorant bar. Since it was not authorized to be there, Mr. Myer brought it to the attention of the aviation safety officer, CW3 Bernard Milloy. CW3 Milloy had the bar analyzed to see what the effect would be if it came in contact with the contents of the battery. He learned that a chemical reaction would have occurred, resulting in the release of chlorine gas which, needless to say, is highly toxic.

While this may not have developed into a big problem in the U-8F because of the location of the battery compartment, it could have resulted in a serious mishap had it happened in some other aircraft.



Obviously, deodorant bars aren't one of our biggest aviation safety problems. You probably won't find one lying around the battery compartment on your next preflight or daily inspection. There is a big problem, however, with failure to perform maintenance by the book (see 19 Sep 79 issue of FLIGHTFAX). Placing a deodorant bar in a battery compartment isn't a great deal different in principle than hammering the wrong bolt into a UH-1 trunnion.

The second teaching point is that someone discovered the error and cared enough not only to correct it, but to tell the ASO about it so it wouldn't happen again in another unit.

A big attaboy to Mr. Myer and CW3 Milloy for their handling of the problem, and thanks to CW3 Pete Smith for sharing it with us. ■

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Emergency procedures . . .
Know them before
you need them.

Will you be ready?

Flying has often been described as hours of boredom punctuated by moments of sheer panic—the result of sudden surprises we call in-flight emergencies.

In one year, Army aviators were involved in more than 2,600 such emergencies. These resulted in 29 destroyed aircraft, 18 major accidents, 13 minor accidents, 21 incidents, 121 forced landings, 2,443 precautionary landings, and 22 other type mishaps. Collectively, these mishaps produced 50 fatalities and 67 injuries. Costs for damages and injuries totaled more than $25 million.

When you consider these statistics, two facts become obvious: First, in-flight emergencies are costly in terms of both lives and dollars; and second, no one who flies is immune to them.

Hard landing resulted when pilot attempted autorotation after misinterpreting self-induced condition as tail rotor failure.

Should you suddenly be faced with an in-flight emergency, will you be able to accurately diagnose the problem and take immediate and proper corrective action? The following pilots apparently couldn't:

An AH-1 pilot on an NOE tactical training mission slowed his aircraft and lost translational lift. To maintain his heading, he applied full left pedal, but because of an overgross condition there was inadequate tail rotor thrust. The aircraft began to turn to the right. Believing the problem to be mechanical tail rotor failure, the pilot initiated emergency procedures by reducing throttle. When he suddenly applied aft cyclic to miss a sand dune, one main rotor blade struck the tail boom. The aircraft came to rest with minor damage.

While at a 300- to 400-foot hover, an OH-6 began losing N_2 and turning slowly to the right. The pilot did not notice the loss of N_2 until it decreased through 80 percent. Loss of N_2 resulted in reduced antitorque control, and the aircraft began turning faster to the right. Believing the aircraft was settling with power, the pilot applied forward cyclic but did not reduce collective pitch—an action that would have alleviated either ineffective antitorque control or settling with power. Consequently, the aircraft continued to descend while turning at an accelerated rate until it hit the ground.

An OH-58 pilot brought his aircraft, which was at a near maximum gross weight condition, to a 50- to 60-foot hover (out of ground effect) in a 10- to 20-knot tailwind. After initiating a turn to the right, he found he could not stop the turn. Misinterpreting the self-induced condition of exceeding left pedal tail rotor authority as tail rotor failure, the pilot closed the throttle and attempted an autorotation. Because the aircraft was operating within the avoid area of its height/velocity diagram, a hard landing was inevitable. The aircraft sustained major damage on touchdown.

When the No. 1 engine of a U-8F failed during climbout after takeoff, the pilot diagnosed the problem as propeller governor failure. He left the propeller in low pitch and made a steep left turn at near single-engine control speed, causing the aircraft to stall. The pilot managed to level the aircraft before it hit on a shoreline. Following impact, the aircraft continued forward into the ocean and sank.

The pilot of this OH-6 diagnosed loss of N_2 as settling with power and applied forward cyclic but did not reduce collective pitch.

After the No. 1 hydraulic system and master caution lights of an AH-1G came on, the pilot did not declare an emergency to gain landing priority. When tower personnel directed the pilot to change landing runways, he responded by trying to land on the parking ramp. This led to a loss of airspeed and aircraft control. The aircraft crashed and was destroyed.

When an OH-58 pilot made a slow, right, downwind turn at 100 to 150 feet agl, he allowed the airspeed to decrease, causing the aircraft to lose effective translational lift. Instead of realizing that the power required exceeded the power available, the pilot incorrectly thought the tail rotor had failed. So he reduced collective pitch, closed the throttle, and entered autorotation. The aircraft landed hard, causing major damage to the airframe.

Cobra sustained minor damage when pilot misinterpreted inadequate tail rotor thrust as tail rotor failure and reduced power.

In contrast to these accidents, the pilot of a CH-47 saved his aircraft by landing at the first flicker of the chip detector light. The aircraft was about a mile and a half away from the runway during approach for landing. The pilot noticed the transmission chip detector light flicker and felt a vibration. Without any hesitation, he made a precautionary landing rather than continue his approach, even though the runway lay just a short distance ahead. As the aircraft touched down, the transmission exploded and the aircraft caught fire, causing major damage to the aircraft and to both main rotors. Six persons were aboard this aircraft. Had the pilot not been attentive and seen the warning light flicker, or had he ignored the warning and continued his approach since he was so near his destination, there is little doubt but that the aircraft would have been destroyed and all on board killed.

Instead of declaring an emergency to gain landing priority, AH-1 pilot tried to respond to order from tower to change runways by hovering to parking ramp. Loss of airspeed and aircraft control resulted in destroyed aircraft.

How would you have fared in any of these situations? The only genuine solution to the problem of in-flight emergencies demands that you hope for the best while staying constantly prepared for the worst. Your "hope for the best" is justified by your thoroughness in flight planning and performance of inspections, cockpit and operational checks; by strict adherence to regulations and SOPs; and by staying constantly alert in the cockpit.

Staying constantly prepared for the worst embodies knowledge, skill, and experience. You must know your aircraft and its systems. You must be able to identify symptoms and be able to correctly interpret them. You must know what corrective action is demanded in any given situation. You must possess the skill necessary to effectively apply correct techniques. Consequently, you need to appraise your capabilities and limitations in an honest and thorough manner, then set about making any improvements you have determined to be necessary.

If you don't like sudden surprises when you fly, preferring the "hours of boredom" to the "moments of sheer panic," the time for personal appraisal and preparation is now. It's too late to bone up on TMs and operators manuals and to practice techniques after an emergency occurs. ■

T53 fittings - there is a difference

Two general types of union fittings are commonly used with fluid-carrying lines: restricted and nonrestricted. Failure to properly identify them and insure the correct type is installed can cause serious problems.

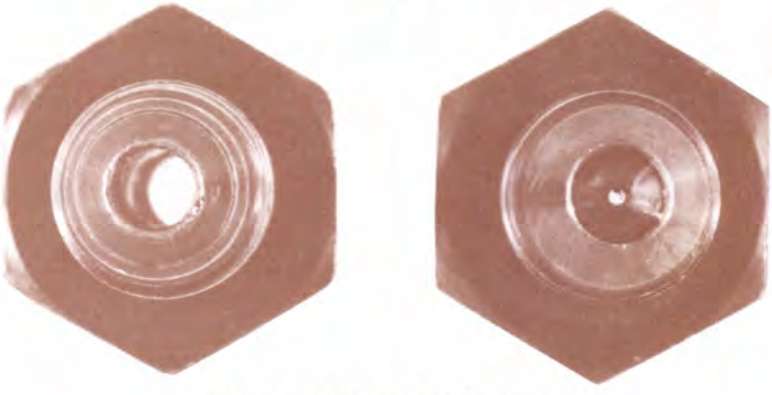
A **restricted** fitting in the P3 port of a T53 fuel control unit (bleed band actuator to fuel control line) will cause the bleed band to close early. The bleed band may remain closed and not respond to sudden power changes. The result can be engine surge. In addition, a restricted fitting in this location will prevent proper adjustment of the bleed band.

A **restricted** fitting installed in the No. 3 and No. 4 main bearing scavenge line (at the engine accessory gearbox end) will prevent proper oil drainage and cause high temperatures. The result will be early failure of the bearings and carbon seals.

Conversely, **nonrestricted** fittings installed in the lower pressure outlet ports of the fuel control unit can cause the fuel pressure warning light to come on. They can also result in a leaking fuel pressure transmitter from pressure surges. Five fuel control units were replaced on a single T53 engine before wrong fittings were identified as the cause of low fuel pressure indications. Mechanics didn't spot the cause sooner because, first, the fittings remain with the hoses—not the fuel control unit—and second, the two types of fittings look identical. Both are the same size, color, and shape.

Yet, the solution is simple. LOOK THROUGH THEM. The inside diameter of the **nonrestricted** fitting

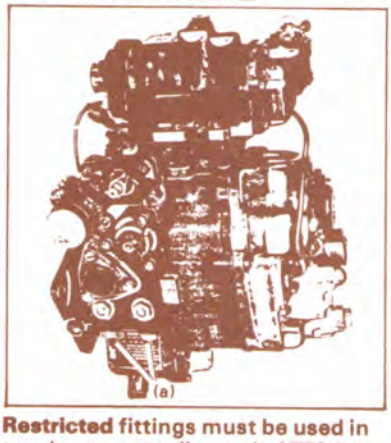
All look-alikes are not alike.



Fitting on left is nonrestricted while one at right contains restrictor at one end. ONLY BY LOOKING COMPLETELY THROUGH FITTINGS can you positively identify type.

(P/N MS24392D4, NSN 4730-00-834-9560) is large and remains constant throughout its entire length. However, the bore of the restricted fitting (P/N 204-060-670-1, NSN 4730-00-675-3239) does not remain constant. Near one end is a plug with a .027- to .032-inch hole drilled through it. Since there is only one drilled plug in each restricted fitting and since this plug is located near one end of the fitting, you must be sure to look completely through any fitting you are trying to identify to insure its type.

Once fittings have been identified, following TM procedures during maintenance will prevent installation of the wrong type. The manual stipulates "restrictor" where a restricted fitting is to be installed. However, even without a manual, you need to simply remember that restricted fittings must be used in the two bottom fuel pressure outlet ports of the T53 fuel control unit. These ports are located just above the fuel control data plate (see photo). All other union fittings used on T53 engine bleed air, fuel, and oil lines are to be **nonrestricted**. ■



Restricted fittings must be used in two lower ports (item a) of T53 fuel control unit.

Shortfax

Unauthorized alteration of electrical equipment

A recent Air Force mishap involving the use of an extension cord plug with an altered ground prong prompted the Air Force to send out a message which stated the following: ". . . The ground prong was altered in such a manner to allow the plug to be inserted into a receptacle in any of three possible ways. This mismatch of a male plug and female receptacle contributed to the mishap by allowing 115 volt 400 cycle power to be transmitted through a ground wire into an aircraft fuel tank. The result wa an explosion and fire which damaged the aircraft and injured three people.

"The mismatch of electrical plugs and receptacles can create extremely hazardous conditions affecting the safety of people and Air Force equipment. The design of electrical equipment with grounding systems protects workers from the hazards of electric shock. The design features also protect equipment from excessive and extraneous voltages from sources such as lightning and line surges. Any action to circumvent the proper function of electrical grounding systems presents serious industrial hazards in work areas.

"The unauthorized alteration of electrical equipment poses a serious hazard to our people and equipment.

"Users should be reminded of the hazard potential associated with unauthorized equipment modification.

"Supervisors should be asked to include this item in their shop/area safety inspection checklists.

"Safety inspectors should make this a matter of special interest in their recurring inspections. . . ." ■

Retorquing or checking torque?

An article in the September 1979 issue of PS Magazine stated: "You can't check torque by slapping a torque wrench on an installed nut and tightening it. The nut needs more torque than was originally used to overcome static friction. A torque check means the nut has to be retorqued. You have to back off on the nut one-half to one full turn. Then, put the nut in motion by tightening it with a torque wrench to the proper torque value."

CW2 Mark Barker, ASO, Fort Bragg, confused about the sentence, "A torque check means the nut has to be retorqued," sent us an Operational Hazard Report. Answering this OHR, TSARCOM explains that **retorquing**, required in special applications, is done by applying torque force in the **tightening direction only**. **Checking torque** is accomplished by backing off the nut one-half to one full turn, then tightening it with a torque wrench to the correct torque value. ■

Selected mishap briefs

uh1 **Precautionary landings** ☐ Aircraft was flying at 50 knots and 30 feet agl on CBR spray mission. There appeared to be a small leak in spray canister during first spray run. Within 10 seconds, inside of aircraft was clouded in CS gas. Pilot landed immediately. Hose attaching coupling to canister either malfunctioned or was improperly seated. ☐ Loud noise was heard from transmission area, followed by illumination of master caution and hydraulic lights and feedback and stiffness in controls. Running landing was made. Fitting to tail rotor servo pressure line in transmission well aft wall was found loose on preflight. Fitting failed when tightened and was undetected before flight.

Aviation-related ☐ As mechanic was backing 1¼-ton maintenance vehicle to turn around, vehicle hit parked UH-1, damaging left passenger/cargo door. Mechanic saw aircraft but misjudged distance.

ah1 **Incident** ☐ Aircraft landed hard during termination of standard autorotation. Main rotor blade flexed down and hit tail rotor drive shaft cover.

Precautionary landings ☐ SCAS hardover occurred at 3-foot hover, resulting in 12° to 15° bank angle. Caused by failure of SCAS roll channel card. ☐ Engine oil pressure light remained on after engine was operating at full rpm during runup. Caused by failure of oil pressure switch. ☐ IP heard high frequency popping noise from rear of aircraft and landed. Caused by improper tension on tail rotor control cables. Tension was checked 40 hours previously. Connecting barrels and safeties were intact.

ch47 **Precautionary landings** ☐ No. 2 engine PTIT rose to 970° during cruise flight. Suspect variable inlet guide vanes disintegrated and were ingested into engine. ☐ During engine starting procedures, No. 1 engine start motor would not motor engine. Caused by internal failure of engine hydraulic starter.

Human factor mishap ☐ Flight engineer was doused with JP4 during hot refueling operation. He was rinsed with water and taken to dispensary.

Aviation-related ☐ Crew, ground handling aircraft from flight line to refueling point, failed to notice one aft blade was still tied down. Blade was damaged when aircraft was moved.

oh58 **Precautionary landings** ☐ Tail rotor jam light and disengage light came on, accompanied by slight jerk in tail rotor pedals. Caused by failure of tail rotor control tube electromechanical disconnect. ☐ Transmission oil hot light came on during landing. Caused by failure of temperature switch. ☐ As collective was being lowered to regain rpm on completion of autorotative landing, IP sensed that something had given away on landing gear. After shutdown, inspection revealed forward cross tube had broken at left strap

assembly. Origin of crack was a stress riser created by drilled rivet hole passing through strap assembly and forward cross tube. Broken surfaces suggest cross tube had been cracked for undetermined length of time, with slow propagation until complete failure occurred. Crack was not discernible using normal inspection procedures. ☐ Loud squealing noise was heard, and engine chip detector light came on. Suspect engine failure. Time since overhaul was 186 hours.

Aviation-related ☐ Two OH-58s were parked at night on north end of unlit parking ramp. Two commercial fuel trucks were approaching from south end of ramp. Pilot of one aircraft noticed trucks were getting dangerously close and tried to signal truck drivers with a flashlight. One driver was able to avoid aircraft, but the other could not. Truck hit one aircraft, damaging tail boom, tail rotor drive shaft, and horizontal stabilizer. ☐ Tug was being used as makeshift maintenance stand. When tug was cranked, it went into reverse and hit aircraft, damaging rear cross tube, FM homing antenna, and honeycomb panel. ☐ As 1/4-ton vehicle was being backed without ground guide, vehicle hit left front of OH-58.

th55 **Precautionary landings** ☐ Rotor tachometer cable failed in flight. ☐ Rpm could not be maintained at hover. Excessive oil was found on right side of engine. Caused by malfunction of No. 4 cylinder push rod.

c12 **Precautionary landings** ☐ (A series) No. 1 engine torque fluctuated 3 to 4 psi and No. 1

prop fluctuated 10 to 70 rpm. Caused by failure of propeller governor assembly. ☐ (A series) Aircraft was cruising at 14,000 feet. Windshield heat was turned from off to high because of precipitation. Windshield cracked near center with many cracks radiating outward. ☐ (A series) Pilot felt thump during touchdown. Copilot had seen rabbit entering runway from right side. Postflight inspection revealed tip of one propeller blade was bent. Dead rabbit was found on runway.

ov1 **Precautionary landings** ☐ (D series) No. 1 engine chip detector light came on. Inspection of chip plug and oil filter revealed excessive metal chips. ☐ (D series) Hydraulic gauge went to zero. Landing was made without incident. Caused by failure of hydraulic pump.

t42 **Precautionary landings** ☐ No. 1 alternator failed during taxi for takeoff, followed by complete electrical failure. ☐ Gear did not indicate safe down during approach. Tower personnel indicated gear appeared down, and aircraft was landed.

u21 **Precautionary landings** ☐ (A series) Pilot saw fuel leaking from No. 1 engine during runup. Caused by failure of fuel nozzle. ☐ (A series) During takeoff, crew smelled something burning and noticed smoke in cockpit. Caused by short in VHF radio. Windshield was leaking water.

u3 **Precautionary landing** ☐ No. 2 engine fuel pressure fluctuated, and engine began to run rough. Caused by failure of engine-driven fuel pump.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Crew was on night medical evacuation mission. When aircraft arrived at site, ground fog covered area. Fog was too thick for searchlight penetration. Pilot requested handheld flare illumination of landing area and began descent. During approach, flares burned out and approach was aborted. Second attempt was aborted for the same reason. Pilot radioed ground unit that he could not land unless they maintained continuous illumination. On third approach, pilot realized ground unit would again allow flares to burn out before he could touch down. Decision was made to climb out at 60 knots airspeed and 700 feet per minute rate of climb. After traveling about one-half mile, aircraft hit ground with both pilots believing they were in a climb. Pilots had less than 5 hours' sleep during past 24 hours.

☐ Test pilot completed all prescribed flight maneuvers for maintenance checkout of overhauled aircraft. Pilot asked if he could take it and see what it could do. Pilot then proceeded to perform a variety of flight maneuvers. Between 500 and 1,000 feet, pilot executed a diving turn, which he claimed to have done hundreds of times before without difficulty. Aircraft crashed during pullup. Pilot stated, "The aircraft was in a steep dive which I misinterpreted as a shallow one." ■

Maintenance

uh1 **Precautionary landings** ☐ Hydraulic fumes were detected in cockpit, followed by illumination of master caution and hydraulic lights. Inspection revealed hydraulic input line rubbed through hydraulic output line. ☐ On approach, copilot noticed stream of vapor coming from upper battery vent. Battery had thermal runaway. Voltage regulator was out of adjustment. ☐ Damage to No. 5 tail rotor drive shaft was discovered during postflight inspection. Damage was caused by spool of .032-inch safety wire left next to No. 5 drive shaft section following crew chief maintenance. Spool was placed in drive shaft compartment after pilot had completed preflight inspection. ☐ Egt gauge stuck at 80°C. Caused by loose cannon plug. ☐ Master caution light flickered during landing. Caused by poor fit of electrical nipple.

ah1 **Precautionary landing** ☐ N_2 needle dropped to zero during runup. When wires were soldered to cannon plug 3 days before this mishap, solder was partially set before wires were properly positioned.

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

More on computing lateral c.g.

An article in the 12 Sep 79 FLIGHTFAX on computing lateral center of gravity provided a simple method for determining the effect of an off-centerline load. An assumption was made that the aircraft started out with its center of gravity on its centerline. What if this is not the case?

Suppose that basic lateral c.g. information is desired for a particular UH-1H. The DD Form 365B, or a concurrent weighing, will provide the reactions required. The only other information needed is the lateral moment arm for each reaction. These are 30.0" and 14.5" for the forward and rear reactions respectively. Moments and basic lateral c.g. are calculated in a manner similar to the method used for longitudinal c.g. A typical example is shown in figure 1, revealing a c.g. one inch left of center. Notice that the sign convention used is minus for left and plus for right.

The determination of lateral c.g. due to an off-center load for this aircraft must take into account the fact that its basic lateral c.g. is one inch to the left of center. There are two methods for doing this.

REACTION	SCALE READING (a)	ELECTRONIC SCALE CORRECTION (b)	NET WEIGHT (c)	ARM (d)	MOMENT
LEFT MAIN (-)	2600	+2	2602[1]	-30.0	-78,060[2]
RIGHT MAIN (+)	515	+4	519	+30.0	+15,570
LEFT REAR (-)	0	0	0	-14.5	0
RIGHT REAR (+)	3817	+13	3830	+14.5	+55,535
TOTAL	6932	+19	6951	-1.0[3]	-6,955

1. a + b 2. c x d 3. Total moment divided by total net weight.

Figure 1

	NET WEIGHT	ARM	MOMENT
TOTAL	6951	-1.0	-6955
ΔCG (1 AUX TANK ON LEFT)	1036	-26.5	-27,454
LATERAL CG	7987	-4.3	-34,409

Figure 2

The first method uses the c.g. formula presented in the previous FLIGHTFAX article and repeated below. The off-center load will be a single internal auxiliary fuel tank mounted on the left side. Since the basic c.g. is not on centerline, the arm used in the formula must be the distance from the load to the actual location of lateral c.g. The center of mass of one fuel cell is 26.5 inches from centerline, so in this example the arm is -25.5 inches. Gross weight is from figure 1.

$$\Delta CG = \frac{W \times arm}{GW \pm W} = \frac{1036\ (-25.5)}{6951 + 1036} = -3.3''$$

The results show a change in lateral c.g. of 3.3 inches to the left of basic c.g., or 4.3 inches to the left of center.

The second method builds on the calculations used to determine basic lateral c.g. Figure 2 repeats the net weight, arm, and moment from the last line of figure 1, together with the remaining steps.

The location of basic lateral c.g. can be very useful in determining on which side to place an off-center load. If that single auxiliary fuel tank mentioned above had been placed on the right side, lateral c.g. would have been 2.6 inches right instead of 4.3 inches left of center. For the purpose of illustration, a UH-1H was used, but the principle applies to any aircraft. ■

–MAJ Walter J. Probka, Army Safety Center

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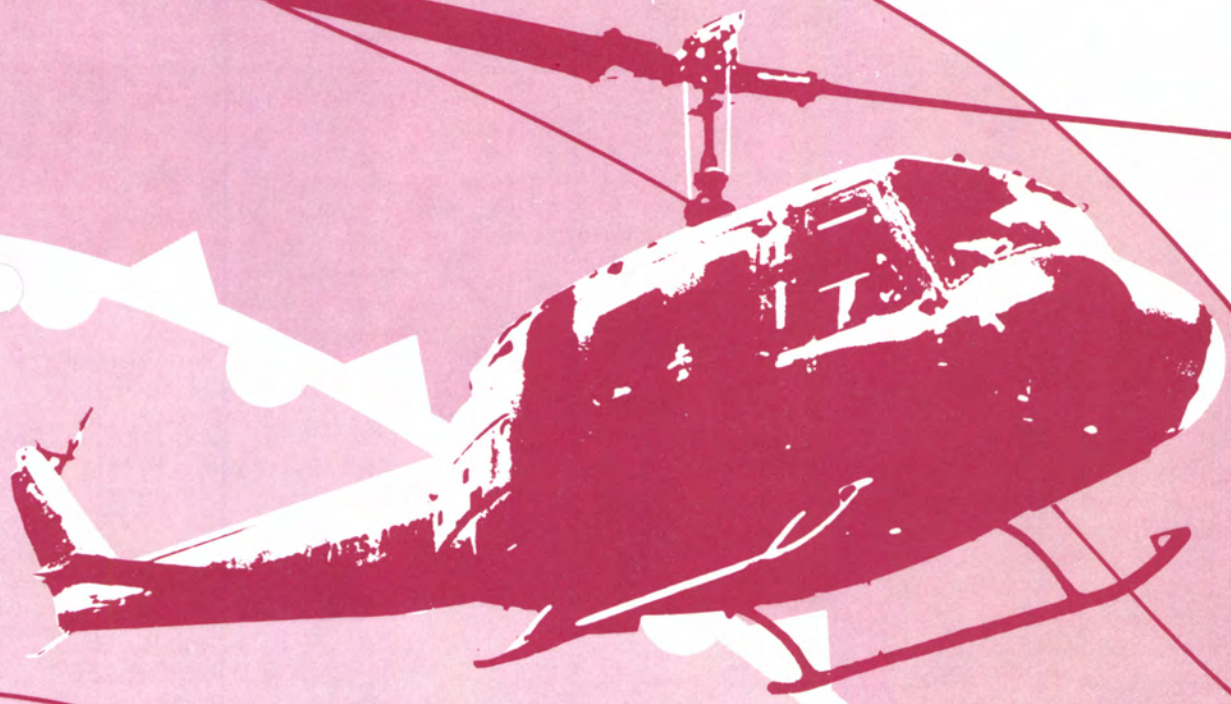
In-flight icing . . .
a potential hazard
to all helicopter pilots



Helicopter in-flight icing

A major finding of artificial and natural icing tests conducted by the Army in 1974 was that moderate ice accumulation (about one-half inch) on inboard portions of the UH-1H rotor blade—and similar aircraft—was sufficient to prevent a safe autorotation in the event of an engine failure.

This abnormality results from ice accumulation in greater amounts near the inner portions of the rotor disc, which directly affects the blade's efficiency with respect to upward airflows during autorotation. The reported result is that, with about one-half inch of ice on the main rotor blade's inner portion, minimum (safe) rotor rpm cannot be maintained during autorotation.

Helicopter pilots should not judge or estimate main rotor blade ice accumulation by observed buildup on the windshield or other parts of the aircraft, since icing occurs at an accelerated rate on the rotor blade as compared to accumulation on the fuselage. A more reliable method for operators of UH-1 aircraft is to estimate ice buildup on the main rotor blades by monitoring power required (torque indications). Researchers indicate that blade icing of one-half inch or greater will be accompanied by a 5- to 6-psi torque increase over the before or "no ice" power requirement.

This phenomenon does not appear to be unique to the UH-1 and deserves the attention and consideration of all helicopter operators.

Many helicopter pilots are inclined to disregard the potential hazards of main rotor blade icing owing to the in-flight "shedding" of ice. In-flight shedding can and does occur. Unfortunately, it is as likely to create a problem as it is to relieve one.

Symmetrical (affecting all rotor blades simultaneously in the same way) shedding in flight can be beneficial by restoring the rotor blades to a more efficient or clean configuration and by reducing the weight of the aircraft. Asymmetrical shedding (affecting less than all of the main rotor blades), however, can create extremely severe vibrations, depending on the amount of ice discharged, rotor system, and other factors.

The severity of vibrations resulting from asymmetrical shedding is generally a function of the unbalanced weight of the rotor system, and therefore, may be expected to be greater for semirigid (2-bladed) systems and 3-bladed fully articulated systems than those rotor systems employing four, five, or more main rotor blades.

In short, the severity of vibrations resulting from asymmetrical main rotor shedding can be extremely hazardous and operators can expect the vibration levels caused by asymmetrical shedding to decrease with an increase in the number of main rotor blades (for a constant rotor mass) since the imbalance represents a smaller percentage of the rotor mass. Conversely, vibration levels may be expected to be greater when asymmetrical shedding occurs on 2- and 3-bladed systems.

Ice shedding from the main or tail rotor can also produce problems apart from an unbalanced rotor system. Though documentation is less than authoritative, researchers have experienced and expressed a concern for structural or foreign object damage to the helicopter's fuselage, rotors or engines resulting from rotor blade shedding. This particular hazard appears to be more threatening to large multi-engine aircraft and especially tandem rotor systems.

Asymmetrical shedding can be minimized by avoiding static temperatures lower than -5° C. Research indicates that by operating in environments of -5° C. or warmer, shedding will generally occur symmetrically. Tests of UH-1 aircraft

suggest that by rapidly varying main rotor speed or entering autorotation, symmetrical shedding may be induced when static temperatures are -5° C. or warmer. Collective and cyclic inputs were generally ineffective in producing symmetrical shedding and may result in asymmetrical shedding. At temperatures below -5° C., it is not possible for the pilot to induce shedding.

Most helicopters are not equipped with windshield anti-icing systems and, therefore, a complete or substantial loss of forward visibility will normally occur following prolonged flight in icing conditions. Normal defogging systems are not capable of preventing this windshield buildup. However, visibility usually remains clear through the side windows even in moderate icing.

Light helicopters such as the OH-6 and OH-58 are "ultrasensitive" to in-flight icing. The limited power available and smaller control surface make this type of aircraft extremely susceptible to icing.

Flight tests in icing conditions indicate that light helicopters experience a rapid degradation in aerodynamic characteristics and handling qualities with a corresponding increase in vibration levels. These limitations are vividly illustrated by icing flight tests with the OH-58A where five test flights were conducted. One flight in the cloud was as short as 1 minute and the longest was only 7 minutes.

Aviation weather education has oriented pilots to think of aircraft icing as a function of the following two atmospheric conditions that must prevail simultaneously:

- Free air temperature at or below freezing (0° C.)
- Supercooled visible liquid moisture or high humidity.

Though this explanation provides some insight into aircraft ice formation, it presents only a meager perspective of the icing environment for operators of rotary wing aircraft.

The inherent limitations of helicopters (service ceiling, range, endurance, speed, and power availability) and the previously discussed icing hazards require a more comprehensive understanding of in-flight icing conditions and their relationship to helicopter operations.

Research studies indicate that in-flight encounters with icing conditions occur most frequently in the vicinity of frontal zones. In addition to the threat of icing in frontal clouds, frontal systems also create the necessary conditions for in-flight icing "outside of clouds."

Warm front icing may occur both below and above the frontal surface.

Helicopter icing

Figure 1 illustrates how freezing rain or drizzle can be produced by precipitation falling through the front into subfreezing cold air below. As noted in figure 1, this particular form of icing is most often found when the temperature above the frontal inversion is greater than 0° C. and the temperature below is less than 0° C. Where temperatures above the frontal surface are subzero, ice pellets or snow may be noticed below the front and are normally not of concern to helicopter operators.

Icing in the clouds above the warm front's surface is characteristic of icing found in stratiform and stratocumulus clouds and usually consists of rime or mixed rime and clear ice.

Cold front icing normally occurs in an area preceding and following the front (figure 2). In this region, aircraft are likely to encounter the most intensive icing in clouds immediately above the frontal zone. Aircraft penetrating a cold front can expect clear icing to be prevalent in the system's clouds at the lower altitudes (0-15,000 feet msl) and a mix of clear and rime ice at higher altitudes.

Freezing rain or drizzle may also be experienced in a "shallow" or "slow-moving" front where the warm air is lifted over the advancing cold front. This condition often produces clouds and precipitation well behind the surface position of the front. Upon falling through a subfreezing cold front, the rain becomes supercooled and freezes on impact with the aircraft.

Aircraft icing is more probable and severe over mountainous or steep terrain than over low or flat elevations. The presence of a mountain range causes strong upward air currents on its windward side which are capable of supporting larger than average water droplets and thereby compounding the icing hazard. The movement of a frontal system, with its companion turbulence and updrafts across a mountain range, combines the normal frontal lift with the upslope currents of the mountains to create an extremely hazardous environment for rotary wing aircraft.

The severest icing occurs above the crest and to the windward side of the ridges. This zone usually extends 4,000 to 5,000 feet above the mountain and can extend much higher when cumuliform clouds have developed. ■

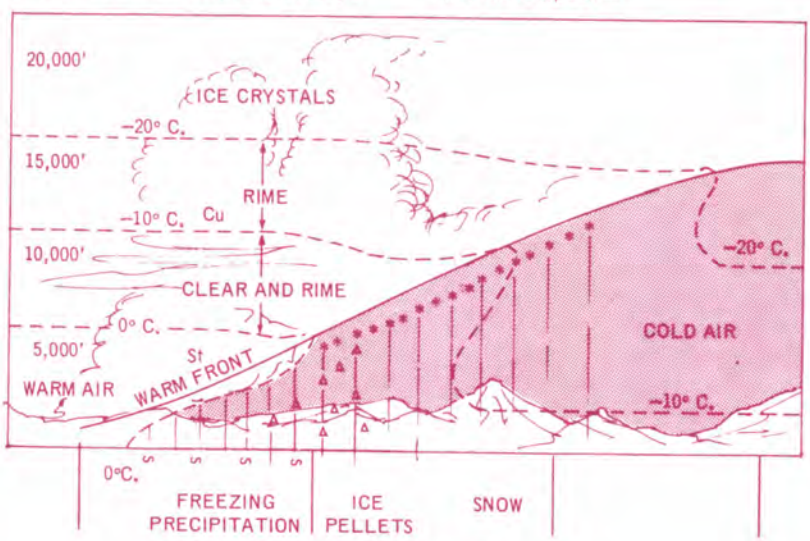


FIGURE 1.–Warm Front

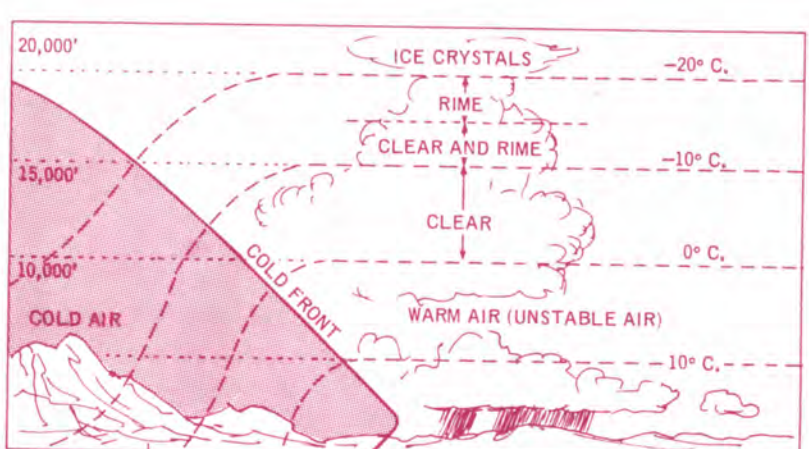


FIGURE 2.–Cold Front

Accident review

Synopsis

As an OH-58 was hovering at night over a snow-covered field the pilot lost visual reference in blowing snow and became disoriented. The aircraft drifted backward, hit some trees, spun three times, and settled into the trees.

History of flight

The mission was assigned by the unit commander as a night cross-country flight to be conducted in three phases under VFR conditions. Phase 1 was a hot refueling exercise. Phase 2 was a cross-country navigation exercise. Phase 3 was minimum lighted approaches to a heliport and return to the field site for inverted Y approaches and termination.

En route to the refueling point, the OH-58 pilot saw an aircraft on the ground about 1,500 meters from the field site. As he was section leader, the pilot was concerned about why the aircraft was shut down and landed to investigate.

After determining that the downed aircraft apparently had an engine malfunction, the OH-58 pilot returned to his aircraft to continue his mission. The copilot then told him he was having problems communicating with another aircraft that had also landed. The pilot called the pilot of the other aircraft and told him the mission would be aborted because of the radio problems and that all aircraft would return to the field site. The pilot of the other aircraft acknowledged by flashing his landing light and then left the area.

The OH-58 pilot and copilot tried to resolve their intercom problems and did get some communication between them before takeoff. The landing light was turned on and the helicopter picked up to a hover. The copilot recommended that the takeoff be aborted and that they remain in the immediate area to guide recovery personnel, who were approaching in a ground vehicle, to the downed aircraft. The pilot agreed.

While the aircraft was hovering, blowing snow created a whiteout condition and the light reflecting off the snow caused a severe glare. The pilot turned out the landing light. Limited visibility was regained, but communication between the pilot and copilot was lost. After about 2 minutes, the copilot realized the aircraft was drifting backward. He tried to tell the pilot but was unable to before the tail rotor hit some trees. The helicopter pivoted up over the trees and to the left. It then spun to the right three times. The pilot rolled off throttle and applied collective, and the aircraft settled into the trees. The pilot, copilot, and crew chief exited unassisted.

Crewmember experience

The 26-year-old pilot had more than 1,000 rotary wing flight hours, with more than 500 in the OH-58. The 36-year-old copilot had more than 1,600 rotary wing hours, with more than 600 in the OH-58.

Commentary

Hovering the aircraft at 5 to 10 feet agl caused loose snow to recirculate through the rotor system, reducing visibility. Intermittent use of the landing light and turning the aircraft away from nearby ground references contributed to the loss of night visual acuity and disorientation. The pilot may also have been preoccupied with the approach of a ground vehicle. Because of lack of proficiency, the pilot had been recommended for additional night training after a standardization ride more than 5 months before this accident. This training had not been accomplished.

Accidents of this type can be prevented by better unit training programs which would insure pilots are capable of safely operating aircraft over snow-covered terrain. Units operating in snow environments should establish night training programs that prescribe night hourly goals and include tasks required to be performed at night by TC 1-137. Unit members should also be familiar with FM 1-51. ■

Prepare for winter operations

Winter operations require special precautions. Some of the things aircrews and maintenance personnel can do to minimize cold weather hazards are:

- Become thoroughly familiar with procedures concerning deicing, snow removal, towing aircraft, and maintenance.
- Know the capabilities and limitations of your aircraft.
- Get a current, detailed weather briefing and select the best route and altitude to avoid the worst weather.
- Review procedures which would be used if icing is encountered.
- Visually check aircraft for ice accumulation when in or near clouds and in any precipitation.
- Plan for the worst, and make sure all equipment which might be needed is in good working order. ■

Selected mishap briefs

uh1 **Precautionary landings** □ N_2 fluctuated and aircraft yawed. Pilot reduced power and landed. Brown substance in bore of bleed band actuator caused piston to stick. □ Jeep with whip antenna stopped under main rotor blades as they were slowly stopping. One main rotor blade was damaged. □ Shortly after takeoff from field site, aircraft hit wire. Poles could not be seen from point of departure. Aircraft was landed with scratches on left windshield and skin damage to nose. □ Noise was quickly followed by 1:1 vertical vibration. Power landing was made. White main rotor blade skin was separated at blade tip.

Aviation-related □ Mechanic drove tug with APU mounted on back into synchronized elevator of UH-1, damaging elevator.

ah1 **Accident** □ Aircraft on day VFR flight crashed. Two fatalities. Details unknown. 8004

Precautionary landings □ Master caution and engine fuel pump lights came on. Caused by failure of fuel pump pressure switch. □ Pilot overtorqued aircraft to avoid high terrain.

ch47 **Precautionary landings** □ Transmission oil pressure gauge indicated maximum during takeoff. Caused by malfunction of oil pressure switch. □ Aft transmission chip detector light came on. Metal particles were found in transmission filters. □ Aircraft was on VFR cross-country flight to field location. About 5 minutes' flight time from field location, weather deteriorated and pilot landed. Weather did not improve until the following day, when flight was completed.

oh58 **Accidents** □ Wreckage was discovered one day after aircraft was reported missing. Two fatalities. Details unknown. 8005 □ Aircraft was hovering into wind when right turn started. Left pedal input was not effective. Pilot initiated hovering autorotation, and aircraft hit ground and rolled on side. 8006

Precautionary landings □ During touchdown phase of hydraulics-off landing, pilot lowered collective prematurely. Resulting yaw was corrected with lateral cyclic rather than pedal, causing aircraft to hit ground right skid low. IP corrected with left cyclic, causing lateral oscillations and spike knock. Maintenance inspection revealed no damage. □ Copilot's door jettisoned about 300 feet agl. Suspect passenger unknowingly broke jettison handle wire seal while entering aircraft, allowing handle to vibrate loose during flight. □ Pilot reached up to change ICS switch from No. 1 to No. 2 position. When passenger in front seat reached down to adjust his position, he accidentally bottomed copilot's collective lever. Aircraft was landed with damge to front and rear crosstubes. □ After hot refueling aircraft, both student pilots and refueler personnel failed to notice grounding cable still attached to skid at right tow ring. Because of turbulence from other aircraft, IP did not notice any pull as grounding stake came out of ground when aircraft took off. Pilot in another aircraft saw cable hanging from skid and called OH-58 pilot. Aircraft was landed with no damage. □ Loud noise was heard during landing. Caused by failure of hydraulic pump.

ov1 **Accident** □ (D series) Pilot descended from 11,000 feet to 9,000 feet because of icing conditions. No. 2 engine caught fire, and No. 1 engine would not develop enough power to maintain flight. Both crewmembers ejected as aircraft descended through 3,000 feet. 8007

t42 **Precautionary landings** □ Crew smelled smoke in cockpit. Landing gear circuit breaker was popped and landing gear was partially retracted. Circuit breaker would not reset. Gear was manually extended and aircraft landed. Caused by defective landing gear motor. □ No. 2 engine chip detector light came on during climbout. Caused by internal engine failure.

u8 **Precautionary landing** □ (F series) Fire occurred in No. 1 engine nacelle during start. Caused by broken fuel line.

u9 **Precautionary landing** □ Crew noticed both generator loadmeters were reading zero during climb. Generator switches were recycled with no indication of power from No. 2 generator, and No. 1 generator indicated output but continued to fall off line. Generators were turned off and aircraft landed. No. 2 engine propeller anti-ice system had several broken wires/terminals, and No. 2 generator failed.

u21 **Precautionary landings** □ (A series) Left nacelle fuel cap popped up after takeoff, and fuel started siphoning. Fuel cap did not seat properly. □ (D series) Left generator light came on after takeoff. Pilot reset generator and light went out. Pilot checked instruments and received no flaps, gear, or fuel quantity indication. Gear was manually extended and no-flap landing was made. Caused by broken left generator reset diode and ground fault detector. □ (H series) Heater failed during ascent. As aircraft was descending through 10,000 feet msl, heater operated normally. Spring-loaded door assembly for avionics compartment is now being investigated for functional operation. Door directs ram air to differential pressure switch which controls K5 relay. K5 relay controls heater fuel pump and fuel valve. When door leaks air and sufficient airflow is not provided, pressure is reduced, rendering heater inoperative.

Maintenance

uh1 **Precautionary landings** □ Compressor stalls occurred during takeoff. Inspection revealed P3 customer pneumatic air line fitting was loose, and bleed band was bent and not properly adjusted. □ Master caution and hydraulics lights came on, and controls became stiff. Caused by hydraulic line chafing against airframe in transmission well. □ When power was applied on takeoff, collective hit what appeared to be upper stops. Power was limited to 35 pounds torque and 92% N_1. Takeoff was aborted. Transmission return line elbow was improperly positioned forward. Nut on throttle linkage control horn was hitting elbow.

oh58 **Precautionary landing** □ Pilot noticed oil on windshield and landed. Crew chief had added transmission oil after pilot had preflighted and forgot to reinstall filler cap.

u21 **Precautionary landing** □ (A series) No. 1 engine was shut down to check autofeathering system and propeller feathering blade angle. Autofeather worked properly and propeller came to full stop. Restart procedures were initiated. With No. 1 engine ignition start switch in ignition start position, N_1 stabilized at 26%. Propeller did not rotate. After two attempts to restart, engine failed. Single-engine landing was made. Caused by fouled igniters. Suspect feathering blade angle was improperly set.

Messages received

- Safety-of-flight (operational) message for UH-1B/C/D/H/M aircraft equipped with internal rescue hoist (UH-1-79-24, 262201Z Oct 79). Message releases the rescue hoist for operator training using dummy loads. The hoist has not been released for live rescue missions. Further guidance will be provided later. Contact: Mr. Bill Lake, AUTOVON 693-0396, commercial 314-263-0396.

- Safety-of-flight technical message concerning rerouting of hose assembly, P/N 209-060-668-9, NSN 4720-00-181-9313, MWO 55-1520-244-30-1 (AH-1-79-23, 302125Z Oct 79).

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Recap of TSARCOM messages

Following is a list of all AIG 8881 addressed messages transmitted by TSARCOM (DRSTS-M) from 1 January through 31 March 1979.

GEN-79-01 Maintenance advisory on fire resistant hydraulic fluid

GEN-79-02 Maintenance advisory message on change 15 to TM 55-2840-229-24

GEN-79-03 Maintenance advisory message on fire resistant hydraulic fluid

GEN-79-04 SOPE message on emergency locator transmitters

GEN-79-05 SOF one-time inspection of emergency locator transmitters

CH-47-79-01 SOF operational message on door latches

CH-47-79-02 SOF operational message on night vision goggles

CH-47-79-03 SOF one-time inspection for washer installation in rotor heads

OV-1-79-01 Maintenance advisory message on extension of installed life on guillotine cartridge and drogue gun used in MK-J5D ejection seats

OV-1-79-02 SOPE message on harness support of MK-J5D ejection seats

OV-1-79-03 SOPE message on service life extension of safety belt used with parachute harness

OH-58-79-01 Maintenance advisory on replacement of TT straps

OH-58-79-02 Maintenance operational message on urgent change to TM 55-1520-228-10

OH-58-79-03 Maintenance advisory message on securing of electrical connnectors

OH-58-79-04 Maintenance advisory message on tail rotor drive shaft cover

OH-58-79-05 Maintenance advisory message on weight and balance

U-21-79-01 Maintenance advisory message concerning lightning strikes

U-21-79-02 Maintenance advisory message on landing gear actuators

U-21-79-03 SOF one-time inspection of landing gear actuators

U-8-79-01 Maintenance advisory message concerning lightning strikes

UH-1-79-01 Maintenance advisory message on lockout valve on dual hydraulic system

UH-1-79-02 Maintenance advisory message on cracked crosshead bearings

UH-1-79-03 SOF one-time inspection of T53-L-13B fuel controls

UH-1-79-04 SOF one-time inspection of swashplate outer ring

AH-1-79-01 SOF one-time inspection of T53-L-703 fuel controls

AH-1-79-02 SOF one-time inspection of T53-L-13B fuel controls

Addressees requiring copies of messages should contact their next higher headquarters.

POC at TSARCOM is LTC (P) Therman Greene, AUTOVON 693-0466, commercial 314-263-0466. ■

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Army aircraft mishap prevention data

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NOE deceleration . . .
if there is any one single maneuver every pilot flying NOE should master, it is the NOE deceleration

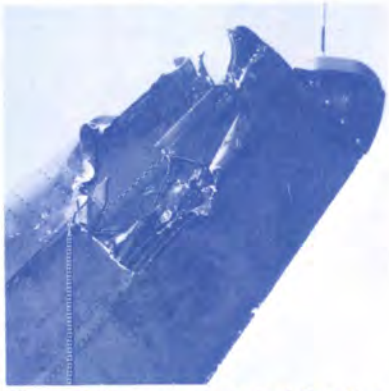
Keep that tail up!

Any maneuver performed at nap-of-the-earth (NOE) altitude requires a great deal of precision. But based on past accident experience, if there's any one single maneuver that every pilot flying NOE should master, it is the NOE deceleration. In FY 79, three Huey accidents occurred during NOE decelerations due to incorrect technique or ineffective control input.

Take, for instance, a UH-1 pilot and IP who were on an annual proficiency and readiness test flight. During the flight, the IP demonstrated an NOE deceleration and then had the pilot perform two decelerations at about 20 feet. The pilot applied too much aft cyclic for the amount of collective pitch application, causing the helicopter to pivot around the mast rather than the tail rotor. The IP explained and demonstrated the maneuver again at about 5 feet agl so the pilot could get more of a sensation of altitude gain. At this time, the wind was 10 knots gusting to 16 knots. The IP then told the pilot to perform another deceleration. During the maneuver, the pilot again applied too much aft cyclic for the amount of collective pitch and failed to maintain sufficient altitude for the tail rotor to clear the ground. The helicopter spun right, and the IP reduced throttle to land. The tail boom, cross tubes, and left side of the aircraft were damaged.

In another case, an IP demonstrated an NOE deceleration during NOE refresher training and the pilot performed two of them satisfactorily. The IP demonstrated another NOE deceleration at a skid height of 10 feet. The pilot again performed two maneuvers to the IP's satisfaction but allowed the aircraft to unmask excessively. The pilot was having some difficulty visualizing the position of the aircraft from this altitude, so the IP allowed him to descend to 5 feet and perform the maneuver downwind. As the aircraft accelerated through effective translational lift, the pilot slightly lowered collective in an attempt to keep the helicopter from unmasking and abruptly applied aft cyclic. The nose of the aircraft pitched upward, rotating around the axis of the main rotor instead of the tail rotor. Before the IP could react, the tail rotor struck the ground and separated. The helicopter then turned right, hit the ground again on the left skid, and rolled on its left side.

A third accident occurred when an IP was demonstrating an NOE deceleration over downsloping terrain. While flying at an altitude of 5 feet and airspeed of 15 to 20 knots, the IP slightly applied collective and aft cyclic to decelerate. Due to a slight downslope of 3 degrees along the flight path, the IP misjudged the effectiveness of the control input and the distance between the tail rotor



View of damage to vertical fin after tail rotor hit ground and 90-degree gearbox separated.

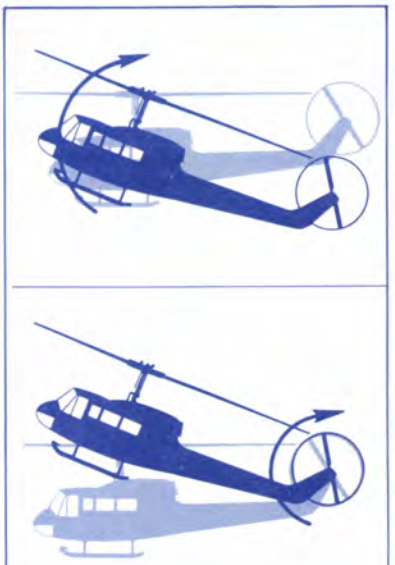
and ground. When the tail rotor hit the ground, the 90-degree gearbox separated, and the helicopter spun and landed hard.

Unlike a normal deceleration at altitude in which the helicopter rotates around the axis of the main rotor, the helicopter must rotate around the axis of the tail rotor during NOE due to the critical height of the helicopter above the ground or obstacles. This technique raises the nose of the helicopter but keeps the tail of the aircraft stationary and above ground obstacles.

The correct way to perform an NOE deceleration below effective translational lift is to increase collective to maintain tail rotor altitude and then apply aft cyclic to decrease airspeed or to come to a complete stop. (The amount of initial collective pitch will depend on your forward airspeed, load, and how fast you want to stop.) As the helicopter comes to a halt, slightly apply forward cyclic to level the helicopter and then reduce collective to maintain the helicopter at the desired NOE altitude.

At airspeeds above effective translational lift, an initial increase of collective may not be necessary. In this case, apply aft cyclic first and then adjust collective as necessary to maintain tail rotor altitude. In most cases, a reduction of collective is necessary. The amount of reduction will depend on how much and how fast airspeed is being reduced.

These procedures for NOE deceleration apply to the Huey, Cobra, and Scout helicopters. However, if the helicopter used as the primary training vehicle during initial training is not the one that will normally be flown, it is recommended that additional NOE deceleration training be given in the mission helicopter. ■



Top figure shows wrong technique for NOE deceleration maneuver. When the helicopter is rotated around the axis of the main rotor, the tail boom goes down as the nose of the aircraft goes up. This puts the tail boom into trees and other obstacles. Bottom figure shows correct NOE deceleration maneuver, with the aircraft rotating around the axis of the tail rotor instead of the main rotor. This raises the nose of the aircraft but keeps the tail of the aircraft stationary and above ground obstacles.

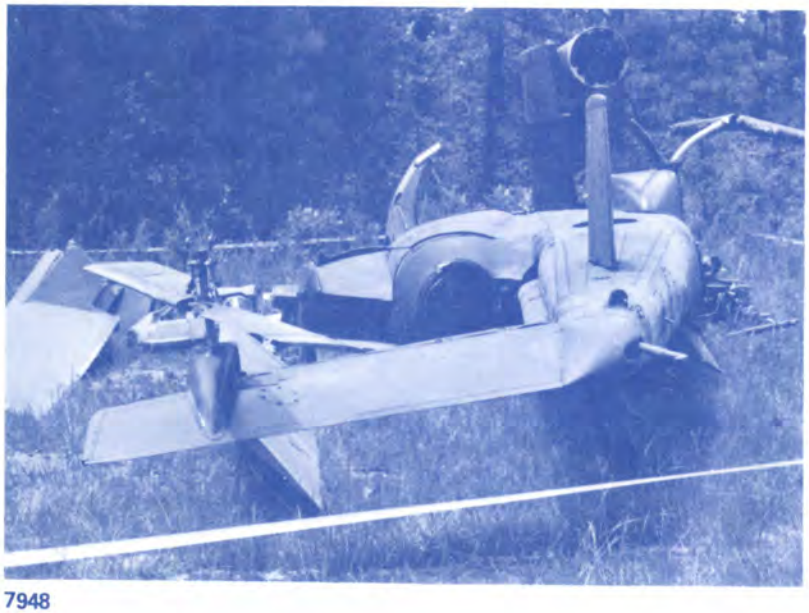
IP did not have time to react to an abrupt application of aft cyclic by the pilot. Tail rotor struck ground and separated, and Huey rolled on left side.

Followups

Additional information on accident briefs previously published

ah1 **Total loss accident** in 27 June 79 issue (7948) ☐ Engine failed during training flight, and IP tried to stretch his autorotation to reach clear area. Aircraft hit ground on its left side with high rate of descent. Pilot sustained fatal injuries, and IP's injuries were major. Engine failure was caused by fuel exhaustion. IP did not plan his flight to arrive at destination with 30-minute fuel reserve and continued to fly after it was apparent fuel quantity gauge was unreliable.

Minor accident in 8 August 79 issue (7958) ☐ Engine failed during training flight. IP overshot intended landing area, and aircraft landed hard on curved portion of road just short of small hill and ditch. Teardown analysis by CCAD revealed no engine stoppage. Engine performed perfectly on test stand.



7948

oh58 **Total loss accident** in 15 August 79 issue (7960) ☐ During 180-degree turn about 100 feet agl, fuel control on engine malfunctioned, reducing fuel flow and causing loss of power. Aircraft descended into trees. Fuel control malfunction resulted from hard particles trapped in main fuel metering valve and fuel bypass valve.

7960

th55 **Major accident** in 1 August 79 issue (7956) ☐ Student pilot applied excessive aft cyclic, left pedal, and collective pitch during approach, resulting in left yaw, slow descent, and very slow rate of closure. SP immediately applied excessive right pedal and reduced collective pitch, inducing right descending spin which continued until ground impact.

ov1 **Total loss accident** in 25 April 79 issue (7944) ☐ Pilot and IP were on service mission. IP placed aircraft in steep banked descent from 865 feet agl to enter low-level run. This caused a 12,000-fpm sink rate to develop, and IP was unable to stop rate of descent before ground impact. Pilot and IP were killed.

7944

uh1

Total loss accident in 18 April 79 issue (7941) ☐ Aircraft was on night training flight when engine failed at 1,000 feet and 90 knots. IP autorotated into 70-foot trees. Pilot sustained minor injuries and IP sustained major injuries. Failure of fuel control drive shaft was caused by excessive wear and stripped splines in accessory gearbox.

Minor accident in 4 Jul 79 issue (7950) ☐ Aircraft was on maintenance test flight. During low rpm hover check at 35 to 40 feet agl, aircraft began turning right. Autorotation resulted in hard landing and minor damage. Maintenance test pilot was operating his aircraft at a gross weight of 7,764 pounds at an engine rpm of 6000, a violation of the operating limits in the operators manual. As a result, tail rotor thrust was lost. Pilot interpreted loss of tail rotor thrust as tail rotor failure and autorotated.

7950

Minor accident in 11 July 79 issue (7952) ☐ Aircraft hit storm drain cover during practice touchdown autorotation to sod. IP and pilot failed to perform adequate ground reconnaissance of selected touchdown area.

7962

Minor accident in 8 August 79 issue (7957) ☐ Copilot allowed rotor rpm to decay during takeoff from training site. Pilot took control but was unable to regain engine and rotor rpm before aircraft landed hard. Pilot did not monitor actions of copilot and allowed him to exceed aircraft limitations. Neither pilot monitored engine instruments during takeoff.

Major accident in 22 August 79 issue (7962) ☐ During low recon, pilot allowed his aircraft to become slower than specified by the operators manual for the gross weight and altitude. Engine could not produce enough power because of high pressure altitude and temperature. Pilot was unable to recover, and aircraft crashed. ■

7957

Selected mishap briefs

uh1 **Accidents** ☐ Loud bang was heard during approach to airfield, and aircraft yawed right and rolled left. Pilot autorotated into trees, and aircraft came to rest on left side. 8008 ☐ Aircraft hit wires during contour flight. Control was lost, and aircraft crashed on right side. Three occupants were injured. 8009

Precautionary landings
☐ Controls became stiff about 100 feet agl, and master caution and hydraulic lights came on. Caused by deteriorated O-ring. ☐ Transmission oil pressure fluctuated. Caused by broken ground wire on oil pressure indicator. ☐ Pedals locked when hydraulics-off check was initiated during maintenance test flight. Hydraulics were turned on, restoring partial control of pedals. Running landing was made. Caused by failure of tail rotor servo cylinder. ☐ Master caution and tail rotor chip detector lights came on. Caused by deterioration of 90° gearbox. ☐ Ammo can lid from door gun blew off in flight, striking synchronized elevator.

ah1 **Precautionary landings** ☐ Transmission oil bypass light came on. Caused by failure of pressure switch. ☐ Aft fuel boost pump light came on, and fuel pressure fluctuated. Caused by failure of boost pump.

oh58 **Precautionary landings** ☐ Aircraft had been running for about 10 minutes after start when engine failed. Engine was stable idle, 62% N_1, when failure occurred. Witness saw puff of smoke come from exhaust stack at time of failure. ☐ Loud squeal was heard from rear of aircraft, followed by high frequency vibration in tail rotor pedals. Pilot landed at nearest safe landing area.

ch47 **Precautionary landings** ☐ No. 1 and No. 2 rotor tachometers went to zero in flight. Caused by failure of tachometer generator. ☐ Flight of three CH-47s landed in open field when visibility decreased to less than one-fourth mile. Mission was continued the next morning. ☐ No. 2 engine failed 5 minutes after takeoff. Caused by malfunction of fuel control unit.

c12 **Precautionary landing** ☐ (A series) On landing roll, pilot noticed he had no right brake. Left turn was made off runway, engines were shut down, and aircraft coasted to stop. Ruptured seal caused loss of hydraulic fluid.

ov1 **Precautionary landings** ☐ (D series) No. 1 engine quit during landing. Caused by failure of second-stage compressor section. ☐ (D series) Top outboard cowling on No. 2 engine came off in flight. Caused by failure of stud assembly.

t42 **Precautionary landing** ☐ Fuel began to siphon from right inboard fuel cap following takeoff. Tension on fuel cap was not sufficient to provide proper seal.

u8 **Precautionary landing** ☐ (F series) Maximum rpm on No. 1 engine during takeoff roll was 3200. Caused by failure of fuel injector pump.

u21 **Incident** ☐ (D series) Nose gear collapsed when aircraft landed, causing incident damage.

Do something!
You know who's going to have the next accident. You saw him on the flight line last week. You've seen him do stupid things with an aircraft and you know he'll do it again. "He's crazy," you've said over a beer at the club. You know him, but you haven't done anything about him. That's the sad part and that's going to be tough to live with when he buys the farm and takes some other people in with him. Go see somebody! See the ASO or the IP or the operations officer or your platoon leader or his platoon leader or the commander. Get up on both feet and talk to somebody and keep talking until somebody does something about him. You'll feel better about yourself for it and you may save someone's life. ■

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Aircraft was flying at 50 feet over large lake toward a distant horizon partially obscured by fog. Aircraft had been loaded near the forward c.g. limits with a high gross weight. As flight proceeded, pilot commented to copilot about how one can lose depth perception when flying over smooth water. Shortly afterward, aircraft hit water at shallow angle. Wind was calm and water was glassy smooth.

Maintenance

u3 Precautionary landings

☐ No. 1 engine was shut down and feathered during maintenance test flight. Propeller could not be brought out of feathered position, and aircraft was landed. Crack was found in high pitch stop on No. 1 engine. New part was ordered. The part removed from the aircraft showed a part number of B882-R. The part received also showed a part number of B882-R, and it was installed on the aircraft. The propeller would not unfeather because P/N B882-R does not fit properly in its designed location unless it is modified by filing certain portions. Inspection of the cracked stop showed it had been filed, and the cracks found were in the same area. **P/N B882-R is not an authorized substitute part for P/N B882-1, according to Hartzell Propeller Corp.** ☐ Landing gear failed to fully retract after takeoff and gear circuit breaker popped. Attempt was made to lower gear manually, but gear was not free and resistance was felt in emergency crank. Rather than apply excessive pressure to handle, gear motor was allowed to cool for several minutes and circuit breaker reset. Gear then extended normally with electrical power, and aircraft was landed. Aircraft had just come out of maintenance, where landing gear was inspected. Between the time the inspection was done and aircraft was released for test flight, avionics work was performed which required nose gear door to be disconnected. This was not noted in logbook, and door was not properly secured after radio work was completed. Disconnected door was not discovered during preflight and on takeoff run air pressure caused doors to partially close. When gear was retracted, shimmy dampener jammed on door and prevented further operation.

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

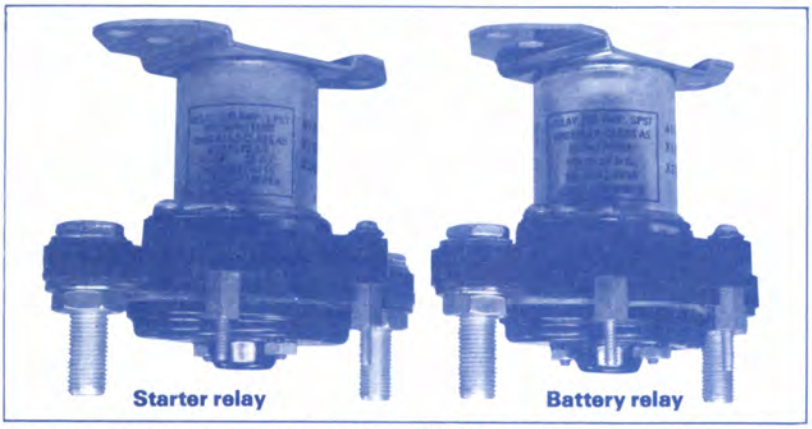
Install bug screens in OH-6As

The existing OH-6A static pressure system, 369A6501, does not have a bug screen installed in the inlet end. The bug screen is required to prevent insects from nesting in the static air line. Any blockage that restricts the static line will cause false readings on the altimeter and the airspeed indicator.

Install bug screen, P/N D3738, NSN 5340-01-080-5503, in the inlet end of the static line. The screen can be bonded in with MIL-A-46050 adhesive, NSN 8040-00-142-9193.

POC is Mr. Clifford Neff, TSARCOM, AUTOVON 693-0396, commercial 314-263-0396. ■

Substitution of battery relay with starter relay not recommended



Starter relay Battery relay

On approach the pilot smelled smoke and a faint pungent odor. After touchdown the crew chief saw smoke coming from the battery relay in the left nose section of the aircraft. The relay was excessively hot. The overheated condition was caused by a combination of improper relay installation and frayed wiring. The starter relay was installed in the battery relay position.

The two relays are similar in appearance. The starter relay (P/N 24172-D1) is designed for intermittent duty. The battery relay (P/N 24171-D1) is intended for continuous duty. Substitution of one relay for the other is not recommended because of the difference in coil characteristics.

The resistance of the battery relay is such that, during the starting sequence, the battery voltage can drop to a point where the current is not sufficient to hold the relay. The relay will chatter, preventing proper current to the starter.

Checking the part number before installation will prevent substitution of one relay for the other. ■

Condition of repair and replacement parts

Usability of repair parts received from the supply system is of prime concern to TSARCOM. The importance of submitting QDRs and EIRs cannot be emphasized too strongly. When an item, large or small, is received and discovered to be defective, it should be reported on an EIR/QDR so that early and effective corrective measures can be taken. If not reported, other units (and perhaps the same customer) may continue to receive defective parts, TSARCOM may continue to procure the same type of defective materiel, and depot stock will not be purged. Most important, however, is that a safety factor may be involved and could result in loss of aircraft and/or life. Remember that both QDRs and EIRs are a direct line from the customer to responsible agencies to inform them of quality problems encountered by you, the user. ■

—from USATSARCOM Information Bulletin

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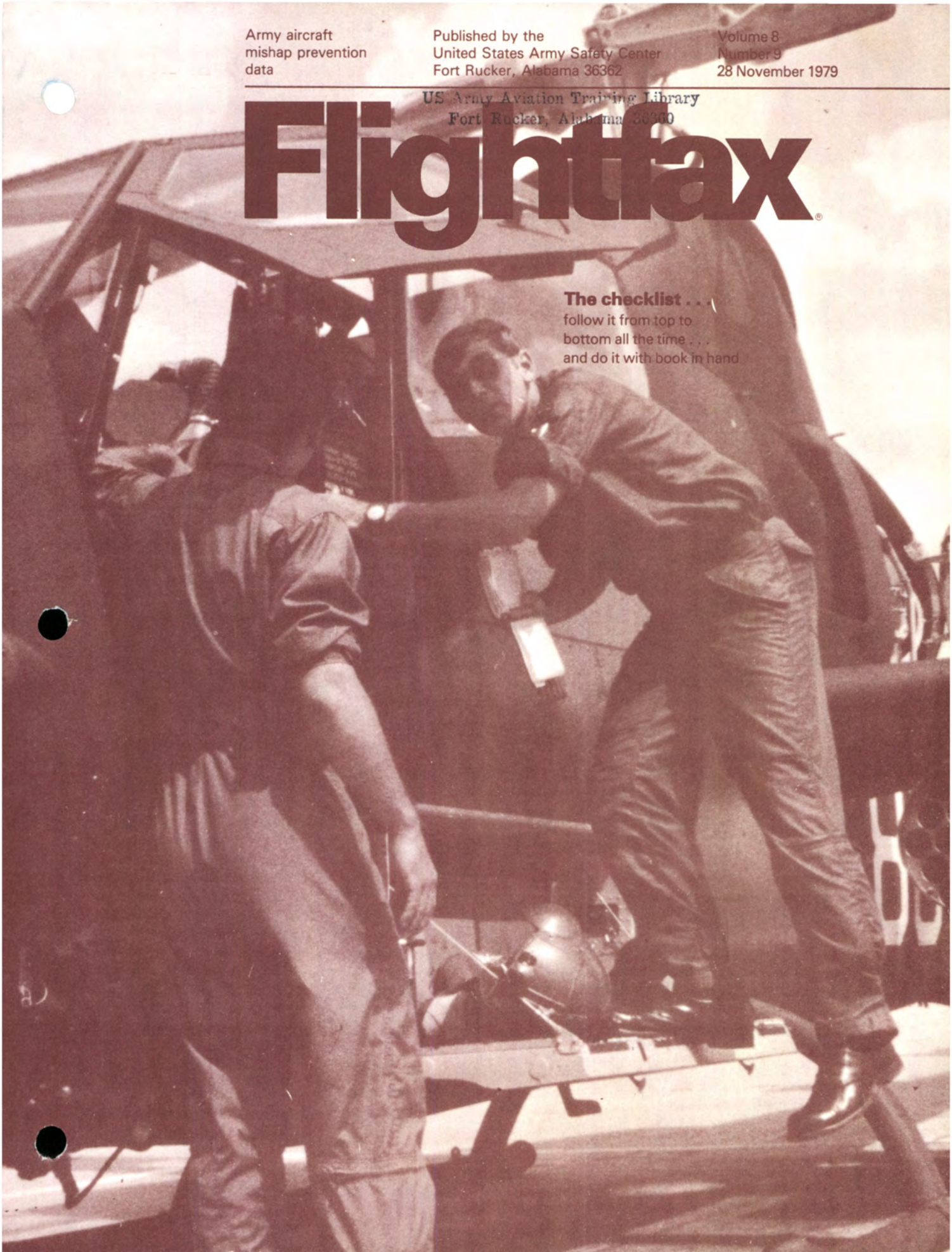
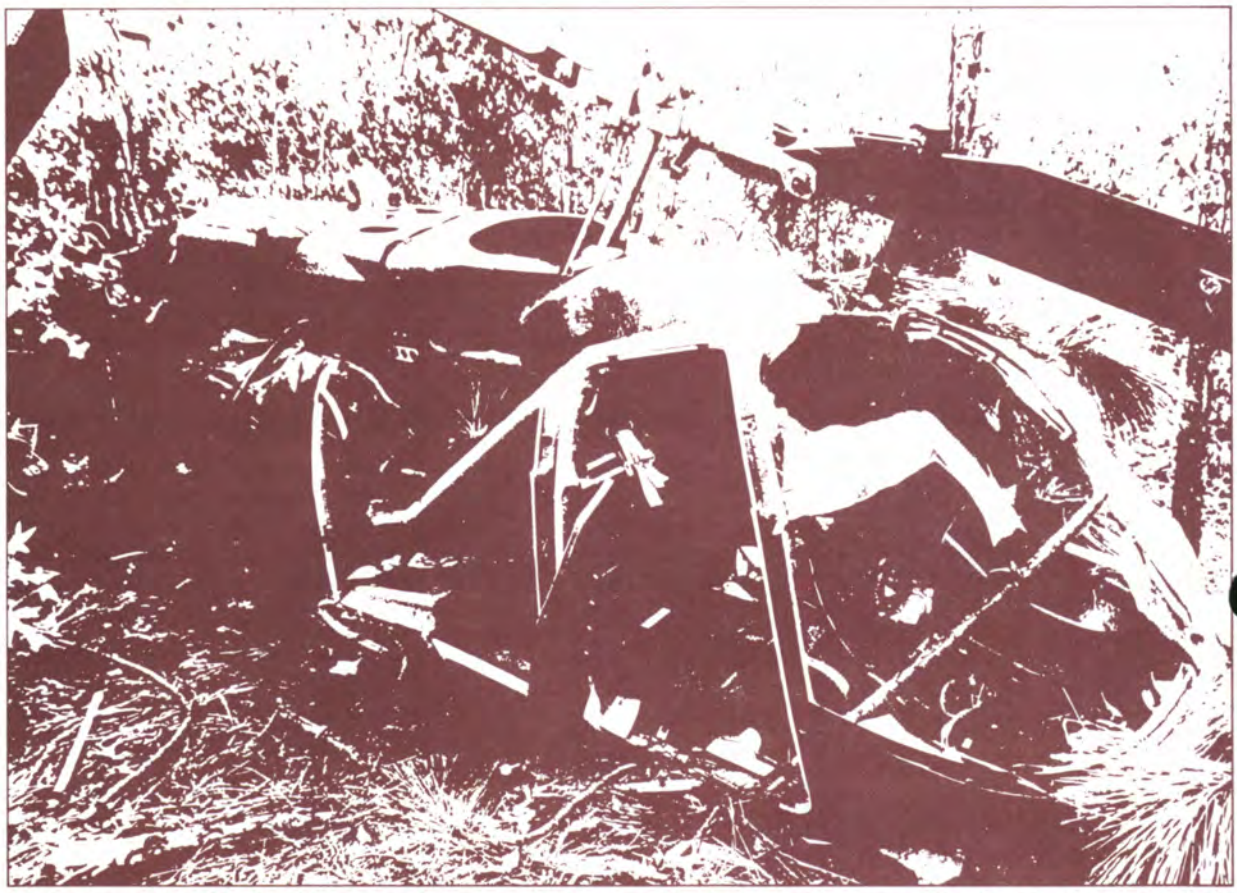


The checklist . . .
follow it from top to bottom all the time . . . and do it with book in hand

Check and double check



In a hurry to take off, pilot did not require removal of rear seat backrest cushion assembly. Cushion blew out of OH-58, which was flying with all doors removed, and hit tail rotor blades. Blades separated from tail rotor, aircraft crashed, and pilot was killed.

You are fooling nobody, including yourself, when you skip or do an inadequate job on a preflight check because of too much pressure, not enough time, fatigue, or a self-induced idea that the checklist isn't all that important in the first place. Mishap experience shows that some Army pilots obviously believe that checklists are not worth the time and patience they require in the face of some really important task which should have been finished yesterday at the very latest. Unfortunately, the checklist is one of the first things to go out the window when time and patience run short. In a depressing number of cases, when the checklist goes out the window so do the pilot and his crew, sooner or later.

Failure to make an adequate preflight or use the checklist correctly was listed as a cause factor in 484 mishaps for the period FY 77 through FY 79. Seven resulted in accidents and 42 in incidents, with 6 people killed and 10 injured. However, over different terrain and under different circumstances, these could easily have turned out to be major accidents.

More than once you have probably heard somebody say he has the checklist so thoroughly engraved on his mind he could recite it backwards and forwards. To be sure, if you stick around Army aviation for a while, you will become familiar with the checklist, maybe even thoroughly

familiar. So familiar, in fact, that you can become complacent and fall into that ho-hum attitude which can do you in. And that's when you overlook a checklist item at just the wrong moment. No use suddenly remembering it after you are aloft and your turbine starts giving off not-so-funny noises.

Carelessness, or complacency (and is there any difference, really?), concerning the checklist probably stems from the fact that relatively few checks, no matter how detailed and careful, turn up anything seriously wrong. So why bother when the odds are with you? Why go to your dentist twice a year?

Complacency isn't the only item on the list of potent checklist troublemakers. There are people who not only know everything they need to know but know it better than most. Operating on the usually sound theory that no matter how good something is it can be made better, people in the grip of this kind of self-hypnosis have been known to take pencil and shears to the prescribed checklist, performing drastic surgery. They will tell you proudly that their home-grown versions not only save time but get things done just as well.

Checklist was not followed, and right passenger seatbelt was left outside aircraft. Seatbelt banged against fuselage during entire flight, causing $5,000 damage.

Loose nut on accumulator end of air tube assembly resulting from improper torque caused power loss. Aircraft was landed on paved road, with major damage to cross tubes. Luckily, there was a landing area available.

The person who allows complacency or know-it-allness to lead him into procedures the book would never condone is asking for what he is sure to get.

Your aircraft is no better than the person who flies and maintains it and if it is being asked to perform with an oily rag lodged somewhere in its craw, something a thorough check would have turned up, it can't be blamed if it falls out of the sky.

Service personnel come blessed, or cursed, with the same lavish helping of human nature as other mortals, including pilots. They react the same way to fatigue, pressure, anxiety, extremes of discomfort, and dim-witted self-satisfaction. The best of them can and do make mistakes.

All top-flight mechanics know this. Like mature pilots they are keenly aware that their capabilities and experience have their limits and that they have to maintain a constant, all-points lookout against the creeping complacency and overconfidence which can turn them into zombies before they know what has hit them.

Like homemade preflight checklists, homemade maintenance procedures just won't do. Sticking to the book is the only answer.

Every unit commander has a responsibility to see that all personnel follow the checklist from top to bottom all the time! And the only way to do this is to do it with book in hand.

(continued on next page)

Check and double check

It is a matter of positive thinking. No mature, normally confident person who knows his job likes to have it dinned into him night and day that he must perform in a certain way and only that way. But we are all human. And accidents do keep on happening in which failure to follow the checklist is a factor.

How often have you heard (or said yourself when you were in a hurry to get back home): "The aircraft's okay. Let's give it a quick onceover." Or have been handed a "revised" checklist with the famous last words: "Never mind what they told you at school. We do things differently out here."

Do you **always** insist on an oral call-out when you are following the checklist? When a fuel line has been taken off and put back in place, do you **always** check for leaks around the connections? If you are interrupted during a check, do you take up where you left off, giving human nature a gap wide enough to drive a truck through, or do you start all over again?

All this is a matter of individual responsibility, particularly when the unit's aircraft are operating over a wide area out in the field. The safety officer and the unit commander share the common human inability to be in more than two or three places at the same instant. A large part of the time, aircraft crews and even mechanics are on their own to a considerable extent; and, in fact, indications are that most of them are doing a good job most of the time. But what we want is **all** of the people **all** of the time.

Check and double check. ■

Reuse of crash-damaged component causes accident

The cause of a recent CH-47 ground mishap was attributed to dephasing of the combining transmission. The transmission had earlier been installed in another CH-47 which was also involved in a phasing-related ground mishap. The first mishap was not caused by a failure of the combining transmission, but it did result in a broken bolt in the phasing lock handle of the transmission.

After the first mishap, the transmission was removed from the aircraft and sent to the overhaul facility through normal supply channels. This was appropriate except for one thing—the transmission was not identified on the historical record (DA Form 2408-16) or any of the accompanying paperwork (i.e., DD Form 1577-2) as being involved in an accident, and it was not coded as 717, accident damage, on DA Form 2410. The transmission was only 5 hours out of previous overhaul, so there appeared to be no reason to completely overhaul it. The overhaul facility, therefore, upgraded the transmission to a -8 in accordance with current work orders, completed a functional operational check, and sent it back to the field, where it was installed in the second aircraft. It was during the 30-minute ground run MOC for replacement of the combining transmission that the second mishap occurred.

Combining transmission removed from damaged aircraft was installed in this aircraft, where it dephased, causing main rotor blades to mesh.

TM 55-1500-328-25, page 4-6, par. 4-6(d), states the following: "Extreme caution must be exercised prior to reuse of a component which has been damaged in an accident, in fire, or in combat. Under no circumstances will components removed from damaged aircraft be reused on another aircraft prior to compliance with the mandatory provisions of AR 750-1 (par. 4-34)."

Paragraphs 4-34, 4-35, and 4-36 of AR 750-1 specifically outline the inspection criteria and identification of components removed from a crash-damaged aircraft.

It is also noteworthy that the aft transmission of the aircraft involved in the first mishap was later found in another aircraft. The transmission was removed before a mishap occurred.

POC at the Safety Center is SFC James J. Wheeler, AUTOVON 558-4202/4198, commercial 205-255-4202/4198. ■

Selected mishap briefs

uh1 **Precautionary landings** ☐ As aircraft was brought to hover, it started rolling left, followed by rapid roll to right. Mooring rope had been left tied to left rear of aircraft. Rope broke during takeoff to hover. ☐ Low rpm audio and warning light activated during flight. Caused by failure of rpm warning box. ☐ Engine oil pressure gauge indicated 110 psi in flight. Inspection revealed main inverter malfunction caused erratic power output and inaccurate reading on pressure gauge. ☐ Loud noise was heard during emergency governor operations at hover. Caused by failure of No. 1 and No. 2 engine bearing pack and seal. ☐ Torquemeter dropped to zero and remained at zero throughout landing. Caused by internal failure of torquemeter.

ah1 **Precautionary landings** ☐ SCAS roll and pitch channels began motoring during flight. Caused by electrical interference. ☐ Rumbling noise was heard in engine area for about 5 seconds. Power loss occurred and flames were seen coming from exhaust. Suspect compressor stall and partial failure of No. 3 and No.4 bearing packs. ☐ Master caution and aft fuel boost pump lights came on, causing interference in all radios. Inspection revealed moisture in main wire bundle cannon plug located under exhaust stack.

ch47 **Precautionary landings** ☐ Rotary pressure selector switch failed during flight, causing all five transmission pressures to peg to high side. ☐ Crew smelled smoke during hover. Caused by failure of No. 2 generator.

oh6 **Precautionary landing** ☐ Transmission oil pressure warning light came on. Caused by failure of pressure switch.

th55 **Precautionary landings** ☐ Main rotor would not engage during runup. Caused by failure of linear actuator. ☐ Oil leak was caused by malfunction of main rotor blade damper assembly. ☐ Fuel leak was noticed during shutdown. Caused by failure of fuel boost pump.

u21 **Incidents** ☐ (G series) While passing through 13,000 feet msl, aircraft was struck by lightning. Weather conditions were light rain, thin clouds, and no turbulence. Area 1 inch long and 1/16 inch deep on No. 1 propeller blade tip trailing edge was burned, and surrounding area was discolored. There was evidence of arcing on several rivets and screws. Left outboard flap panel was melted one-fourth inch deep and one-fourth inch wide on trailing edge. One-inch area was melted from left outboard elevator tip. **Lightning strike inspection procedures are contained in maintenance advisory messages U-21-79-01 and U-8-79-01.** ☐ (A series) Aircraft was turning around on sod runway. As left main gear rolled near edge marker, gear slipped into small drainage ditch. Elevation of ground on far side of ditch was high enough that propeller just caught the dirt. Propeller was damaged.

Precautionary landing ☐ (A series) On landing rollout, pilot placed power levers in beta and No. 1 secondary low pitch stop light came on. Pilot returned power levers to idle and tried to reset secondary low pitch stop light but was unsuccessful. Aircraft was taxied to ramp and shut down. Caused by broken wire rope stud terminal.

Mishap briefs

ov1 **Accident** ☐ (C series) Aircraft crashed during VFR training flight. Pilot was killed. Cause unknown pending investigation. 8010

Precautionary landing ☐ (C series) Right main gear indicated unsafe during approach. Pilot declared emergency and landed without incident. Caused by failure of landing gear down-lock switch.

Disorientation

Mishap briefs to help you recognize the conditions, operations, and cockpit activities that set the stage for disorientation accidents

☐ Pilot moved aircraft to edge of runway awaiting tower clearance for takeoff. When clearance was received, relatively inexperienced pilot (298 total rotary wing hours) made pretakeoff check, raised aircraft to hover, and moved toward runway. Rotor-raised dust caused visibility to go completely IMC, Ground witnesses stated that "only the rotor blades were visible." Pilot noticed the rpm drop and decided to set aircraft down. Pilot had difficulty maintaining heading (later determined to be due to a faulty governor). Aircraft, which was nose high, began slow drift to rear and to right, hit on uneven terrain, and rolled over on side.

☐ A flight of 10 aircraft inserting troops into field site received warning to expect dusty conditions. As the flight neared termination, rotor-raised dust began to engulf the entire flight. The No. 6 aircraft then moved left in an attempt to avoid dust as did several other aircraft. When visibility went completely IMC, pilot momentarily hovered aircraft at about 6 feet, then decided to try level setdown. Pilot misjudged attitude/rate of descent and aircraft landed hard, breaking off tail boom. All other aircraft landed without mishap.

Maintenance

oh58 **Precautionary landings**

☐ Mechanic raised tracking flag into main rotor blade path during ground run. Flag damaged main rotor tip cap. ☐ High frequency vibration in pedals and airframe was caused by out-of-balance tail rotor. ☐ Smoke was seen coming from battery vent during shutdown, and d.c. amp gauge read 60. Caused by voltage regulator set 1 to 2 volts too high.

uh1 **Precautionary landings** ☐ No. 1 hydraulic light came on during runup and pedals became stiff. Inspection revealed No. 1 reservoir was low. Leak occurred at collective accumulator B-nut.

☐ Loud noise was heard from battery compartment during start, and voltmeter read zero. Caused by improperly adjusted voltage regulator.

Messages received

• Maintenance advisory message concerning assembly screws bottoming on rollover vent valve assembly (UH-1-79-25, 072030Z Nov 79). Some manifold assemblies furnished in rollover vent valve kit have been manufactured with thinner mounting flanges than the original design. This has caused the assembly screws to bottom out on the rollover vent valve, causing dimples, cracks, and holes in the rollover vent valve cover. Inspection should be made to determine if the manifold mounting flange meets the specified thickness of .180 inch.

• Maintenance advisory message OH-58-79-13 (072045Z Nov 79) concerning main rotor grip assembly, P/N 206-101-102-9. Cracks have been found in five commercial main rotor blade grips in the 206 series. None have been reported on OH-58 aircraft to date. Corrosion from moisture trapped between the surfaces of the steel blade bolts and the aluminum grips is believed to be a significant factor contributing to the cracking. The message reminds maintenance personnel that the grip tangs and blade bolts are to be coated with corrosion preventive compound. Aircraft are not grounded nor is an immediate inspection required; however, a specific inspection to be made during the normal inspection period is outlined. Maintenance personnel should review the entire message for further clarification and details. ■

For more information on selected mishap briefs, call AUTOVON 558-3901/3913.

Standardization Communication | Directorate of Evaluation & Standardization USAAVNC, Fort Rucker, Alabama 36362 | STACOM 50 28 Nov 1979

Stacom

TC 1-20: Aeromedical Training for Flight Personnel

Are you familiar with the contents of TC 1-20, dated 18 January 1979? Did you know that this document establishes:

- Aeromedical training requirements for flight personnel that will enhance the accomplishment of the Army aviation mission, and
- Aeromedical training requirements that will assist in the conduct of aeromedical health and safety education of flight personnel.

An observation made during recent Flight Standardization Evaluation visits by DES indicates a lack of awareness of the contents of TC 1-20 on the part of aviation personnel. This was evidenced by weak responses to aeromedical factors questions during the oral portion of flight standardization evaluations (chapter 7, ATM). One reason for this deficiency is that aviation units may not be conducting periodic aeromedical refresher training. TC 1-20 states that unit training should be conducted at intervals of 3 years or less and that all aviation-related personnel should be included in the unit aeromedical training program. The goal is to provide aviators with knowledge to recognize the capabilities and limitations of the human body and to reduce the hazards associated with the aviation environment. TC 1-20 also states that certain records of training will be annotated following completion of prescribed training. (Refer to page VI, TC 1-20.) ■

DA Form 4507-R

The requirement for a copy of DA Form 4507-R/-1-R/-2-R to be submitted to DES upon completion of IP/SIP evaluation/training flight has been rescinded.

The rescission conflicts with paragraph 8-3, chapter 8, ATMs (2d draft). A published change to the ATMs is anticipated in the near future.

USAAVNC POC is Major Primm, P/O, DES (AUTOVON 558-3617/2501). ■

Questions and answers

Question: What has happened to the Level-Off Check in the new UH-1 Checklist (-CL), and what procedure do we follow now?

Answer: The UH-1D/H Level-Off Check was intentionally omitted from the new -10 and -CL; however, this should not be interpreted to mean that the items accomplished with the former Level-Off Check are no longer required. On the contrary, each of the checks—rpm/cruise power, control friction/force trim, attitude indicator/flight instruments, engine/transmission instruments, communications/navigation radios, and fuel consumption—must be continually performed throughout the flight. These checks are considered functions that the aviator would normally perform on a continuous basis and, therefore, do not require checklist prompting.

Question: The new UH-1D/H Operators Manual does not cover extended ground running operations or the necessity to maintain 5500 rpm. Was this requirement purposely deleted from the Operators Manual, or was it mistakenly omitted?

Answer: The requirement to maintain 5500 rpm for extended ground operations (exceeding 2 minutes) was purposely deleted from the new UH-1D/H Operators Manual, dated 18 May 1979. There is no requirement to maintain rpm above idle for extended ground operations. This change is in compliance with message 291531Z Aug 1978 from Commander, TSARCOM, and was published in STACOM #33, 18 October 1978. ■

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.

Still no ELT batteries

More on emergency locator transmitters

An article pertaining to the emergency locator transmitter (ELT) appeared in the "PEARL" section of the October 1979 AVIATION DIGEST. This article stated that, according to the Air Force Coordination Center, the ELT is still one of the most effective means of locating crashed aircraft, despite false alarms that are sometimes emitted. The Army Safety Center totally agrees with this statement and supports the need for ELTs; but we are still faced with a problem with the ELT batteries.

For instance, in February 1979, the Federal Aviation Administration (FAA) issued Airworthiness Directive (AD) 79-05-02 requiring the removal of lithium sulfer dioxide ($LiSO_2$) batteries and ELTs powered by these batteries from all U.S. registered civil aircraft. This AD was prompted by reports of battery failures resulting in explosions and violent venting of sulfur dioxide gas which could cause serious injury and/or loss of the aircraft.

As a follow-on, USATSARCOM issued a safety-of-flight message (DTG 281900Z March 79) requiring removal of ELTs with these types of batteries from Army aircraft. ELTs are commercial, nonstandard items without an NSN and are authorized in Army aircraft in Alaska and Panama. The only aircraft in which ELTs are installed and authorized worldwide is the C-12.

Although FAA issued a Technical Standard Order (TSO) for a commercial-type nonlithium battery for ELTs, a battery has not been manufactured or tested in accordance with the TSO specification. Therefore, FAA has extended Airworthiness Directive 79-05-02 to March 1980 and requires that all civilian aircraft be placarded with the following: "ELT inoperative due to batteries being removed."

At the present time, Army aircraft are flying without operational ELTs, which could mean the difference between survival and nonsurvival of aircrewmembers. Unfortunately, there has been no known progress in the development of a new battery for ELTs. In the meantime, you will have to depend on flares, the signal mirror, and the survival radio. ■

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