Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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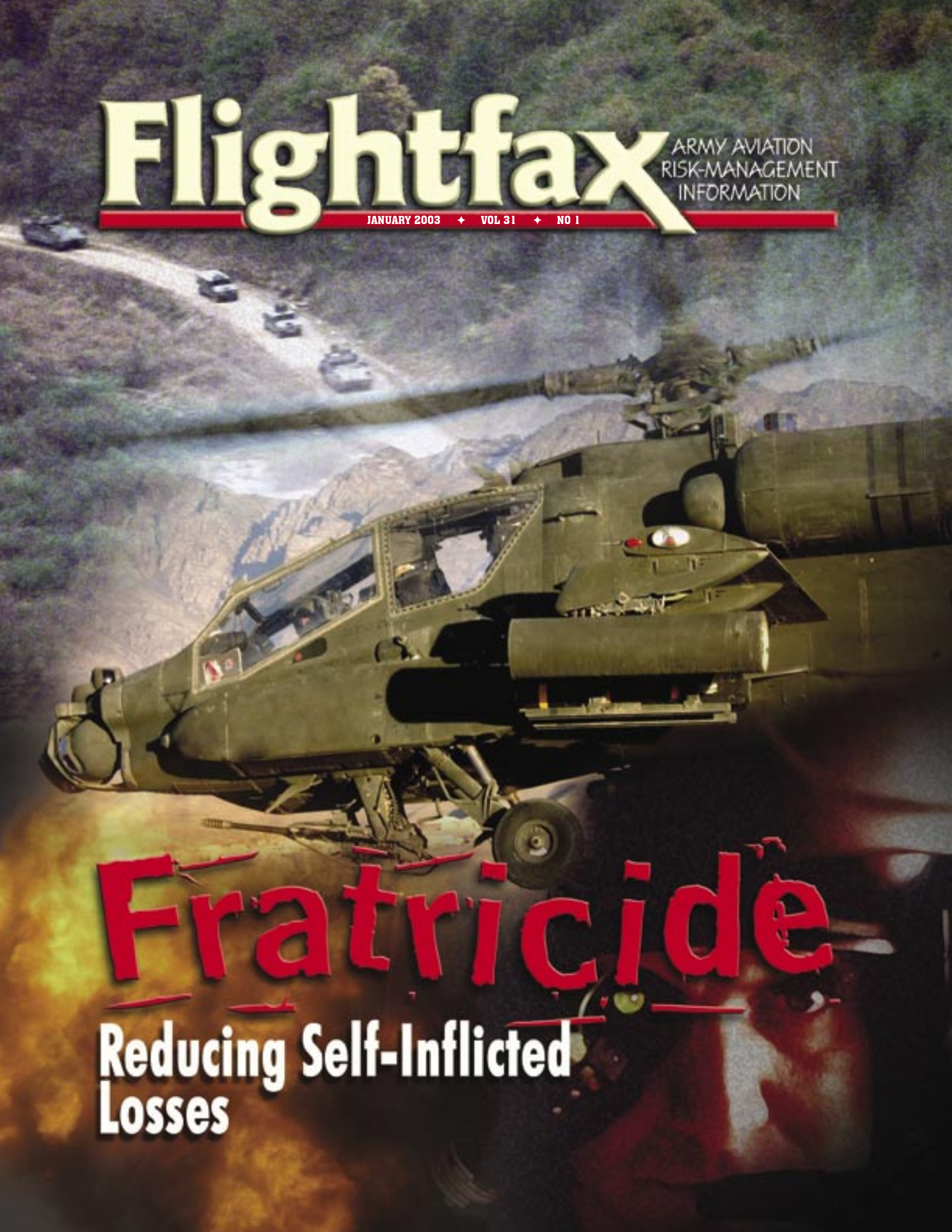

Fratricide

Reducing Self-Inflicted Losses

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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James E. Simmons
Brigadier General, US Army
Commanding

DASAF's CORNER

from the Director of Army Safety

Managing Risks Prevents Fratricide

Each time we extend into conflict, the number of accidents goes up both in the areas of operation and in the training bases preparing to support the operation. Statistics show that we lose more soldiers to accidents than to enemy action during conflicts. In every major conflict since the Korean War, we have suffered more casualties due to accidents than to enemy action. In addition to accidents, friendly fire incidents have claimed a significant number of lives as well.

In combat operations and intensified training conditions that nearly replicate combat conditions with large numbers of armored combat vehicles operating in congested areas, convoy operations at night and often limited visibility, aviation operations, and huge numbers of personnel on the ground, the "fog of war" can result and the stage is set for friendly fire incidents. In Operation Desert Shield/Desert Storm, we experienced 12 direct-fire, 1 indirect-fire, and 2 air-to-ground fratricides, and 77 percent of our combat vehicle losses were due to fratricide. Combat identification was the number one problem.

Since Desert Shield/Desert Storm, fratricide prevention has been a point of discussion for soldiers attending leader courses. It is also a subject of great concern at our training centers. However, technological solutions for fratricide prevention have not advanced significantly in the years since Desert Shield/Desert Storm. In fact, other than schoolhouse training and development of situational awareness tools, we actually have made no measurable improvement in our ability to prevent fratricide since Desert Shield/Desert Storm.

Recognizing the need to address this potential hazard and proactively define controls to reduce its risk before we engage in future conflicts, the Chief of Staff, Army, directed a fratricide avoidance risk assessment. Data and lessons learned collected from FORSCOM units and TRADOC institutions show that we remain at high risk for fratricide incidents.

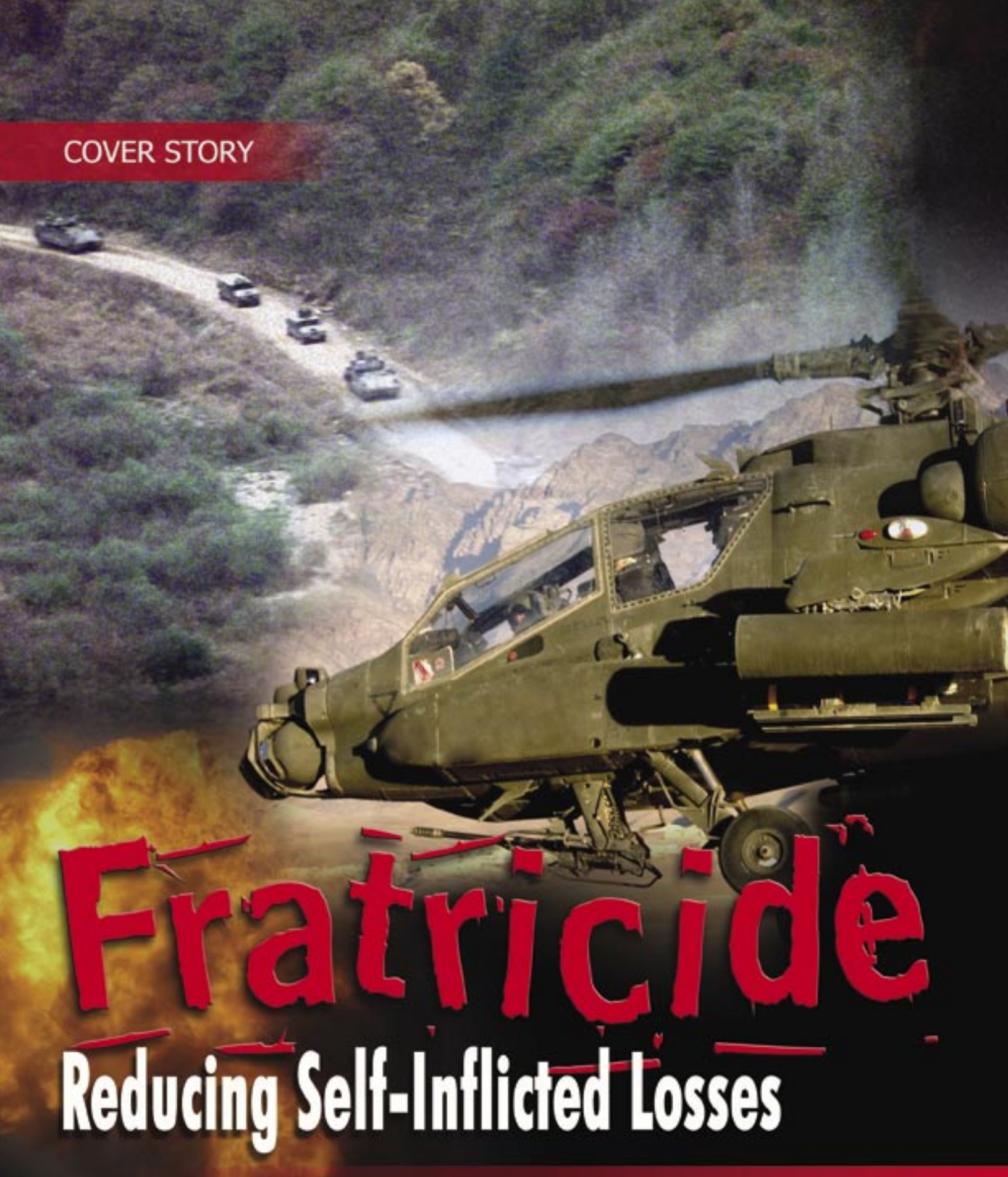
Reducing that risk requires continued education and training. Soldiers must learn to maintain situational awareness. Vehicles and individuals must be marked appropriately, and soldiers must be sufficiently trained to identify those markings. Other mitigation efforts include fielding combat identification panels or thermal identification panels on all vehicles at brigade and below. Soldiers must also master the use of global positioning systems and land navigation. We also can reduce this risk by developing a standard method for employing attack aviation in the close fight, by certifying our battalion commanders on the effects of weapons system and fire and control of direct and indirect fires.

The intent of conflict or war is to inflict harm on only those we intend to—the enemy—and not our own forces. The loss from accidents or fratricide of any of our assets greatly reduces our readiness. But when we lose soldiers due to friendly fire, this needless loss of combat power also results in a general degradation of cohesion and morale, which can cause us to lose the initiative and our aggressiveness during fire and maneuver operations. The impact can be so great that it leads to a hesitation to conduct limited visibility operations, loss of confidence in the unit's leadership, an increase in leader self-doubt, hesitation to use supporting combat systems, or even over-supervision of a unit.

As leaders charged with executing the many missions given to our Army while simultaneously protecting the men and women who so selflessly serve, it is incumbent upon us to address proactively common recurring hazards that accompany intensified training preparations and real-world missions. Fratricide is one hazard we must ensure our soldiers have been properly trained to prevent on the battlefield.

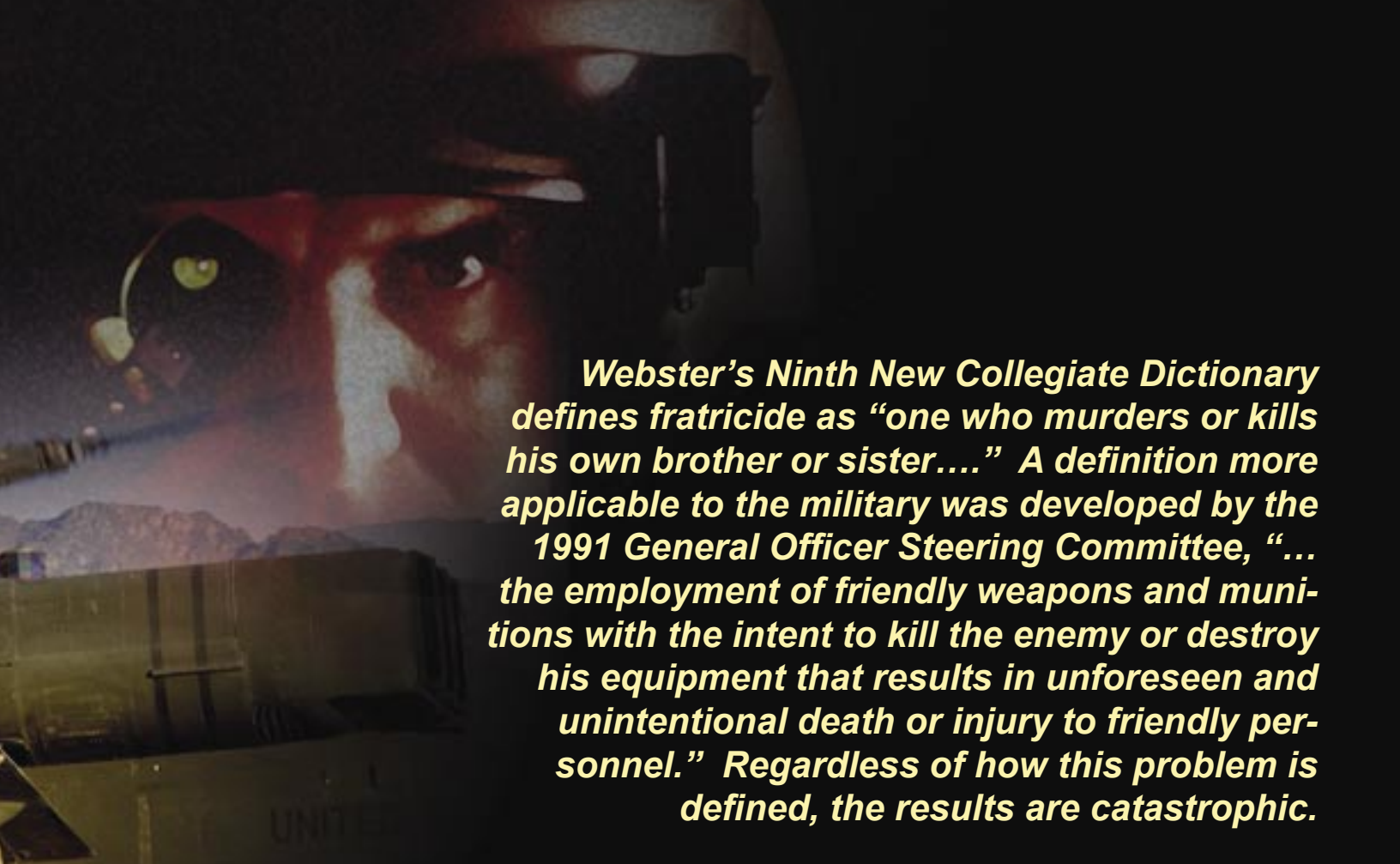
Train hard and play hard, but be safe!

BG James E. Simmons



Fratricide

Reducing Self-Inflicted Losses



Webster's Ninth New Collegiate Dictionary defines fratricide as "one who murders or kills his own brother or sister…." A definition more applicable to the military was developed by the 1991 General Officer Steering Committee, "… the employment of friendly weapons and munitions with the intent to kill the enemy or destroy his equipment that results in unforeseen and unintentional death or injury to friendly personnel." Regardless of how this problem is defined, the results are catastrophic.

Fratricide is not a new problem. As long as man has taken up arms as part of an organization, incidents of fratricide have been present. Occurrences of fratricide are evident in all organized human conflicts, from the ancient Greek and Roman armies through our current operations in Afghanistan. As weapons have become more efficient at killing the enemy, acts of fratricide have become more common.

An untimely friendly fire accident could have catastrophic results for an individual, unit, or even an Army. Some believe the untimely death of Stonewall Jackson at Chancellorsville during the American Civil War so disturbed General Lee that his judgment was affected at Gettysburg. It's impossible to say whether this incident turned the tide against the South in the Civil War, but the loss of such an able commander no doubt had a negative impact.

Accurately measuring fratricide rates is a difficult task. Since friendly fire accidents are unpalatable, they have gone underreported; thus, there is a lack of base data, with the exception of Desert Storm, to work with. The method of counting is also an issue. According to the U.S. Army War College Quarterly, *Parameters*, our Combat Training Centers (CTCs), National Training Center (NTC), Joint Readiness Training Center (JRTC), and the Combat Maneuver Training Center (CMTC) each use different methods of documenting fratricide rates. The table on page 6, extracted from the Spring 1995 edition of *Parameters*, shows historical fratricide rates.

Causes of friendly fire

Friendly fire accidents can be grouped into three main categories: human, environmental, and technological.

- **Human**. Human causes include a lack of training, situational awareness failures, lack of discipline, and combat stress. Training

failures include poor navigation skills, inability to proficiently operate assigned equipment, and combat vehicle identification failures to name a few.

Situational awareness must be built and maintained; it is not a given. It is built over time through education (knowing doctrine), training (practicing execution), planning, briefing, and rehearsals. Situational awareness is maintained through battle tracking and must be accomplished, as appropriate, from the individual gunner to the commander.

Disciplined execution means, among other things, making assigned times and checkpoints, accurate position reporting, and knowing and understanding the plan. Combat stress is caused by all those simple things that go wrong, piling up at once and resulting in bad decisions.

■ **Environmental**. When speaking of environmental causes of fratricide, you must expand the discussion beyond the obvious. It's easy to see how weather, darkness, terrain, and visual obscurants affect our ability to locate and identify friendly or enemy combat vehicles. How much time does one have to identify a target as it moves between buildings in a city? How do these factors affect our ability to navigate and position report? Fratricide prevention is not only the responsibility of the trigger pullers; soldiers must be where they are supposed to be when they are supposed to be there or report the difference. There is more than one example of vehicles getting lost and misreporting their position. During Desert Storm, 11 of the 13 fratricide incidents reported by the Army were attributed to environmental factors.

■ **Technology**. The Army has made great strides in the development of situational awareness tools to give the commander a digital picture of the battlefield. Aircraft have Identify Friend or Foe (IFF) systems on board and some ground vehicles are equipped with the Enhanced Position Location and Reporting System (EPLRS) radios; both are designed to identify the aircraft or vehicle as friendly. Our weapons' range and lethality has greatly outpaced our targeting sensors' ability to identify the targets we are killing. And finally, technology must be correctly maintained, operated, and used to be effective.

How do friendly fire accidents affect an

Conflict	Source of Data	Fratricide rate
World War I	Besecker Diary (Europe)	10% Wounded in Action (WIA)
World War II	Hopkins, New Georgia Burma Bougainville Study	14% Total Casualties 14% Total Casualties 12% WIA 16% Killed in Action (KIA)
Korea	25th Infantry Division	7% Casualties
Vietnam	WEDMET (autopsy) WEDMET (autopsy) WEDMET Hawkins	14% KIA (rifle) 11% KIA (fragments) 11% Casualties 14% Casualties
Just Cause	U.S. Department of Defense	5-12% WIA 13% KIA
Desert Storm	U.S. Department of Defense	15% WIA 24% KIA

organization? At the very least, both the victim and the organization responsible for the fire will experience morale problems. Depending on the nature of the incident, an organization may become paralyzed and hesitate to conduct limited visibility operations or to use combined arms or to maneuver, all of which will affect their effectiveness on the battlefield. Fratricide effects extend beyond the battlefield. U.S. casualty rates during recent conflicts have been so low that the public will not continue to accept a rate of fratricide that is higher than the rate of casualties produced by enemy action.

What can be done to reduce the risk of fratricide? The place to start is education and training. Education includes knowing the basic soldier skills of navigation, map reading, combat vehicle identification, proper operation of assigned equipment, and effects of their personal and crew served weapons. Soldiers must be trained and drilled in the skills taught above until they are second nature. We must also become familiar with the tactics, techniques, and procedures (TTPs) of other branches within the Army and other services or coalition partners.

Along with education and training, technological control measures such as IFF systems, combat identification panels (CIPs), and tactical identification panels (TIPs) can be used to identify friendly vehicles. Situational awareness tools such as the EPLRS radio and the Army battle command system (ABCS) assist commanders in battle tracking. All current technology based systems are tools and should not be trusted implicitly. Education, training, and technology are all things we should bring to the game.

Situational awareness, on the other hand, must be gained and maintained on the battlefield. Situational awareness is gained by the commander and staff through mission planning and preparation which includes the location and disposition of units they may come in contact with. The picture gained through the planning process is communicated to the unit through mission briefings and a clear commander's intent.

The rehearsal is where individuals within the unit back brief the commander with their understanding of the situation and their part of the mission. Planning, preparation, briefing, and rehearsing are the mechanisms through which a commander builds situational awareness within an organization.

Karl Von Clausewitz wrote of the friction of war stating that, "Everything is simple in war, but the simplest thing is difficult. These difficulties accumulate and produce a friction which no man can imagine…."

Maintaining situational awareness is the responsibility of the entire unit. Leaders must report their elements' positions and observations to maintain and continue to build these units' collective situational awareness. Situational awareness maintenance is like the homeowners' "To Do" list, never ending and ever expanding.

Finally, strict discipline must be maintained. The pace of current military operations does not allow for late position reporting or lost crews. Individuals and crews must be where they are supposed to be when they are supposed to be there, or report the difference. If they do not, they run the risk of being misidentified and targeted by friendly systems.

Karl Von Clausewitz wrote of the friction of war stating that, "Everything is simple in war, but the simplest thing is difficult. These difficulties accumulate and produce a friction which no man can imagine…." The causes of fratricide are components of Clausewitz's friction. He also wrote that this friction is countered by such means as training, planning, orders, and discipline. How effective an organization is at overcoming the friction of war and thus controlling the causes of fratricide are directly proportional to how well the commander applies those remedies described by Clausewitz. ■

—CW5 Larry Kulsrud, Aviation Systems and Accident Investigation Division, DSN 558-2534 (334-255-2534), larry.kulsrud@safetycenter.army.mil

Too Tired To Perform?

Happy New Year from the new Command Surgeon at the U.S. Army Safety Center. I hope to be a frequent contributor to *Flightfax*. I see my job primarily as one in which I might impact safety through prevention. You, the human, are the only weapon system that increases in value over time. But your value is predicated on your training, discipline, and ability to perform at the decisive time and place.

Illness and injury can adversely affect your combat readiness. The Army wants to positively impact the health of soldiers, but when it comes to your individual health, *you* have the flight controls. The health choices you make are "at pilot's discretion," and like an air traffic controller, we will keep you informed and up to date with medical PIREPS, but you must choose wisely in order to remain healthy and in the cockpit, on the hangar floor, or on the flightline, being all you can be!

Now that you are rested up from a nice Christmas break, I'd like to discuss a medical readiness issue that is epidemic in today's society: lack of sleep. Everywhere I go, I see people living lives at a frantic pace. Not only are they stressed trying to satisfy the myriad demands of work, home, professional and personal development, but many people are pathologically tired. This can be a killer! How many *Flightfax* readers have prided themselves in working a full duty day, then taking off and driving 9 hours to see that special someone, or ski (or fish or sail or hunt)? We "pull all-nighters" getting that last minute briefing or report out, then strut our ability to perform without sleeping as a badge of honor. Benjamin Franklin was right about a lot of things. Death and taxes are unavoidable, and so is sleep. Perhaps that is why he stressed the "early to bed, early to rise" recipe for a healthy and prosperous life.

We have all felt fatigued after a particularly arduous effort, but we do not always recognize the insidious onset of the dulling effect that sleep deprivation can have on our mental abilities. Fatigue can cause even "Pentium 4" caliber intellect to function at a "386" speed.

How many commanders and primary staff officers have you observed walking around like zombies on the third day of a field problem? By the time the second live-fire exercise begins, the entire TOC can be decremented 20 IQ points! This mental decline can be ruinous in the aviation environment, making for bad decisions in and out of the aircraft.

Sleep is unavoidable, and is as basic to survival as food and water. The loss of only two hours of sleep can adversely affect alertness and performance. While most soldiers are able to compensate for one night's acute sleep loss, going several days without adequate sleep causes one to accumulate a "sleep debt," which can be potentially catastrophic when the debtor comes calling.

Sleep deprivation affects an aviator's attention to detail and ability to respond to an emergency. How many of us depend on that little "adrenaline surge" we get after we doze off while driving? That boost is short-lived, and followed

by rebound drowsiness. Symptoms of sleep deprivation include poor judgment, impaired decision-making and memory, inappropriate reaction time, decreased concentration, visual fixation and worsened mood. Perhaps that grouch sitting next to you in the cockpit is actually sleep deprived, not a malcontent.

What do the following disasters all have in common? Three Mile Island. Chernobyl. Exxon Valdez. They all occurred during the night shift when operators were fatigued and vigilance was impaired.

Consider fratricide (see page 4) as well. An inordinate number of fratricide incidents occur at night when the decision-making abilities of both the shooter and the victim are decremented. Studies of brain activity and performance have repeatedly demonstrated that sleep deprivation not only impairs high-level, executive thinking, but that one-in-five shift workers doze off during the shift. Afterwards, many of them do not even realize they have done so. It is little wonder General Jackson was hit by sleep-deprived friendlies with excitable reaction times!

Research at the U.S. Army Aeromedical Research Lab has shown that aviators flying a UH-60 simulator doze off for up to three seconds before they realize they had done so. How much can happen in three seconds when you are traveling 120 knots at a "comfortable" 200 feet AGL?

Another recent study has equated acute sleep deprivation with the consumption of two beers. While two beers will not intoxicate the average aviator, performance is so universally impaired that it would be unthinkable to show up at the flight-line after downing two beers in the Lizard Lounge. Yet we routinely report to fly acutely fatigued.

So what is to be done about this epidemic lack of sleep? There is no free lunch. Your body needs 8 hours of sleep per night. Eight hours! Every night! This is an unfunded mandate, sound familiar? Watch less T.V. Accept the fact that you can't know everything. Does it really matter who Brad or Jennifer or J-Lo are dating? It isn't you! Go to bed.

Sleep is unavoidable, and is as basic to survival as food and water. Your body needs 8 hours of sleep per night. Eight hours! Every night!

Ideally you should wake up without an alarm, refreshed after 8 hours of cortical re-programming. If you go to bed early enough, you can train yourself to get up without an alarm; Ben Franklin did! Do not use alcohol to help you get to sleep. It will destroy your sleep architecture and interrupt your REM sleep. That's why you feel so terrible the morning after (well, it's one of the reasons).

Exercise more, but not late in the day, and avoid caffeine after dinner or even after lunch if you are sensitive to its effects. Avoid turning your bedroom into an office. Don't read or watch T.V. in bed, it ruins your sleep hygiene.

The bottom line is that you need to be as disciplined about sleep as you are about checking your E-mail and going to the gym. Your job requires you to be vigilant. You are not in college. Dozing-off in English Lit after staying up until 0200 is one thing; forgetting a tool, skipping a pre-flight step, or dozing-off in flight can be catastrophic. It is critical that you get the sleep you need. Others depend on you, and besides, if you don't take care of your body, where else are you going to live? ■

—LTC Joseph F. McKeon, MD, MPH, U.S. Army Safety Center Surgeon, DSN 558-2763 (334-255-2763), joseph.mckeon@safetycenter.army.mil

Editor's note: *In 1997, the U.S. Army Aeromedical Research Lab and the U.S. Army Safety Center jointly published the Leaders Guide to Crew Endurance. This classic publication is available online, and nicely articulates the problems with acute and chronic fatigue, sleep hygiene and circadian desynchronosis or maladaptation* ***(http://safety.army.mil/home.html)****. Future articles in Flightfax will discuss these and other sleep-related topics.*

Aircrew Coordination Training (ACT) Challenge

The two-man crew of the AH-64 was conducting a regimental Deep Attack. The pilot (PI), CW2 Smith, was a little nervous, having only 300 hours in this aircraft, but he was very aware that his instructor pilot (IP), CW3 Jones, had over 2,000 hours of flight time and was highly respected in the unit.

CW2 Smith was on the controls while they were en route. The IP asked the PI to make a radio call while he was busy using the TADS. The PI assumed the IP wanted to take the controls as the radio frequency was not pre-set. The PI released the controls and focused his attention on the radio, which left no one flying the aircraft. The aircraft descended into the trees at 90 KTS. The IP was fatally injured and the $12M aircraft was destroyed.

The results of the accident review board were conclusive. Crew coordination error, specifically on the part of the IP, was the direct cause of this accident. CW3 Jones lost situational awareness by assuming that the PI could continue to control the aircraft while attempting to change radio frequencies. But there was a deeper, more disturbing element present here as well. Assumptions not spoken can often result in failures.

Aircrew coordination training defined

The Army defines aircrew coordination as a set of principles, attitudes, procedures, and techniques that transforms individuals into an effective crew. The stated objective of aircrew coordination training (ACT) is to provide aircrews the knowledge, skills, and attitudes necessary to increase their mission effectiveness while decreasing errors that lead to accidents.

Aircrew coordination training

The Army initially implemented the ACT program in 1992. As a result of this program, Army aircrews learned behavioral skills and team coordination techniques that helped them to remain focused and ready to deal with emergencies and unforeseen problems. Therefore, they were able to better concentrate on mission objectives. Commanders and aircrews alike acknowledged the benefit of the mandatory, one-time training that was received by all aviators within the Army Aviation community.

Unfortunately, the initial program did not address sustainment issues and did not package the training in a program that would facilitate such training. Further, significant personnel turbulence associated with downsizing the force has resulted in a natural erosion of the safety gains initially realized as a result of ACT.

Regrettably, the atrophying of skills and experience levels that has occurred during successive years of limited Defense funding have now manifested themselves in a sharp increase in accident and incident rates.

Current issues

Lack of effective aircrew coordination continues to be cited as a contributing factor in flight accidents, and it is a factor limiting attainment of the full-mission effectiveness of Army Aviation. The Director of Army Safety reported in the December 1999 issue of *Flightfax* that FY99 produced Army Aviation's worst safety performance since Desert Shield/Desert Storm. FY02 was even worse than FY99. Currently, ACT is conducted in the classroom with no follow-on mandatory training periods in either aircraft simulators or in the aircraft.

Temporary measures such as awareness

videos, assistance visits, safety newsletter articles, and a web-based training support package have had limited success, but are ineffective substitutes for focused aircrew coordination training. A recent look at 18 months of Class A through C accidents clearly indicated some 45 percent of all mishaps had crew coordination errors.

Aircrew coordination training enhancement (ACTE) research

The Army Research Institute (ARI), through its Rotary-wing Aviation Research Unit located at Fort Rucker, Alabama, manages a program of applied research structured in three major phases: upgrade and sustain the existing ACT program, refresh and maintain the upgraded ACT program, and deploy advanced ACT applications.

ARI receives research assistance from the Aircrew Coordination Working Group (ACWG). The ACWG, formed in 1999, is composed of designated representatives from the U.S. Army Aviation Center and Fort Rucker, the U.S. Army Safety Center, and the Army National Guard. The ACWG provides subject matter experts (SMEs) who are knowledgeable and experienced in aircrew coordination training, standards and evaluation, safety and human factors, as well as uniquely qualified to review measures, methods, and training materials included in the prototype ACTE courses.

The objective of the ACT research effort is to improve the crew and team coordination effectiveness of Army aircrews in their day-to-day mission planning and flight operations. The enhanced ACT program builds on the original exportable training package, revitalizing it from a one-time training event and enhancing it to a dynamic, relevant program that is continuously updated and improved.

Establishing and maintaining a unit-level command climate that promotes the use of team coordination behaviors will realize this objective and place equal emphasis on technical and team coordination skills in daily flight operations. Instructor pilots and ACT facilitators in aviation units are key to the institutionalization of a successful ACT program.

A recent look at 18 months of Class A through C accidents clearly indicated some 45 percent of all mishaps had crew coordination errors.

What can you do?

While the research is being completed and programs are being developed, here's what Army aircrew members can do:

- Review the Crew Coordination section of your ATM.
- Analyze your own crew briefing, in-flight and post-mission procedures; do they cover crew coordination adequately?
- Review approved materials such as the crew coordination student handout you received in flight school or a copy of the Crew Coordination Exportable Training Package (ETP) available from your unit standardization officer.
- Do our unit SOPs and training plans cover ACT and are crew coordination issues relevant to our METL? How do we capture ACT-related incidents?
- Do we allow time for effective pre- and post-mission briefings?
- Do we ensure crews utilize the recording systems in the aircraft and simulator on all missions?
- When was the last time a crewmember in our unit failed an evaluation due to improper crew coordination?

The proper employment of aircrew coordination helps to mitigate errors, thereby reducing the potential for an accident. Research also indicates a 20-percent improvement in mission effectiveness in crews that utilize crew coordination. The only way that the two-man crew in the downed Apache is going to fly with the experience of a 2,300-hour crew (a 2,000-hour IP and a 300-hour PI) is through the use of *effective crew coordination*.

If you are interested in having your unit participate in future ACT-related research projects, contact Dr. Larry Katz at the Army Research Institute at katzl@rwaru.army.mil. ■

—Bob Giffin, USASC Systems Safety Manager and a member of the ACWG, DSN 558-3650 (334-255-3650), Robert.Giffin@safetycenter.army.mil

Refractive Surgery for Army Aviation

Will refractive surgery ever be allowed within Army Aviation? This is a question that researchers at the U.S. Army Aeromedical Research Laboratory (USAARL), Fort Rucker, Alabama, are busy trying to answer.

Each year, it seems that more and more refractive surgeries are being performed in the civilian world. Many people like the idea of not having to depend on spectacles or contact lenses to see 20/20 or better. Because of this trend, more applicants to flight school and current aviation personnel are considering refractive surgeries. USAARL is currently researching two procedures: laser in-situ keratomileuses (LASIK) and photorefractive keratectomy (PRK) for Army Aviation.

There are three populations of interest to the research of refractive surgery in the Army Aviation realm. The combination of these studies allows a broad, comprehensive look at how refractive surgery could impact Army Aviation.

Accession

Many flight school applicants have the potential to be excellent pilots, but are disqualified because their vision is outside of standards or because they have had refractive surgery. Flight school applicants can enter the "Evaluation of Refractive Surgery for Army Aviation" study. This study allows flight school hopefuls the chance to become candidates for flight school by granting exceptions to policy for post-PRK or post-LASIK applicants that meet study parameters. Vision must be the only flying duty medical examination (FDME) disqualifier in order for the application process to continue, and applying to this study does not guarantee a flight school slot. Applicants must still compete for a slot with other qualified applicants.

This is a four-year study that looks at the parameters of how refractive surgery might affect initial entry rotary wing (IERW) students. The study will include 100 LASIK, 100 PRK, and 100 Control subjects. They have to be between the ages of 18 to 35 and be at least 3 months post-operative. The subjects' surgical correction must not have been greater than six diopters of myopia correction, four diopters of hyperopia correction, and/or three diopters of astigmatism correction. Corrected visual acuity must be within Class 1W/1A FDME standards and the cornea must be free of haze. Other considerations, such as low contrast visual acuity, are thoroughly examined by researchers at USAARL before an exception to policy will be granted.

Upon graduation from flight school, the subjects' flight records are examined so a complete assessment of their performance can be made, as well as all of his vision health and acuity examinations.

Rated aviator

Active Army, rated and current, aviators are included in the two-year "Operational Assessment of Refractive Surgery for Rated Army Aviators: A Prospective Evaluation" study.

This study monitors the possible changes in vision and flight performance of rated aviators after refractive surgery. To qualify, one must be 22-50 years old, active duty (Title 10 or 32 USC), FAC 1 or 2 proficient, RL 1 or 2, NVG experienced, with a prescription greater than –0.75 diopters of near-sightedness or +2.00 diopters of far-sightedness. Qualified pilots visit USAARL for a preoperative exam and an initial flight in USAARL's JUH-60A aircraft and full motion UH-60 simulator. The subjects then travel to Walter

Reed Army Medical Center (WRAMC) for their refractive surgery procedure which is included as part of the study. They return to USAARL after one week post-surgery to be evaluated with vision exams and a flight in the simulator.

From this point, the subjects will only return to USAARL for a one-month, six-month and twelve-month post operative exams so more in-flight data and visual acuity data can be collected. All trips to USAARL are paid with normal temporary duty (TDY) procedures. The subjects are expected to return to their normal duty station flight duties within one to three months postoperative after being cleared by USAARL and a designated flight surgeon.

The response to the Rated Aviator study has been great, but one question seems to keep surfacing: *"Why are only UH-60 pilots being allowed to participate?"* The answer lies within the equipment being used to collect the in-flight data for the study. USAARL has possession of a JUH-60A that is fully equipped with an on-board computer system that monitors in-flight pilot performance data, such as drift from desired flight course. There is not another system available like this that can be utilized for the collection of real-time, in-flight data in any other aircraft platform at the present time.

It is expected that the results of this study will eventually be applicable across all platforms. The results will be provided to the Aeromedical community, Aviation Branch, and the U.S. Army Surgeon General for policy decisions.

CRSSP

Non-pilot aviation personnel can apply for the "Corneal Refractive Surgery Surveillance Program" (CRSSP). The CRSSP is looking at non-pilot aviation personnel and how refractive surgery may affect this area of Army Aviation. This program includes flight surgeons, flight medics, crew chiefs, air traffic controllers, and other crewmembers.

The CRSSP is governed by an Aeromedical Policy Letter (APL). Individuals who have had refractive surgery or wish to have surgery must follow the guidelines in the APL in order to qualify for a waiver. The best way to proceed is through the supporting flight surgeon's office. Six weeks after surgery, if visual acuity has stabilized and all other vision concerns meet FDME standards, the subject may receive a waiver to continue their normal flight duties. After receiving a waiver, a regular yearly FDME eye exam is completed at their normal duty station and USAARL is sent the results. This allows monitoring of any changes in performance and/or vision parameters that may occur post-operatively.

What's ahead?

USAARL hopes to have an answer to whether refractive surgery has a place in Army Aviation within the next few years. These three different protocols will give an accurate and thorough report on how safe refractive vision procedures are for the Army's unique flight conditions. Low-level rotary-wing flight introduces many things that can affect visual acuity such as dust and haze. Throw in decreased light levels such as in night flights or night vision goggle (NVG) flights, and a pilot and his crew have an array of visually demanding parameters that calls for healthy, consistent eyesight. This fuels the demand for accurate, field-tested data that answers the questions set forth by the aviation community concerning the value of refractive surgery. ■

—LTC Corina van de Pol, USAARL, 334-255-6876 or Jon "Bo" Sawyer, USAARL, 334-255-6980, www.usaarl.army.mil.

If you would like more information on these programs, contact the USAARL Refractive Surgery Study Team at 334-255-6875/6809/6810

WAR Stories

Risk management lessons learned

Engine Flameout – 45 Seconds to Initial Impact

We were scheduled for a 2-hour data collection flight in the TH-6B, a half-hour longer than the typical syllabus sortie at the U.S. Navy Test Pilot School, but still comfortably within the endurance of the aircraft. During the flight brief, a bingo fuel of 100 pounds was established to ensure the aircraft was back on deck by the SOP minimum of 50 pounds.

During preflight checks, we noted a full indication on the fuel quantity using battery power. Due to the longer nature of our flight, we continually monitored the fuel indicator, reassured by a fuel level consistent with the mission profile. However, as the fuel level dropped below 200 pounds, the quantity indicator began to fluctuate ±20 pounds during flight maneuvers. A sensitive instrumentation fuel gauge was also installed in the aircraft that indicated gallons-used. As a backup to the ship's gauge, we calculated a bingo of 42 gallons used (100 pounds remaining) and decided to head back at the first indication of bingo.

At 1.8 hours into the flight, we turned back to base with 150 pounds remaining on the ship's gauge and 39.2 gallons used on the sensitive gauge. As I initiated an 80 KIAS descent from 2,000 feet AGL, the engine suddenly began to spool down. Surprised by the engine out audio warning, we both immediately checked the throttle position to ensure it was full open.

We sat dumbfounded for what seemed an eternity in denial of the fact that the engine had just quit on us. The PC called "Rotor RPM decreasing" as the needle swung to the low end of the green arc. I finally realized the engine failure, lowered the collective, and initiated an autorotation. After lowering the collective, the rotor RPM climbed to 104 percent.

The PC called "High rotor speed," and confirmed I set a collective correction. The collective setting was maintained throughout the descent until the flare. The whine of the transmission helped us monitor rotor RPM while keeping our scan outside the aircraft.

As we attempted to determine why the engine stopped, we checked the fuel gauge and noticed it was still indicating 150 pounds remaining. We considered an engine restart, but decided there wasn't enough time and focused on finding a landing site. I recall thinking, "I can't believe how fast we're descending."

After checking the throttle, the PC immediately made a MAYDAY call, and then selected the transponder to emergency and locked our shoulder harnesses. I quickly began to evaluate the surrounding fields for a suitable landing site. I considered four fields in the

short descent and initially chose a large open farmer's field with fairly level terrain. I started a turn towards that field then realized the aircraft would impact a group of trees just short of the field. I could remember thinking, "We're going to hit the trees and die if I try to make that field."

The PC considered an S-turn or 360 to use some energy to remain within the field to his left as I turned to another field. I was finally committed to a field being developed for a housing area that had construction equipment, dirt roads, and drainage ditches.

I wasn't sure of the ground conditions, so I elected to make a zero ground speed touchdown autorotation. The only clear path seemed to be along the right side of the field next to a busy road. I wasn't sure how much distance down the field it would take to bleed off airspeed and the remaining altitude during the flare, but we were now committed to that flight path.

I glanced at the far end of the field and the group of trees thinking, "I hope we don't use the whole field trying to stop." As we crossed the edge of the field, I initiated a progressive flare, reducing airspeed and the high descent rate. By now, I was totally focused outside the aircraft looking at the intended landing area. As the rotor speed increased, the PC announced "High Nr" and I adjusted the collective to arrest the rapidly increasing rotor speed.

Approximately half-way across the field as airspeed slowed to zero and altitude closed to about 5 to 10 feet AGL, I leveled the aircraft and pulled all remaining collective until it hit the upper stop. What a sinking feeling it was to now realize we were along for the ride and could no longer influence the outcome of our little event.

As the knee-high weeds below the aircraft parted under what was left of the rotor wash, I thought to myself, "This is going to hurt." We fell about 3 to 7 feet, bounced up once, and landed about a foot over to the right from the original touchdown point.

As the aircraft hit the ground, the PC and I could feel the jolt of the impact go up our spine. I sat there for a few seconds after touchdown watching the rotor blades turn slowly, still holding the collective in the full-up position, thankful to be alive.

I looked over at the PC for the first time since the whole event started and noticed he seemed to be just fine. The PC completed the emergency engine shutdown procedures and continued to talk to a sister ship circling overhead, letting them know we were down safe. It was a weird sensation standing outside the aircraft; our skin was tingling and we were still in denial of the whole event. Faces of concern soon turned to smiles and high fives. We had lived through it!

A few minutes later, I turned the aircraft battery on again and checked the fuel. It now read zero and the low-level fuel light was illuminated. We later learned that a faulty fuel level sensing unit and associated wiring was causing erroneous fuel indications that resulted in the aircraft not being fully fueled at start-up. The fuel system design is such that the low fuel light is also driven by the same fuel sensing unit.

It took the teamwork of two pilots to do exactly what was supposed to be done and what they had been trained to do. Although we never expected something like this would happen to us (you always think it only happens to the other guy), we had just lived through it.

Lessons Learned

■ Although no one flies around continuously evaluating fields for emergency landings, you can improve your chances of survival by flying as much as possible over suitable landing areas. On that day, we were doing our testing in an area noted for its many fields. A few miles further and we would have been in a heavily wooded area with most probably a totally different outcome.

■ Practice autorotations at various airspeeds with turns to final. You just might need to use that max glide airspeed and do some turning to reach a field. The descent rates can be significantly higher than practice autorotations while the engines are still coupled to the rotor system.

■ You will probably spend a few seconds in denial trying to figure out what just happened.

■ The biggest help during the emergency was the copilot taking care of the radio calls, shoulder harnesses, transponder, and *calling out instrument indications* (rotor speed) so that I could focus outside the aircraft and concentrate on finding a suitable landing area and executing the autorotation.

■ During the flight briefing, think through the emergency plans, as well as talk about immediate actions and division of cockpit duties.

■ Landing along a road provided quick access to a phone, police, and HELP. ■

Editor's note: *Special thanks go to these two pilots who endured this accident. These men deserve a lot of credit and praise for their heroic airmanship that day. The pilots in this story are CW3 Gregg Deetman, U.S. Army (deetmanga@navair.navy.mil) and LT John Schultz, U.S. Navy (schultzjp@navair.navy.mil). They are both attached to the U.S. Navy Test Pilot School at Patuxent River, Maryland.*

Let's share... In Army Aviation, we can't afford to learn every lesson firsthand. We must learn from each others' experience whenever we can and share what we know with each other. Send your war stories and other lessons learned to flightfax@safetycenter.army.mil or call Ms. Paula Allman at DSN 558-9855 (334-255-9855).

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class D:** While in refuel and at 100%, aircrew heard loud grinding noise from the transmission area and refuel personnel noticed smoke coming from the transmission compartment. Pilot-in-command (PC) directed copilot to egress aircraft while PC performed emergency shutdown. Investigation of auxiliary power unit (APU) and transmission revealed that a small fire had occurred in the APU compartment and around the power-take-off clutch area.

D Model

■ **Class A:** Crew was conducting night gunnery familiarization training. Crew reported inbound to tower that they were returning to the FARP to download ammo. Aircraft crashed en route, fatally injuring the crew and destroying the aircraft. Investigation is ongoing.

■ **Class B:** Crew was on an approved low level multi-ship screening mission. The acft struck a small set of wires that were not marked on the map causing damage to one main rotor blade, two broken antennas, as well as damage to the ALQ144 and possible arcing on one wing.

CH-47

D Model

■ **Class E:** During cruise flight at 200 feet AGL (6,500 MSL), a loud whine was heard. The pilot on the controls initiated a decent. Seconds later, the #1 FLT HYD caution light illuminated. The aircraft landed with no further incident.

■ **Class E:** During cruise flight, the #1 & #2 beep trim switches became inoperable. Acft landed and was shutdown without further incident. Replaced N2 actuators.

■ **Class E:** During cruise flight at 600 feet AGL and 140 knots on a maintenance test flight, aircraft struck a bird. A small dent was found on post-flight inspection. No other damage to the aircraft was noted.

MH-60

L Model

■ **Class C:** Two main rotor blades contacted a small pine tree during confined area operations. Sudden stoppage inspection ongoing.

OH-58

C Model

■ **Class C (Aircraft Ground):** During the first start of the day, the student pilot depressed the starter and opened the throttle to flight idle at the appropriate N1 speed. As TOT approached 600-700 degrees, the IP heard an unusual sound coming from the engine area and instructed the student pilot to abort the start. During the aborted start procedures, the TOT reached 1,000 degrees. The aircraft was shutdown without further incident.

■ **Class D:** Suspected overtorque up to 110% for two seconds during GCA climbout. Aircraft immediately landed on airfield and flight terminated.

■ **Class E:** During hover, excessive play in collective controls. Acft was shutdown without further incident. Replaced tachometer generator.

DR Model

■ **Class C:** Student was receiving training on Manual FADEC operations. With the student on the controls, they switched to manual control on downwind. The RPM stabilized and then rose to 105-106%. The IP reduced throttle, the aircraft began to vibrate, and the engine oversped to 120%, at which point the IP entered autorotation. The aircraft landed hard upslope in soft terrain, rocked forward and back on the skids, with no ground slide. Skids were spread, right chin bubble broken, two antennas broken, and one main rotor blade had repairable damage.

TH-67

A Model

■ **Class D:** During the termination phase of a standard autoroatation, the aircraft touched down unlevel with excessive aft cyclic. This resulted in low rotor RPM and loud knocks were heard in the rear of the aircraft. The aircraft was shutdown and inspected by maintenance. Maintenance discovered evidence of spike knock and repaired aircraft.

UH-60

A Model

■ **Class A:** During NVG continuity and RL progression training, the acft struck the side of a mountain, fatally injuring all five crewmembers. Acft was discovered during SAR efforts after having been reported overdue. Investigation is ongoing.

■ **Class B:** During confined area operations in a whiteout condition, the crew experienced a tree strike, resulting in damage to the acft main rotor blades.

Note: For more information on selected accident briefs, call DSN 558-9552 (334-255-9552). Information published in this section is based on preliminary mishap reports submitted by units and is subject to change.

NCO CORNER

One Moment Can Affect a Lifetime

As we begin a new year, it is only fitting that we pause for a moment to reflect on the 198 soldiers that were killed in accidents over the last 12 months. One hundred ninety-eight of our people are gone forever. Our soldiers are our most precious resource; we can and must do better. We can't afford not to.

We owe it to our soldiers and we owe it to the people of this great Nation that we are sworn to protect. Our citizens send us their sons and daughters in good faith, confident that we will train them and protect them to the best of our ability. How can we justify losing even one of our soldiers to a needless accident that could have been prevented? How can we explain that loss to a grieving parent, a young widow, or to a child that can't understand why their mother or father isn't coming home?

While it may seem strange, good intentions are a common factor in Army accidents. Accidents are not caused by evil people; they are caused by people just like us that are merely trying to accomplish their daily tasks, on and off duty. Frequently they are doing things that many of us also have done before—we were just lucky enough to get away with it. The fatigued soldier speeding to get home over a long weekend; the motivated troop trying to "make it happen" in the face of inadequate time, training, or information; the operator or mechanic taking the maintenance shortcut that "never caused a problem before." These are just some of the examples that have led to disaster for our soldiers. These were great people trying to do great things but failing to properly identify, assess, and control the hazards, whether through inattention, overconfidence, indiscipline, or a simple lack of knowledge.

One thing that always has distinguished our Army from that of other nations is our ability to take initiative and make things happen. In the absence of proper supervision and effective training, this positive trait can actually work against us in the accident prevention arena. Do not discourage initiative; it is a vital part of what gives us the ability to fight and win wars. Encourage initiative and ensure we have provided our soldiers with the tools required to accomplish their tasks properly and safely.

Soldiers are adults with adult responsibilities and a serious mission. Let them stand on their own two feet, give them responsibility that is commensurate with their rank and maturity, but never relax your guard. That young soldier is squared away and has the best of intentions, but he or she does not have the experience you have.

Increase their responsibilities as they grow, but continue to provide leadership and mentorship so they can rise to your level of expertise and continue the tradition by leading and mentoring their own soldiers. Gaining experience is a continual process. Some lessons come easy and others are painful. We learn and grow by trying new things and often by making mistakes. Let your soldiers learn from the mistakes you may have made and the lessons you have learned so they do not have to relearn the things that we already have discovered the hard way.

The profession of arms is inherently dangerous and will never be truly safe. We must continue to conduct hard, realistic training. The old adage still rings true: "Better to sweat in peace than bleed in war." We must effectively manage risks by ensuring that the benefits to be gained outweigh the risks, controls are in place to reduce or eliminate

the risks, and that decisions are made at the appropriate level.

Build positive habits on duty that your soldiers will transfer to off-duty activities. Never miss an opportunity to emphasize safety or make an on-the-spot correction. Supervise and enforce the standards in all tasks. Mission accomplishment and welfare of the troops are simultaneous tasks that are interdependent upon each other. One moment can affect a lifetime. Talk to your soldiers and make them believe it. You may just save a life. ■

POC: MSG Sean O'Brian, Risk Management Integration Division, DSN 558-2845 (334-255-2845), sean.obrian@safetycenter.army.mil

NEWS & notes

Storage of Pilot Equipment

In their 10-11 December 2002 meeting, the Kiowa Warrior System Safety Working Group (SSWG) discussed an open hazard on the improper storage of pilot equipment. They made note of a recent Class E mishap in which there was an in-flight DC generator failure due to a ground wire being detached by items placed in that area of the avionics section. Improper storage of pilot equipment can also cause wire chaffing and fire.

Crews are reminded that the Operator's Manual contains cautions stating that "Cargo shall not be placed in avionics compartment" and "To prevent damage to electrical components, all equipment placed in aft electrical compartment shall be clear of electrical components and properly secured." ■

—Mr. Ron Boyce, SAIC, SFAE-AV-AS-ASH-T, DSN 645-9702 (256-955-9702), ron.boyce@redstone.army.mil

YAW KICK

In their 10-11 December 2002 meeting, the Kiowa Warrior System Safety Working Group (SSWG) opened a hazard on "yaw kick." During introduction of CDS4, there have been incidents of "yaw kick" on the ground, in which the aircraft yawed during engine shutdown/deceleration. The rapid deployment gear, because of its smaller footprint, is particularly susceptible.

In the follow-on investigation, the condition could be reproduced to a lesser degree on CDS3 aircraft. In either case, pedal positioning minimizes yaw kick during throttle reductions. The phenomenon has been attributed to an interaction between SCAS and the FADEC deceleration schedule; a fix is forthcoming in CDS4 Phase IIB, next August.

In the interim, Operator's Manual urgent change 4, 29 November 2002, cautions that "With YAW SCAS engaged during ground run operations, the potential for an uncommanded LEFT YAW exists during throttle reductions. YAW SCAS must be OFF for all throttle reductions." Also, as units receive CDS4, they are being briefed on the potential hazard. ■

—Mr. Ron Boyce, SAIC, SFAE-AV-AS-ASH-T, DSN 645-9702 (256-955-9702), ron.boyce@redstone.army.mil

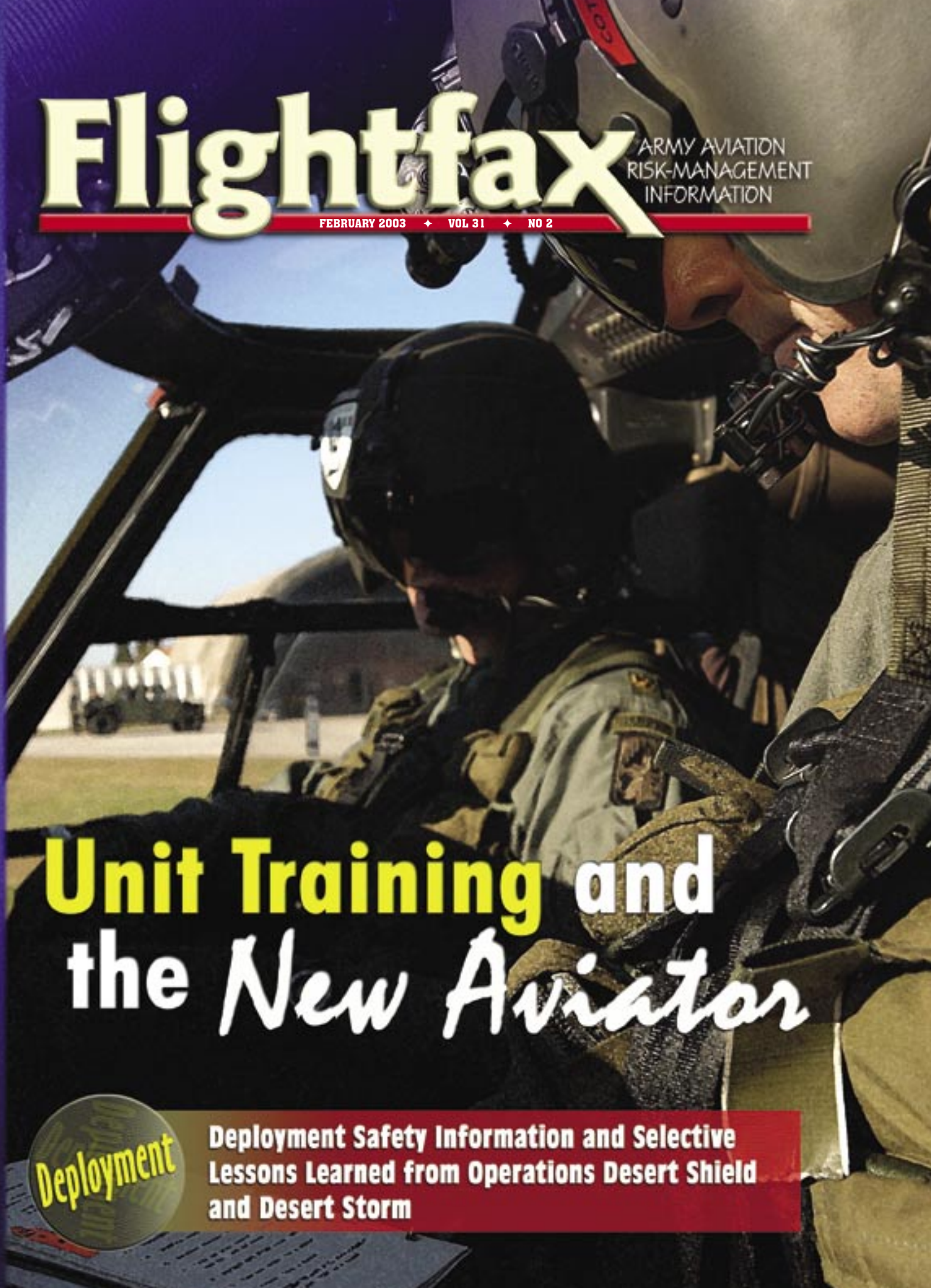
We should all bear one thing in mind when we talk about a troop who 'rode one in.'

He called upon the sum of all his knowledge and made a judgment. He believed in it so strongly that he knowingly bet his life on it.

That he was mistaken in his judgment is a tragedy, not stupidity.

Every supervisor and contemporary who ever spoke to him had an opportunity to influence his judgment, so a little bit of all of us goes in with every troop we lose.

Author Unknown



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ARMY AVIATION RISK-MANAGEMENT INFORMATION

FEBRUARY 2003 ✦ VOL 31 ✦ NO 2

Unit Training and the *New Aviator*

Deployment

Deployment Safety Information and Selective Lessons Learned from Operations Desert Shield and Desert Storm

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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James E. Simmons
Brigadier General, US Army
Commanding

DASAF's CORNER

from the Director of Army Safety

Leading Is Not Always Easy, but Profoundly Rewarding

Conditions and situations that can tax even the most seasoned leader's skills abound in our Army today: uncertain world situations, multiple training and real-world missions and tasks, transformation of unit formations, testing and fielding of new weapons systems, back-to-back deployments to training centers and theaters of operation. In the midst of all these changes and uncertainties, leadership still encompasses the awesome responsibility of ensuring the combat readiness of our units and the safety of our soldiers.

Safe operations are dependent upon effective command and control. Leaders are multi-tasked with numerous administrative and command responsibilities associated with running a unit and finding time to be present with their units during training to help them understand where we are at risk. Whether it is a training mission or a real-world combat mission, leaders can make a huge difference in their unit's safety performance by actively being involved in the planning, preparation, and execution of the mission.

Despite the inherent challenges of tough, realistic training and the adverse conditions encountered on the battlefield, we can keep accidental losses to a minimum. We can train hard and we can execute combat missions safely if we successfully integrate risk management into planning and preparations. As officers, NCOs and soldiers, we can excel in safety performance and mission accomplishment by aggressively managing risks and executing missions to established standards.

Good training produces tough, disciplined, and highly motivated soldiers. When given a mission, soldiers will accomplish it. But we must ensure that our soldiers are disciplined to execute that mission to an established standard. Any shortcut, lapse in discipline (individually or collectively within the unit), or a failure to execute to standard is stepping on the fast track to an accident and a price much higher than we are willing to pay. If we mold disciplined soldiers, they will accept responsibility for their own safety, the safety of others, and the protection of valuable Army equipment. Being a leader who is a stickler for maintaining discipline on even seemingly minor issues may not make you popular within the unit today, but what soldiers really want is consistent leadership.

Sometimes, despite our best efforts to safeguard our soldiers, breakdowns in managing risks do happen and we lose soldiers in combat and in costly accidents. At the end of the first quarter of FY03 we had 16 Class A on-duty accidents with 15 fatalities, compared to 8 in FY02 and 9 fatalities. On a more positive note, our off-duty Class A accidents and fatalities were down: 24 Class A accidents versus 29 for first quarter FY02 and 24 fatalities versus 33. Of those 24 fatalities, 21 resulted from POV accidents.

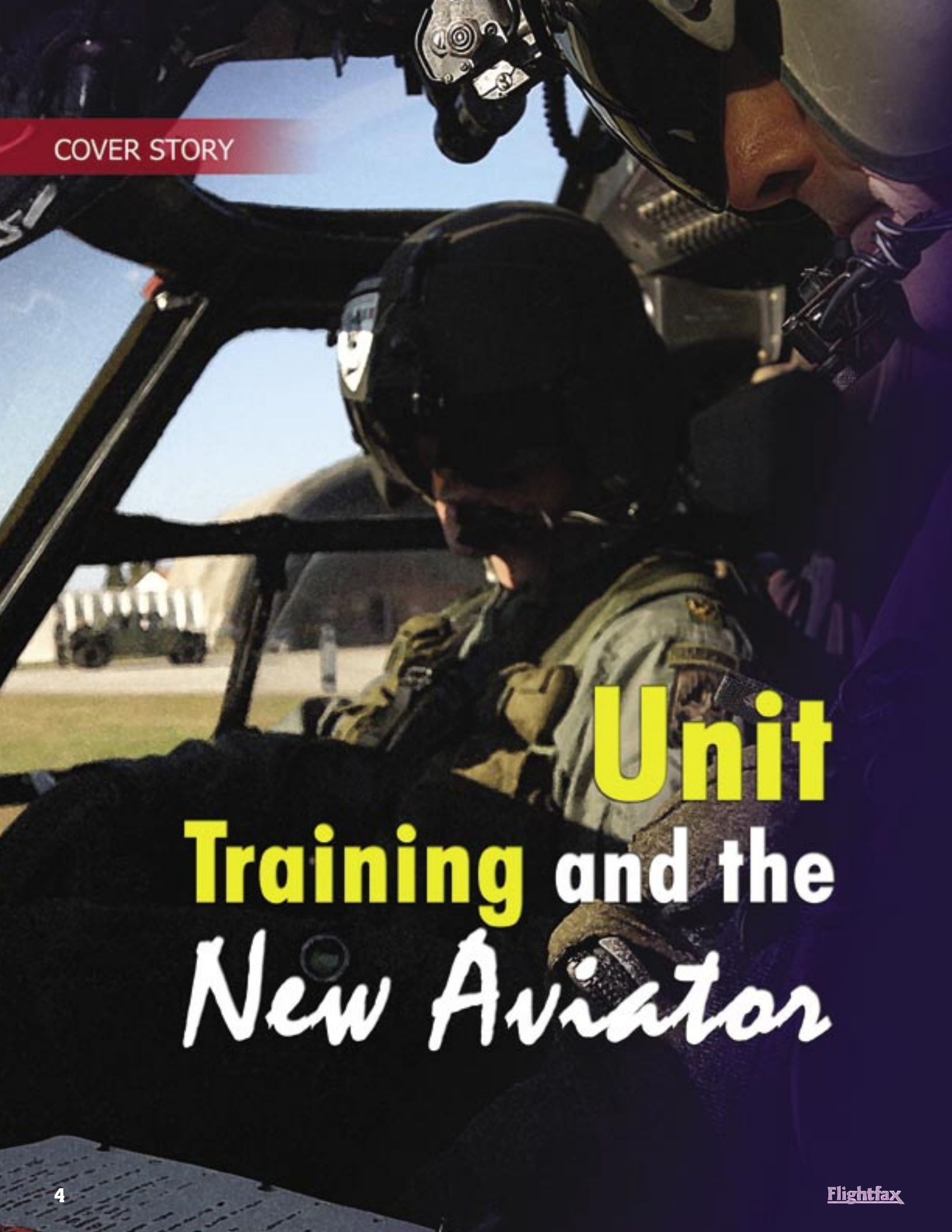
With every fatality—accidental or combat loss—comes the hardest part of being a leader: helping the victim's family and the unit deal with the loss. Leading is not all about supervising the loading of trains and airplanes; it includes dealing with the sad realities of combat losses and losing soldiers to accidents that should have been prevented.

Effectively leading soldiers and managing risks appropriately make it possible for us to conduct tough, realistic training and operational missions while minimizing losses. Leading will never be an exact science with textbook solutions that can be applied to every situation. However, using the risk management process provides us with an invaluable tool to help execute exemplary training safely and conduct successful battlefield operations with minimal losses.

Knowing that soldiers' lives often depend on our risk assessments and decisions makes leading the sometimes overwhelming, intimidating, and difficult task that it is. But even though leading is not always easy, leading great soldiers—and leading them safely—is one of the most profoundly fulfilling jobs an individual can be blessed to do within our Army.

Train hard and play hard, but be safe!

BG James E. Simmons



Unit Training and the New Aviator

New pilots fresh out of flight school and arriving at their new units have been in the schoolhouse environment for a year and have acquired a lot of the knowledge and skills they need to become a "real Army aviator," but they lack experience. It is one thing to be flying in "clear blue and 22" conditions under the hood with an IP and quite another to suddenly be forced to make a quick transition to instruments from VMC while "scud running" back to home base. Inadvertent IMC is often all that is needed for an inexperienced pilot to become involved in an accident. It has happened more than once.

■ An OH-58 pilot became disoriented while hovering in snow. One main rotor blade struck the ground, causing the mast to separate and severing the tail boom aft of the horizontal stabilizer. The aircraft then ended up on its left side. This pilot was fortunate. A bit shaken up, he managed to exit the aircraft through the right cockpit door uninjured.

To begin with, this pilot was flying in weather conditions beyond his capabilities. Further, he persisted in his attempt to continue flight even though he had previously experienced spatial disorientation in a whiteout. He was not adequately trained nor did he have knowledge of the techniques for hovering in falling and blowing snow. An effective unit training program would have lessened the possibility of this inexperienced aviator being placed in such a situation.

On his own

It must be remembered that the new pilot has become accustomed to having assistance—someone to rely on. Namely, the IP. When he embarks on his own, no one is available to make his decisions for him.

In gaining experience, the new pilot must not only develop proficiency in handling his aircraft, but also (and what may be even more important) in handling situations—making right decisions and coping with any problems that may arise. Without benefit of unit training, he must acquire this experience on his own. Consequently, he may pick up wrong habits and develop self-taught practices or procedures not found in the operator's manual or contrary to those published. Sooner or later, this means trouble.

Helping hand

In a sense, then, unit training takes the place of the instructor after a pilot leaves flight school. This training (or helping hand) is necessary not only for the new aviator, but for the seasoned one as well. Neither outgrows the need for it. The veteran aviator left to his own designs can develop a case of severe overconfidence to the point that his technique becomes sloppy. Further, he may become so familiar with routine missions that he may disregard established procedures.

Another important purpose of an effective unit training program is that it identifies an individual's strong points as well as his weak ones, and points them out not only to the pilot involved, but also to his commander. Armed with this information, the commander can intelligently assign missions within the capabilities of his pilots and provide any necessary training. *His failure to know the limitations of his pilots can result in mishaps.*

■ During a field exercise, the crew of an OH-58 was detained after completing a mission to a field location because it was thought the aircraft might be needed for another mission. The crew made several requests to be released from further duty because of approaching darkness and the need for crew rest. These requests, however, were denied.

Finally, around 2100 hours, the aircraft was released for flight back to the training area which was located on flat terrain devoid

of trees or other vegetation. While on final approach to an unlighted landing pad, the aircraft impacted the ground in level attitude, causing one minor injury and major damage to the aircraft. The crew was fatigued and both pilots had limited experience in executing night approaches to minimum or non-lighted areas. In addition, no night training program had been established. Couple these facts with the extremely low ambient light conditions that existed, the absence of vegetation or other land features to aid in depth perception, and the dust present in the area to further restrict visibility, and it can readily be seen that the demands placed on these pilots far exceeded their capabilities.

To be effective, a training program must be tailored to a unit's needs. Consequently, no two programs will necessarily be exactly alike—even if the units involved are operating in the same geographic area and using the same type of aircraft.

Tailored program

To be effective, a training program must be tailored to a unit's needs. Consequently, no two programs will necessarily be exactly alike—even if the units involved are operating in the same geographic area and using the same type of aircraft. Specific mission requirements of each unit are the prime considerations, along with the equipment being used and the environment in which the unit must operate. This includes climate and topography.

Special problems

Although many training tasks can be readily worked into the unit's normal operations; some cannot, and these pose special problems. For example, functions such as inserting and extracting troops in confined areas, or tactical missions that require night formation flying fall into this category. Special training is necessary for tasks such as these, and often the training hours available to conduct it are insufficient.

This is where a good record system can be invaluable. While it won't magically produce extra hours for training, it will show the number of pilots qualified to perform a particular type of mission. If this number is insufficient and the supported unit must have that type of support, then some kind of arrangements will have to be worked out to give the pilots the necessary training and experience.

This may mean an increase in flying hours to be allocated for the following year; or it may mean fewer hours to be applied to support missions, with more to training. *In any case, the commander will not be guessing when he assigns his pilots to specific missions. He will be aware of their capabilities and be able to provide documentation as to what they can and cannot do.* When he makes an assignment, he will know the personnel selected are knowledgeable, experienced, and able to accomplish the mission, and do so with maximum safety.

A good unit program does more than point out strengths and prepare and maintain unit personnel in full readiness. It also identifies any weaknesses associated with the unit's operations for corrective or preventive action.

For everyone

Although the emphasis for unit training is placed on pilots, the supporting elements must not be forgotten. Training is equally important for maintenance and other personnel, including technical inspectors (TIs). Sooner or later, experienced mechanics are reassigned. Their replacements may be seasoned or green; there will be equipment changes as well as modifications in maintenance procedures. Even TIs can become lax, especially when they know they are working with mechanics who are thorough and conscientious.

All in all, effective unit training sharpens the skills of new aviators, as well as all personnel and maintains the entire unit in a state of readiness to accomplish its mission. It enhances safety, produces pride in the individual, increases self-confidence and morale, and ensures peak performance. ■

—Paula Allman, Flightfax Managing Editor, DSN 558-9855 (334-255-9855), paula.allman@safetycenter.army.mil

Operations in Afghanistan

From January to July 2002, our company was deployed to Afghanistan in support of Task Force Rakkasan for Operation Enduring Freedom. We are an AH-64A attack helicopter company assigned to the 101st Airborne Division (Air Assault). During the deployment, we were exposed to a wide range of temperatures, a variety of flight environments, and altitude extremes that we had never operated in before.

We arrived in Afghanistan near the end of January and were based out of Kandahar International Airport. Kandahar is approximately 3,500 feet mean sea level (MSL) and can be characterized as high desert. The terrain is relatively flat with rolling sand dunes 10 miles west and a mountain range approximately 15 miles to the north. Temperatures during January were mild with an average daytime temperature of 12 to 15 degrees Celsius (53º-59ºF).

"We had operated at altitudes from 3,500 MSL to 12,500 MSL. We had operated in temperatures from -15 degrees Celsius to temperatures in excess of 50 degrees Celsius. We quickly learned that power management was a skill necessary to survive our deployment."

During the winter months at Kandahar, our aircraft performed well. We had six aircraft equipped with T700-GE-701C engines and two equipped with T700-GE-701 engines. On a daily basis, we had power available to hover out of ground effect (OGE). Even though we had OGE power, we still had to pay close attention to our TGT because we were operating close to dual engine automatic TGT limiting. We knew that it would not be long before power was a luxury that we would not have.

Within three weeks of our arrival, our missions started taking us to higher and higher altitudes. Prior to my arrival in Afghanistan, I had never been above 10,000 MSL in an Apache. Our first mission took us from Kandahar to Bagram Airbase to refuel and then on to the eastern city of Khowst. While en route to Khowst, we crossed a snow-covered mountain at 11,500 MSL. The free air temperature was -15 degrees Celsius (5ºF)

when we crossed the peak. While climbing to cross the peak, I applied my maximum torque available from my PPC and noticed that I was not close to TGT limiting. I slowly increased the power until I drooped the rotor and then decreased the collective. I still had not reached TGT limiting, but the droop in rotor RPM was the result of fuel flow limiting. I knew fuel flow limiting existed and how to attain the information from chapter seven of my operator's manual, but had never been exposed to it before.

By the end of April, the temperature at Kandahar was nearing 100 degrees Fahrenheit. We had power to hover in ground effect (IGE), but we no longer had power to hover OGE. We had already conducted numerous missions to include Operation Anaconda. We had fought at altitudes from 8,200 MSL to 10,500 MSL using running fire tactics. The racetrack patterns and running fire tactics we utilized were necessary due to insufficient power to hover and to increase our own survivability.

Performance planning was a critical part of each mission. Each mission required performance planning for altitudes, temperatures, and gross weights that were much higher than we normally operate. During our missions in Afghanistan, we had two aviators assigned to our performance-planning cell. This cell always contained at least one of the unit instructor pilots.

By the time we left Afghanistan, we had operated at altitudes from 3,500 MSL to 12,500 MSL. We had operated in temperatures from -15 degrees Celsius to temperatures in excess of 50 degrees Celsius (122°F). We quickly learned that power management was a skill necessary to survive our deployment. We adapted to this environment well, but were fortunate to have a wealth of experienced aviators in our company. A valuable lesson learned from this deployment is that units should focus early on power management issues and train accordingly so that they are prepared when deployed. ■

—CW3(P) Rich Chenault, A/3rd Battalion, 101st Avn Regt, Fort Campbell, KY, DSN 635-9291

Going Somewhere?

Many of you are either in or on your way to a desert environment and the many different problems associated with living and fighting in it. Throughout history Greek, French, British, and American forces have learned and relearned the problems associated with desert operations. Most recently, our experience in Operations Desert Shield and Desert Storm provided numerous lessons learned that were captured in after action reports. Fortunately, we have the ability to use those lessons and not relearn them the hard way.

It should be remembered that the principles and fundamentals of combat do not change in the desert. Priorities may alter, techniques will vary from those in temperate climates; but soldiers, leaders, and units who are fit and well-trained to fight in other environments will have little difficulty adjusting to desert war. This article highlights certain unsafe situations or hazards, many of which led to accidents, and offers suggestions on ways to eliminate or control these unsafe situations before they cause accidents again. Safety, survival, knowledge, and

common-sense thinking will lead to mission accomplishment.

Deployment

***Situation:* Individuals abandoned safety in an effort to establish "combat posture."**

■ Ensure that all personnel know and use the five-step risk-management process in all operations.

■ Establish a command climate from the outset that promotes safety. Begin by establishing a safety network, designating safety personnel.

■ Enforce standards; require all personnel to perform to standard in all operations.

***Situation:* Unsafe loading and shipment. Examples of violations include failure to identify and mark containers, mixing Class A explosives with incompatible Class C ammunition, corrosives improperly certified and mixed with unidentified hazardous lubricants, MRE rations and undocumented insecticides on same pallet, lack of MILSTAMP advanced cargo clearance, improper storage, and improper security.**

■ Train load teams to standard.

■ Use Quality Assurance Specialist Ammunition Surveillance (QASAS) support.

■ Nesting all equipment and supplies inside vehicles to deal with rough port handling and high seas.

■ Comply with Air Force regulations in airlift of hazardous material (AFR 71-4) and with guidelines in TM 38-250 (11 December 2001).

■ Ensure that vehicles have required tiedown shackles.

■ Keep personnel out from under equipment being lifted aboard ship.

■ Coordinate/understand requirements for "topping off" vehicles prior to shipment.

■ Coordinate port of embarkation shipping requirements for bulk fuel/POL tank transporters through the servicing ITO.

■ Ensure that vehicle master switches are turned off immediately after loading.

***Situation:* Chemical agent resistant coating (CARC) used to repaint vehicles for deployment.**

■ Ensure that CARC painting is done in accordance with established requirements.

■ Caution users that CARC is flammable.

■ Caution users that CARC is toxic and exposure can lead to respiratory problems.

■ Ensure that users wear proper personal protective equipment.

Human factors

***Situation:* Air travel caused dehydration and fatigue.**

■ Encourage hydration before and during air travel.

■ Ensure that arriving troops are given the opportunity to rehydrate and rest before being assigned duties.

***Situation:* Lack of depth perception in desert environment.**

■ Stress that lack of contrast in terrain features reduces depth perception.

■ Ensure vehicle drivers follow proper ground-guide procedures.

***Situation:* Soldiers performing strenuous manual labor.**

■ In general, 2 weeks are required to adjust to the humidity and extreme heat.

■ Remind soldiers to avoid strains and lifting injuries by using proper lifting techniques (lift with the legs, not the back) and getting help with heavy loads.

Aviation operations

***Situation:* Aviation units have problems maintaining standardization.**

■ Deploy standardization and safety personnel with the advance party.

■ Develop unit training program to address new operational hazards.

■ Establish a deployment library and take essential maintenance, operational, and training regulations and safety publications.

***Situation:* NVG operations in desert environment.**

■ Operate according to the crawl-walk-run philosophy, especially in an unfamiliar environment.

■ Conduct detailed planning and mission briefings regardless of pilot experience.

■ Establish all crewmember duties.

■ Identify crew coordination requirements, especially during critical phases of missions.

■ Remind crews that continuous scanning is a must and that the pilot on the controls must "stay outside."

■ Require that all crewmembers assist in obstacle clearance.

■ Remind aircrews that airspeeds must be adjusted downward during low illumination and visibility conditions and in areas of little or no contrast (go low, go slow).

***Situation:* Failure to establish Emergency Helicopter Instrument Recovery Procedures (EHIRP).**

■ Establish EHIRP for area of operation.

■ Include EHIRP in mission briefings (unit SOP).

■ Spell out crew duties and crew coordination requirements.

■ Execute unannounced EHIRP whenever possible.

***Situation:* Failure to conduct local-area operation surveys.**

■ Survey area of operation, and establish hazard maps and restricted flight areas as first order of business.

■ Brief manmade and natural hazards and obstacles for every mission.

■ Brief all crewmembers on their responsibility for scanning to detect hazards and obstacles and to inform pilot on controls.

***Situation:* Uncommanded launch of ordnance from aircraft.**

■ Ensure that aircraft are downloaded or in a safe area when performing inspections or maintenance on weapons systems.

■ Ensure that weapons are oriented away from other aircraft, troops, and facilities.

Ground operations

***Situation:* Vehicle operations result in accidents.**

■ Ensure driver and vehicle commander understand the responsibilities for safe vehicle operation; e.g., establishing and enforcing safe vehicle operations based on personnel, training, terrain, environment, and equipment.

■ Ensure drivers are trained and licensed on the vehicle they are operating (check OF 346).

■ Ensure soldiers drive defensively.

■ Remind drivers to clear all sides before turning.

■ Remind drivers not to allow passengers to ride on the outside of any vehicle unless it is command-directed.

■ Caution drivers to use extra care when operating off improved roads; sand dunes drop off abruptly on the leeward side.

■ Check loads to ensure cargo is correctly secured. Stress even load distribution, especially when traveling over sandy terrain.

■ Train soldiers on rollover procedures in the vehicles in which they operate; practice

rollover drills.

■ Instruct tracked-vehicle commanders to ride no higher than "name-tag defilade."

■ Enforce seatbelt and Kevlar requirements.

■ Establish and enforce safe convoy and catch-up speeds for expected road and environmental conditions. Include in pre-march briefing. Remind drivers that driving too fast for conditions is a primary cause of accidents.

■ Train drivers in the correct use of ground guides and all personnel in how to perform as ground guides. Remind drivers to always use two ground guides while backing.

■ Recon routes for mountain passes or any sharp turn that might require special control measures, as well as bridges or underpasses that may be too low for large vehicles.

■ Train drivers of M915 series vehicles in braking procedures.

■ Train crews on vehicular fire drills; practice drills.

■ Caution drivers that roads, bridges, and overpasses may not be posted with weight or height restrictions.

■ Require safety briefings for senior occupants as well as vehicle drivers.

■ Require the use of 10-foot extension hose for inflating and deflating split-rim tires.

***Situation:* Not enough attention to weapons safety.**

■ Review fratricide-prevention procedures.

■ Remind soldiers to handle all weapons as if loaded.

■ Caution soldiers not to play with knives.

■ Do not allow target practice and blank ammunition to be mixed.

■ Caution soldiers not to burn ammo boxes and to handle them with gloves; some are treated with PCP, which is toxic.

■ Execute drills on rules of engagement.

***Situation:* Unsafe fuel handling and burning.**

■ Use FM 21-10 for guidance on proper fuel mixtures.

■ Ensure that fuel is not used as a substitute for cleaning solvents.

■ Prohibit burning of aerosol cans and unopened MRE packages; they will explode.

■ Train soldiers in the process of burning human waste.

***Situation:* Eye exposure to sunlight degrades night vision.**

■ Enforce the wear of Ballistic Laser Protection System (BLPS). The sunglasses will reduce the adverse effects of sunlight on night vision. The sunglasses and clear lens will also protect against eye injury.

■ If BLPS are not available, allow soldiers to wear sunglasses during the day to protect against night vision degradation. ■

—Paula Allman, Flightfax Managing Editor, DSN 558-9855 (334-255-9855), paula.allman@safetycenter.army.mil

For more information on general deployment safety, check these excellent references:

■ Aviation/Ground Operations. **http://safety.army.mil**; click on the TOOLS tab; scroll down to Leaders' Guides and Handbooks. The Safety Center has many publications developed in support of Operations Desert Shield and Storm: "Desert Shield Leader's Safety Guide," "Southwest Asia Leader's Safety Guide," and "Redeployment and Port Operations Leader's Safety Guide."

■ The Center for Army Lessons Learned (CALL) web site **http://call.army.mil** also has several publications on lessons learned during desert operations. The first is Newsletter No. 90-7, Aug 90, *"Winning in the Desert,"* Newsletter No. 90-8, *"Winning in the Desert II,"* and Newsletter 90-11, Dec 90 *"Getting to the Desert."*

■ Other web sites pertinent to deployments:

http://chppm-www.apgea.army.mil
http://tri.army.mil
http://deploymentlink.osd.mil/
Human factors:
www.hqmc.usmc.mil/safety.nsf/

Who Ya' Gonna Call?

Does your unit need risk management training and information to better prepare your officers and NCOs to do tough missions safely? Current world events have intensified the need to ensure we are tactically and technically proficient in all areas. Don't forget that you have some excellent sources for help. You don't have to go anywhere...the training comes to you. More comprehensive information is available on our website at **http://safety.army.mil**.

NCO Risk Management and Safety Training

The intent of this training is to teach safety to NCOs, not to produce a safety NCO. NCOs are the leaders on the ground "where the rubber meets the road" and are most likely to have a direct impact on accident prevention. Therefore, USASC has designed a 5-day, 45-hour course focused on hazard identification and risk management. The target audience is sergeants and staff sergeants who will be able to integrate risk management into both the planning and execution phases of training and operational missions.

The Junior Officer Professional Development

This course is tailored to the junior officer level of responsibility. The 3-day, 24-hour course is focused on hazards identification, risk management, the Army Safety Program, and leader responsibilities. The target audience is the young company grade officer or warrant officer technician charged to integrate risk management into both the planning and execution phases of training and operational missions.

Assistance Visit Program

The Safety Center offers a 9-event, unit-tailored visit to provide training in risk management and risk management integration, POV toolbox application, ground and aviation systems safety, and driver's training program applications. Units identify their requests and USASC will tailor a team of subject matter experts to address the areas of concern.

Risk Management Information System (RMIS)

From this site, you can get detailed information on the types and kinds of accident hazards, risks, and controls for your area of operations. You can even get accident prevention lessons learned from Desert Storm or major training exercises. You can apply for a password at our web site **http://safety.army.mil** or telephone DSN 558-2920.

If you would like to schedule a visit or if you have questions on course content, contact SFC Pat Stoker, DSN 558-9854/9579 (334-255-9854/9579). ■

Preparing for the NTC

Although this experience had all the trappings of combat and required all the pilot and crew skills we could muster, this was not combat. It was an NTC rotation, the closest we could get to combat conditions in a training environment. This rotation ended in success, thanks to a lot of preparation and training prior to leaving home station.

If you haven't been to the NTC before, you can rest assured that the experience will be demanding and combat realistic. To ensure your NTC rotation is accident-free, focus your training before deployment on the following:

■ **Brownout NVG landings**. You cannot do enough of these.

■ **Rough terrain NVG landings**. Practice landing on rough terrain so pilots and crewmembers can learn to recognize obstacles, such as rocks, under NVGs (and believe me there are *many* of them at the NTC).

■ **Crew coordination**. Crew coordination is essential for every mission, but especially so for missions flown in low illumination. The NTC is a very dark environment. Have crewmembers learn to recognize what various altitudes look like and to advise pilots constantly on any significant deviations.

Identifying hazards is every crewmember's responsibility. Emphasize to soldiers that this includes stepping out of their lane to identify and take action on hazards if necessary. Encourage crewmembers to speak up if they recognize a hazardous situation; lives may depend on what just one crewmember sees.

Other suggestions and lessons learned

■ Develop a sleep-management plan and make it a priority. Segregation of day and night crews is recommended. An aggressive fighter-management program is necessary and should facilitate mission support.

■ Procure and train with a global positioning system (GPS). Using the GPS will reduce the stress level when navigating in low illumination and ensure accuracy.

■ Develop a severe weather plan before deployment. Winds at the NTC often exceed 50 knots; therefore, a plan for protecting personnel and aircraft is required.

■ Ensure aircraft field-mooring kits are available to moor the aircraft in multiple tactical assembly areas. Procuring reinforced bars for tent-staking also will help to ensure security.

■ Allocate planning time for crews to plan the missions thoroughly and to study the map properly. With today's complex missions, time must work for you, not against you.

■ Don't try flying UH-60s in low illumination without the HUD. The less time you spend looking inside the aircraft, the better off you will be.

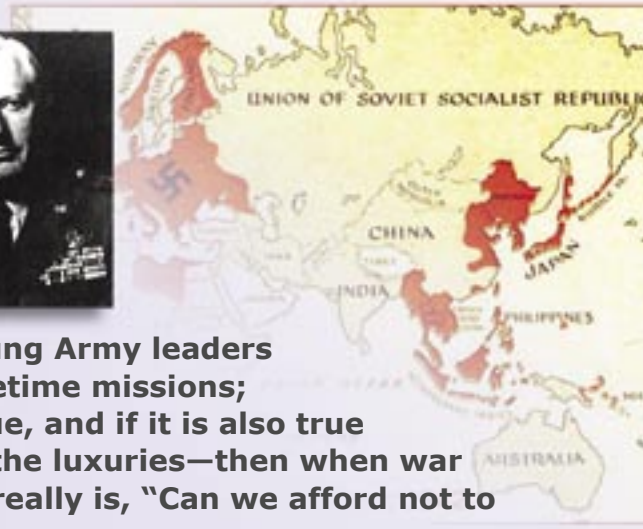
■ Use the *Risk Assessment and Control Options Program for Army Night Rotary-Wing Missions* software. It works and will provide the commander with another risk management tool.

■ Maintain tactical situational awareness. Getting distracted or focusing on one factor exclusively is easy to do. Know the enemy situation. Don't be predictable. Maintaining tactical situational awareness may keep you from sleeping in your aircraft overnight or running for your life to the nearest downed-pilot pickup point.

Thorough home station training and aggressive risk management can improve your unit's performance during an NTC rotation. Creating an environment where all personnel are empowered to identify unsafe conditions and provide leaders with control options and countermeasures will ensure a realistic measure of success for all personnel and equipment returning home safely. ■

—POC: CW5 Larry Newsom, Aviation Safety Officer, 18th Aviation Brigade, Fort Bragg, DSN 236-7767/8260 (910-396-7767/8260)

Wartime Safety



Safety professionals report that in spite of today's emphasis on safety by the Army's top leadership, there is still a perception among some young Army leaders that safety is something you have to consider in peacetime missions; but in wartime, safety becomes a luxury. If that is true, and if it is also true that when things get tough, the first things to go are the luxuries—then when war comes, we can no longer afford safety. The question really is, "Can we afford not to consider safety during wartime?"

One military officer who recognized the importance of safety in aviation operations was General William H. Tunner. General Tunner was responsible for the India-China airlift in the last year of World War II. Below, General Tunner gives us an excellent example of how a vigorous safety program actually did work in a combat theatre, and how safety made a difference in the success of the mission.

In his lively memoir, "*Over the Hump*," General William H. Tunner recalls his stint as commander of the crucial India-China airlift and tells of his experiences during one of the first attempts to supply an Army by air.

In the 1940s, the very concept of military airlift was in its infancy. In fact, the India-China airlift had only been reluctantly called into existence by a ground-oriented command because a deadly combination of Japanese and geography made the better-known Burma Road somewhat less than efficient.

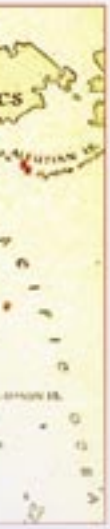
The purpose of the airlift was to carry enough supplies into Western China to keep the Chinese in the war. A Chinese military presence tied down approximately two million Japanese troops—troops that otherwise could be used against U.S. forces in the Pacific.

When General Tunner arrived in India in the summer of 1944, the airlift had been in operation about 2 years. Its performance was barely adequate in terms of tonnage transported, but the major problem was safety. General Tunner described the situation: "*Here, in a strange land far from home, on the fringes of a mysterious backward civilization, were all the conditions that bring hazardous flight: fog, heavy rain, thunderstorms, dust storms, high mountains, a necessity for oxygen, heavy loads, sluggish planes, faulty or no radio aids, hostile natives, jungles, and one-way airfields set in mountainous terrain at high altitude*."

As tonnage had gradually increased during the airlift's operation, so did the mishap rate. In January 1944, the accident rate was 1.97 per 1,000 flying hours! Every 200 trips over the Hump cost one airplane; for every 100 tons flown into China, three Americans died.

As General Tunner put it: "*Not only was the accident rate alarming, but most of the accidents were washouts—total losses with planes either flying into mountain peaks or going down in the jungle. In many of the cases in which there was reason to believe that some or all crew members had been able to parachute from their planes, the men were never seen again. The jungle had simply swallowed them up. The combination of a high accident rate with the hopelessness of bailing out was not conducive to high morale in the flying crews.*" (This was certainly an understatement.)

General Tunner soon identified a major problem: "*All efforts up to that point had concentrated on increasing tonnage, the prime indication of mission success. But all consideration*



for safety had been ignored."

Night flying had been introduced on the Hump, although radio communication and navigational facilities were nonexistent except at the terminals. Weather conditions were virtually ignored; the common saying was, "*There is no weather on the Hump*." Many planes flew in violation of standard Air Corps specifications. As one report indicated: "*If Air Corps technical orders were now in force, I doubt that there would be an airplane in the air.*"

General Tunner's challenge became immediately clear: increase tonnage and lower the accident rate, seemingly contradictory actions in a wartime environment. Yet the record shows the two were not at odds at all. By instituting a safety program that seems obvious to us today, it became possible to change the whole tenor of the airlift.

What was the program?

Nothing more than the basics distilled into four main points:

- Analysis of existing flight and maintenance procedures and practices.
- Statistical investigation and analysis of accidents.
- Recommendations for the correction of faults revealed in the foregoing analysis.
- Prompt action and follow-up on that action.

In particular, General Tunner and his staff carefully investigated the training of the pilots and made up for any gaps before sending them over the Hump. They began to take weather and communications seriously (there was weather on the Hump), attacking such conditions as icing and turbulence and becoming more familiar with navigational equipment and how best to deal with its absence.

Another major area was one we hear much more about today, particularly in the area of human factors—pilot discipline. General Tunner was very specific about the use and importance of the checklist, an aid which told the pilot "the exact procedure he must follow from the time prior to starting the engine to that following his cutting it off at his destination. We found planes without checklists and pilots who didn't bother." Both situations had to be corrected.

Briefing and debriefing, according to General Tunner, lay at the heart of the program: "*Briefing and debriefing proved to be of the greatest importance. Briefing involved not only a thorough preparation of the pilot for the route he was to take, but a check to make certain that the crew was competent to make the proposed flight safely. Debriefing would show up incompetent flight procedures, indicating the need for corrective action and additional training. Debriefing also provided our best weather reports.*"

Did all of this work?

In August 1944 (just before General Tunner's arrival), they airlifted 23,000 tons over the Hump to China with an accident rate hovering around 2.0 per 1,000 flying hours. In January 1945 with close to 40,000 tons airlifted, the accident rate dropped to 0.301. By July 1945, total tonnage jumped to 71,042 with an accident rate of 0.239. During August, the final big month of the airlift, 20 planes were lost during 136,000 flying hours, bringing the accident rate down to 0.154 per 1,000 flying hours.

Can we afford the luxury of a safety program during wartime? History tells us we can't afford not to have one. We simply can't get the job done without it.

General Tunner makes the statistics come to life by looking at them another way: "*If the high accident rate in 1943 and early 1944 had continued, along with the great increase in tonnage delivered and hours flown, America would have lost not 20 planes that month, but 292, with a loss of life that would have shocked the world.*"

Serious military airlift was born in this distant theater on the almost forgotten edge of the twentieth century's greatest war. Along with it, however, came safety. Can we afford the luxury of a safety program during wartime? History tells us we can't afford not to have one. We simply can't get the job done without it. ■

—Paula Allman, Managing Editor, DSN 558-9855 (334-255-9855), paula.allman@safetycenter.army.mil. **Portions of this article on the India-China airlift were taken from General Tunner's lively memoir, "Over the Hump," republished later by Richard W. Huling, Ph.D., AFISC Historian.**

Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

Perishable Skill—Currency is Not Proficiency

Perishable Skills. We have all heard the phrase, "*That's a perishable skill*," but what does it really mean? I have heard it for almost 20 years and always thought of my golf swing as my most "*perishable skill*." But a recent accident investigated by the Safety Center brought the phrase back to mind in a much more appropriate way.

This UH-60L accident serves as a prime example of how perishable some skills really are. It involved a crew that no one ever expected to have an accident.

The instructor pilot had over 8000 hours of rotary-wing experience; the PI was young but highly thought of; and all the crew members had flown together many times in the past. Both aviators were qualified and current for the night vision goggle environmental training mission.

The problem? Neither crewmember had significant recent experience in NVG flight. The hostile conditions overcame their skills. They became disoriented during a takeoff and crashed, destroying the aircraft. Fortunately, everyone on board will fully recover from their injuries.

We are all aware of "NVG currency" requirements as stated in the Aircrew Training Manual (ATM) for each aircraft. Instructor pilots and unit commanders constantly monitor aviators to ensure that everyone remains current by flying at least one hour every 45 days under goggles. As long as we maintain that standard, we can report combat-ready goggle crews to the chain of command every month.

But, in the back of our minds, we all know that one flight every 45 days does not maintain the proficiency necessary to execute the tough missions we may be called upon to complete. This mission is a perfect example.

The aviators involved in this accident were NVG current. They met the ATM standards required to conduct the mission. However, neither crewmember had flown more than 3 hours of NVG flight in a single month for over 7 months. We have all seen this in our units at one time or another. Other mission requirements, administrative obstacles, or flight time restrictions have put nearly everyone in this position at some time. Most often, we manage to get the mission accomplished when called on. The problems arise when an aviator who is just maintaining currency is placed in conditions with which he is unfamiliar and that requires real proficiency rather than currency.

In this case, we put these aviators in a dusty, windy environment, with low illumination, with little recent experience under NVGs, and all these things added up to a situation primed for an accident. The cumulative effect of the

risks associated with this mission exceeded the capability of the crew, and a major accident was the result.

If any one of the conditions—low recent experience, dust, winds, or low illumination—had not been present, perhaps the accident would not have occurred.

If the aircrew had more recent experience, they would have been better able to deal with the harsh environment. If the illumination had been better, their low recent experience might not have been a factor. If the conditions had not been as dusty, perhaps the crew would not have become disoriented. If, if, if...

The key lesson to be learned is that there are perishable skills. Night vision goggle flight is one of the most perishable skills in our business. When circumstances force us to maintain NVG currency rather than proficiency, we must be aware that those aviators are not ready to proceed directly into harsh environments. Commanders must transition through the crawl, walk, run scenario. NVG currency is the crawl. NVGs in adverse conditions, such as the desert or other severe environments, are Olympic events. We can't expect aircrews to go straight from one to the other. ■

The key lesson to be learned is that there are perishable skills. Night vision goggle flight is one of the most perishable skills in our business. When circumstances force us to maintain NVG currency rather than proficiency, we must be aware that those aviators are not ready to proceed directly into harsh environments.

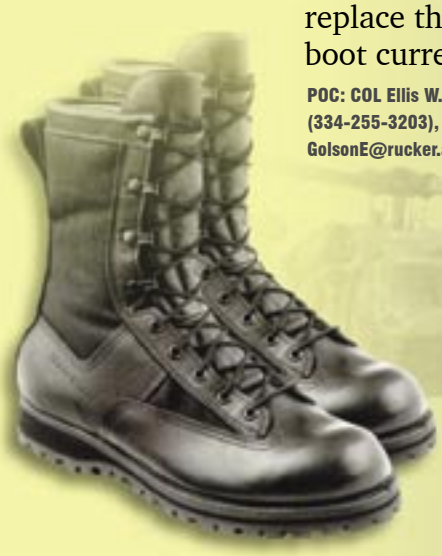
—LTC W.R. McInnis, Chief, Aviation Systems and Accident Investigation Division, U.S. Army Safety Center, DSN 558-9552 (334-255-9552), william.mcinnis@safetycenter.army.mil

Infantry Combat Boot Approved for Army Aviation Use

Effective 4 Dec 02, the U.S. Army Aviation Center waives the requirement in AR 95-1, *Flight Regulations*, paragraph 8-9c(1) Leather Boots, requiring the wear of leather boots when performing crew duties. This waiver specifically allows the wear of the U.S. Army designated Infantry Combat Boot, also known as the Belleville 700 series boot. No other non-leather boot is authorized for wear.

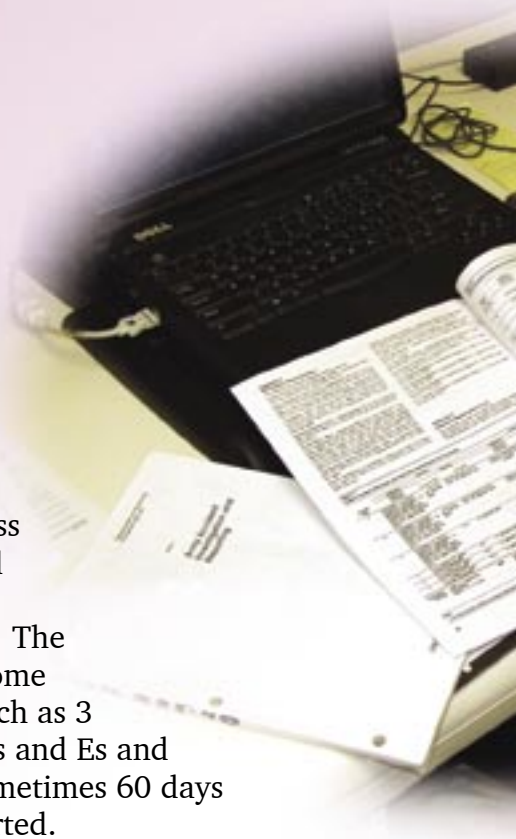
The Infantry Combat Boot is black in color but not an all-leather boot. This boot has undergone all required testing and has been type classified for aviation use. Starting in third quarter of FY03, this boot will be issued to all soldiers during basic training and will replace the all-leather boot currently issued. ■

POC: COL Ellis W. Golson, DSN 558-3203 (334-255-3203), GolsonE@rucker.army.mil.



AAAR Problems

When submitting AAARs, remember the term "GIGO."



The Army Safety Management Information System (ASMIS) data base, which contains almost 30 years of Army Aviation accident and incident data, is a valuable safety resource for the aviation community. Among other things, the U.S. Army Safety Center (USASC) uses the ASMIS for hazard identification and trend analysis and provides that information to major commands, as well as installation and unit safety personnel.

One way aviation unit personnel contribute to this data base is by reporting aviation accidents and incidents IAW AR 385-40: *Accident Reporting and Records* and DA Pam 385-40: *Army Accident Investigation and Reporting*.

You've probably heard the term GIGO—garbage in, garbage out. Unless we get complete, clear, and concise data on AAARs, the result will be GIGO.

Problem areas

The following are some frequently encountered problems with AAAR data:

■ **Late or incorrect submissions**. Late or incorrect submission is one of the most frequently occurring problems with AAARs.

AR 385-40, chapter 3, clearly states the reporting criteria. Paragraph 3-2 states that the commander who first becomes aware of any Class A or B Army accident or Class C Army Aviation (flight, flight-related, or aircraft-ground) accident will, through their existing chain-of-command, *immediately notify*—

■ The immediate commander of all personnel involved.

■ The Commander, USASC, by telephone (DSN 558-2660/2539, commercial 334-255-2660/2539). No hard copy notification is required.

Paragraph 3-4b states that an AAAR for all aviation Class D accidents and Class E and FOD incidents will be submitted within 10 calendar days; 30 calendar days for Class C accidents (Changed by message 051236Z MAY 98, to 90 days). The USASC is receiving some Class C AAARs as much as 3 months late. Class Ds and Es and FOD incidents are sometimes 60 days late or not even reported.

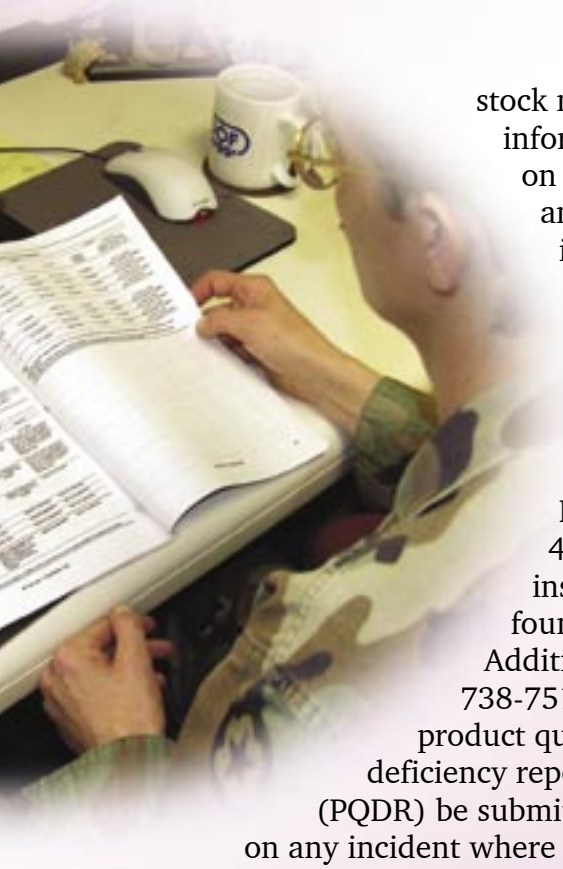
■ Incomplete information. Other frequent problems are insufficient narrative and incomplete or missing component information or part information. (Part information is required for materiel failures, and component information is required for engines, transmissions, and gearboxes.) Remember the narrative should include: what happened, what caused it to happen, and what was done to correct it. Following is an example of a narrative that provides the information needed:

• **What happened?** "While taxiing out for a training mission, the Shaft Driven Compressor (SDC) caution light illuminated and all Pressurized Air System (PAS) air stopped."

• **What caused it to happen?** "Inspection revealed that the PAS air hose was disconnected."

• **What was done to correct it?** "The clamp and hose were replaced. Maintenance operational check (MOC) OK and aircraft returned to service."

When AAAR component or part information is only partially entered or not entered at all, it causes a problem when the data base is queried for materiel trends. When the data base is queried on a specific part number or national



stock number, the information received on component anomalies is inaccurate. This data is needed. If you are uncertain about what to report, check pages 63-66 of DA Pam 385-40. Additional instructions can be found in AR 385-40. Additionally, DA Pam 738-751 requires that a product quality deficiency report (PQDR) be submitted on any incident where material or equipment is confirmed or suspected of contributing to the cause. Identification as an accident exhibit is often neglected. As a result, the Army Material Command, or its delegated sub-command provides inadequate disposition instruction to ensure an analysis is accomplished to identify the cause of the equipment failure. Therefore, Army personnel submitting a PQDR for equipment which contributed or suspected to have contributed to an Army accident should identify all accident exhibits as such in Block 22 of the PQDR (Details).

When AAARs are submitted in a timely manner and the data is complete and correct, the Safety Center can identify potential hazards and trends and take the appropriate action. But when an incomplete AAAR is received, someone has to contact the AAAR POC for the missing information. This adds to the time required to get the data into the ASMIS, which means it takes longer to identify potential hazards and trends and take action to fix the problem.

■ Illegible AAARs. Faxing a hard copy of AAARs to the Safety Center saves time for the sender and gets the information to us faster. But if the information on the AAAR is illegible, not clear, or is missing, the whole purpose is defeated. Not only does it take more time for someone at the Safety Center to contact the AAAR POC, that person has to take time to run down the information that is needed. Remember, you can also send the AAAR by e-mail to accidentinformation@safetycenter.army.mil.

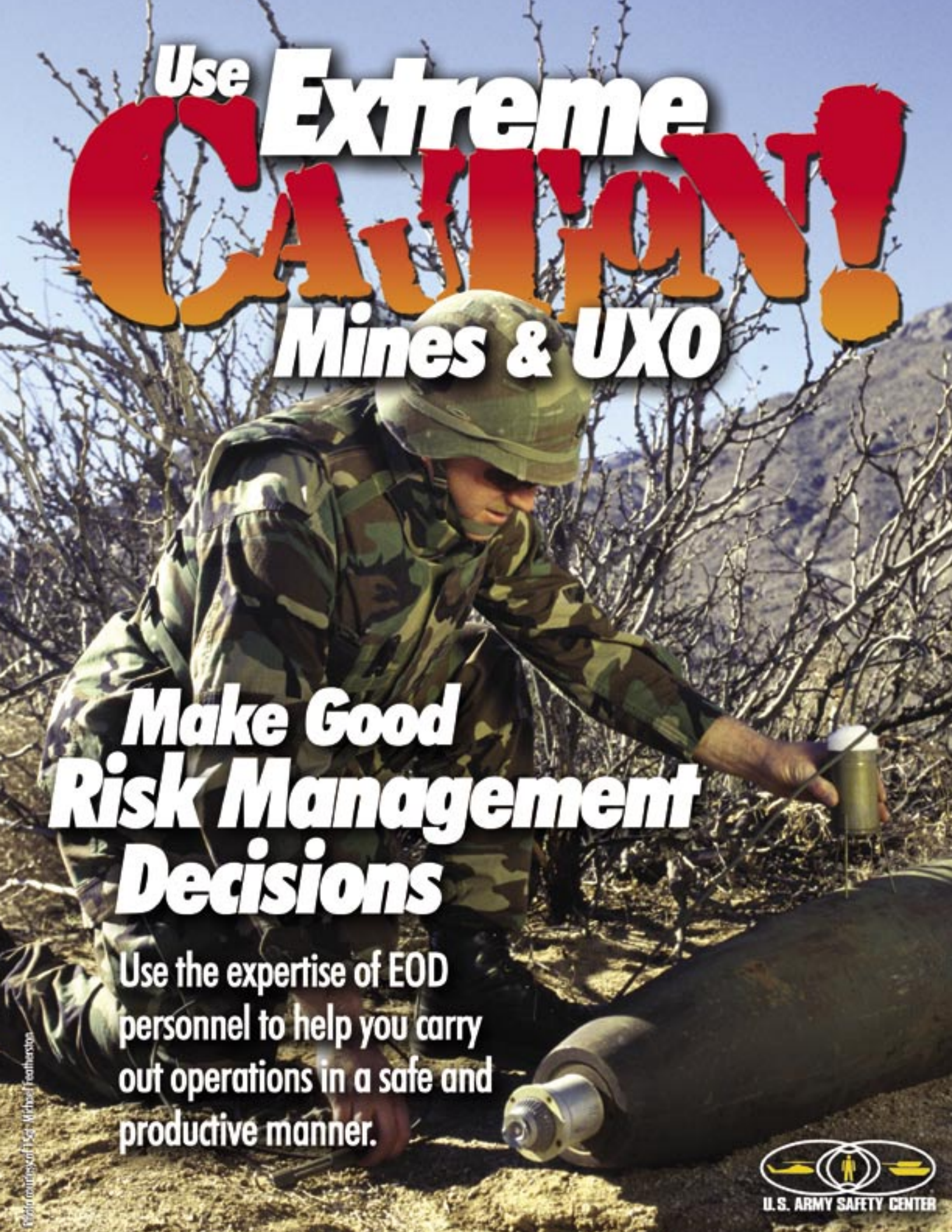
AAARs are reviewed daily by aviation systems managers at the Safety Center to identify trends and potential hazards that might affect fleet aircraft or operations throughout the Army. Once hazards are identified and assessed, the information is used to modify or change doctrine, operating procedures, or equipment to control risks and reduce accidental losses.

Although the benefits of submitting AAARs are often not immediately seen at the unit level, AAARs provide an invaluable service to all of Army Aviation. The more complete information you can give us, the quicker we will be able to identify a potential hazard or trend and take action to correct it.

Although the benefits of submitting AAARs are often not immediately seen at the unit level, AAARs provide an invaluable service to all of Army Aviation. The purpose of this article is certainly not to cause units to submit fewer AAARs. Even an incomplete AAAR is better than not reporting an accident or incident at all. Such an AAAR will at least let us know that a problem exists; for example, a parts failure that may be fleet wide. But the more complete information you can give us, the quicker we will be able to identify a potential hazard or trend and take action to correct it. And we all have a responsibility to our fellow soldiers to make Army Aviation as safe as we possibly can.

Remember GIGO. Take the time to make that AAAR data legible, concise, and as complete and accurate as you possibly can. ■

—Mike Evans, USASC Operations Division Quality Control, DSN 558-3493 (334-255-3493), mike.evans@safetycenter.army.mil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CAUTION!
Mines & UXO
Make Good
Risk Management
Decisions
Use the expertise of EOD
personnel to help you carry
out operations in a safe and
productive manner.
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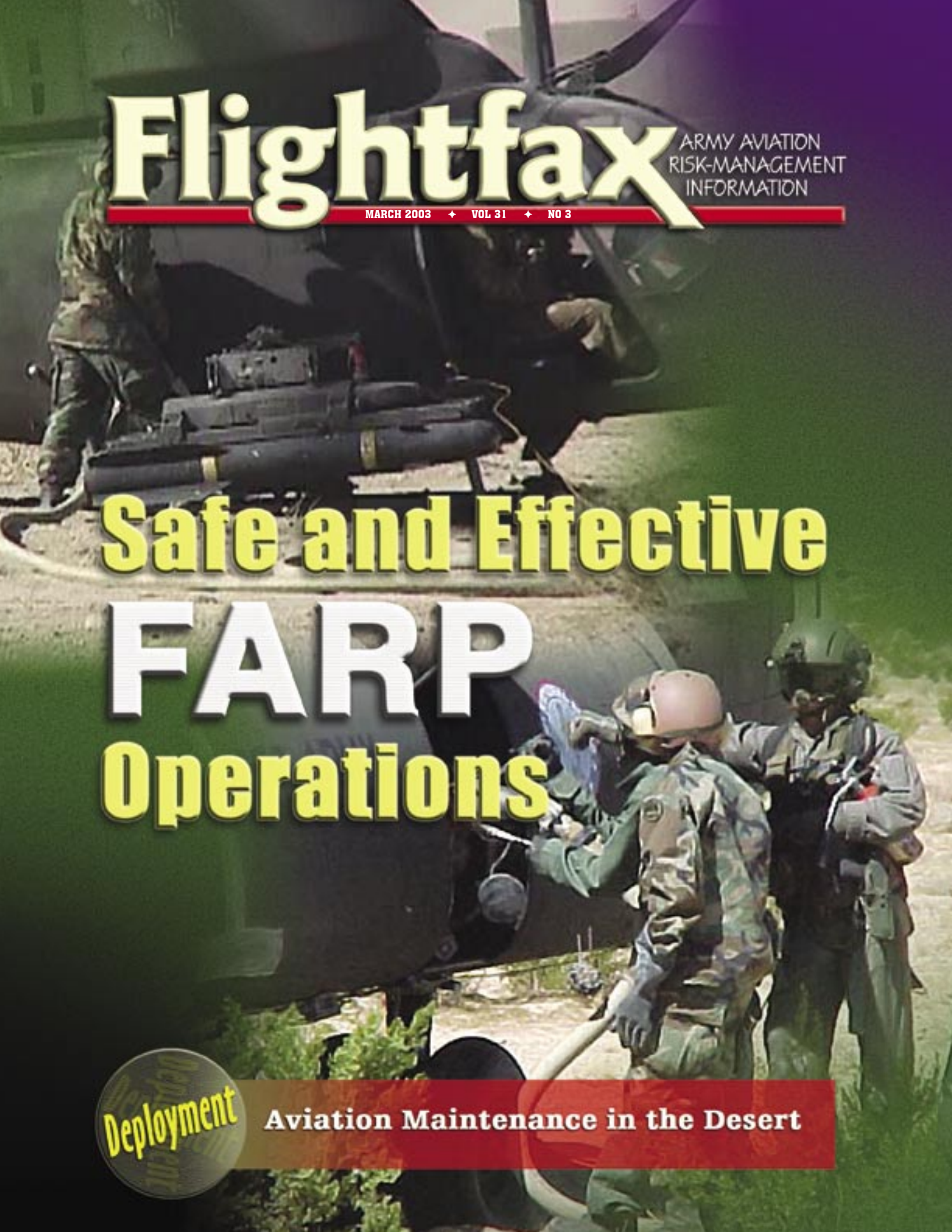

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

MARCH 2003 ✦ VOL 31 ✦ NO 3

Safe and Effective FARP Operations

Deployment

Aviation Maintenance in the Desert

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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U.S. ARMY SAFETY CENTER

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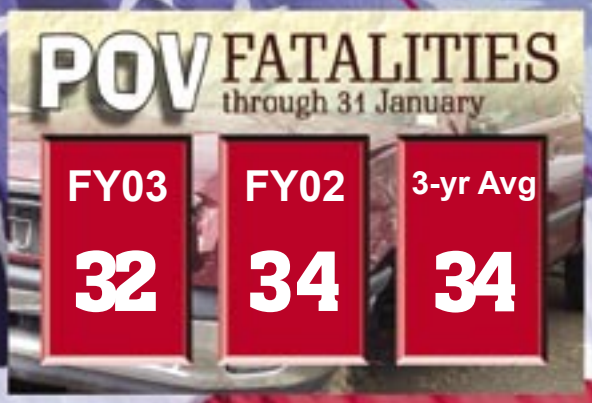

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James E. Simmons
Brigadier General, US Army
Commanding

DASAF's CORNER

from the Director of Army Safety

Keeping the Attack Aggressive on Deadly POV

The most deadly threat that soldiers face in peacetime is traffic accidents. Privately owned vehicle (POV) accidents kill more soldiers than all other on- and off-duty accidents *combined*. Although many of the Army's POV accident prevention programs have resulted in a decrease in fatality rates (from 0.32 per 1,000 soldiers in the early 1980s to the current rate of 0.19 per 1,000 soldiers), POVs still remain the number one killer of our soldiers.

An alarming trend in the analysis of POV accidents from 1998 through 2002 is the fact that failure to use protective equipment such as seatbelts and motorcycle helmets was reported in at least 118 military injury or fatal accidents. Failure to use appropriate protective equipment is a clear indication of indiscipline—failure to follow an established standard. Ours is an Army built on standards and discipline and we, as commanders and leaders at all levels, owe it to our soldiers to strictly enforce standards, including ensuring that they are disciplined enough to wear protective equipment and obey traffic laws whether they are on or off duty.

The Army's senior leadership has made clear their determination to end this needless loss of soldiers to preventable POV accidents and the adverse impact it has on readiness. In August 2002, General Eric Shinseki, the Chief of Staff, Army (CSA), directed major commands to analyze their POV and Army motor vehicle accidents and provide a summary of command initiatives to reduce accidental losses. General Shinseki then directed in September 2002 that commanders increase enforcement of motorcycle safety training course requirements, and that those requirements not be deferred by commanders. In addition, General Shinseki has re-enforced repeatedly his commitment to the Six-Point Model Program as the minimum standard for the Army POV accident prevention program.

Our major Army commands have implemented specific POV accident prevention initiatives. For example, Forces Command implemented the "Combating Aggressive Driving Program" in conjunction with the American Institute for Public Safety, which received Congressional recognition and authorization for FY02. A Fatality Review Board consisting of principal staff, medical doctors, and psychologists was established to identify accident causal factors and trends following each fatal accident. Other units and organizations—Training and Doctrine Command, U.S. Army Europe, National Guard Bureau, etc.—have implemented aggressive programs designed to reduce POV accidents as well.

Armywide and joint service POV accident prevention initiatives also are being developed. The Army Safety Coordinating Panel (a general officer steering committee) chartered a POV process action team to assist the Army Chief of Staff for Installation Management in

developing, resourcing, and implementing an Armywide traffic safety program through the newly created Installation Management Agency. A Joint Service Traffic Safety Task Force also has been activated to promote inter-service cooperation in the development and implementation of effective traffic safety programs, as well as increase cooperation between the services and other interested traffic safety organizations such as the National Highway Traffic Safety Administration.

To provide risk-management tools and assist commanders in building effective POV accident prevention programs, the U.S. Army Safety Center (USASC) has created several groundbreaking, high-definition video and film productions and other accident prevention initiatives. A total of 10 "Drive to Arrive" infomercials starring country music artists deliver short, to-the-point messages on specific driving hazards before feature movies in AAFES theaters worldwide. "Every Drive Counts" is an unconventional safety video set at the Airborne School connecting safe, high-risk training to off-duty activities, specifically POV driving. The USASC Web site (**http://safety.army.mil/**) contains a one-stop shopping POV accident prevention page, which includes the POV Toolbox (**http://safety.army.mil/pov/index.html**) and the Six-Point Model Program.

In addition to videos and Web-based tools, USASC provides enhanced POV accident prevention training to each resident CP-12 safety intern class and to aviation safety officers attending the Aviation Safety Officer Course. USASC's mobile training and assistance visit teams travel worldwide to teach NCO and junior officer risk-management courses and to selected brigade and battalion units to assist commanders, at their request, in assessing their safety programs, including POV accident prevention programs.

Every life is extraordinarily precious. The needless loss of any single one has a tremendous impact on the victim's family, the unit, and the Army's combat readiness. The standards, programs, and tools exist to help us protect soldiers from the hazards associated with operating POVs and motorcycles. From the unit level to the joint service level, we each must be dedicated to continually and aggressively enforcing standards and discipline and to using all of the model programs and tools to attack this killer of our soldiers. If your organization needs further assistance with your POV accident prevention programs, contact our staff at **povspt@safetycenter.army.mil**.

Train hard and play hard, but be safe!

BG James E. Simmons

COVER STORY

Safe and Effective FARP Operations

Successful combat operations are often dependent upon effective and efficient forward arming and refueling point (FARP) operations. To ensure safe rearming and refueling of aircraft, soldiers who plan and operate FARPs must be constantly aware of the associated hazards and learn to manage the risks effectively. Field Manual (FM) 1-111, Appendix J, *Forward Arming and Refueling Points*, outlines staff responsibilities for FARP employment. As in other combat operations, safe FARP operations are a command responsibility. Commanders, unit aviation safety officers (ASOs), and other leaders are all ultimately responsible for safety.

SOP

A good standing operating procedure (SOP) is used to help the FARP operation run smoother each time you deploy. The FARP SOP should be tailored to the missions of the unit.

FARP certification

In many units, FARP certification means the first PC in the FARP uses the checklist to conduct the inspection. The PC is often untrained and just "checks the block," and then hurries to get back into the fight. The commander must ensure a solid training program is established to educate those pilots authorized to conduct FARP certification. Forces Command (FORSCOM) Regulation 350-1 restricts the FARP platoon leader from conducting the certification.

Grounding rods

Fuel handlers should always assume that static electricity is present during all phases of operations. Static electricity is impossible to eliminate; however, there are several safety methods for controlling it and its effects. Method one, listed in Chapter 2 of FM 10-67-1, is the only acceptable and safe grounding method at any fixed airfield or refueling point; e.g., an ohms reading of the grounding point. While the FARP may not have a multi-meter, each unit usually has an avionics or armament section that does. In order to achieve the required ohms reading of 10,000 or less, it may be necessary to use multiple rods and prep the soil with a solution of water and salt or other chemicals.

Method two involves specific depth requirements that are based upon soil conditions (see depth chart on page 6). The required depth is a *minimum* standard and is acceptable only when it is absolutely *impossible* to use the first method. It should be noted that the commander must approve of method two if it has to be used.

Markings

All refueling points need some type of marking for ease of identification (see instructions to build marker panel on page 6). During daylight hours the grounding rod, drip pans, and associated equipment

may be sufficient. At night chem sticks, no-power thermal tape (PN-CAMCAL 210T095, Monterey Bay Corporation, P.O. Box 1538, Columbia, MD 21044), or some other form of marking is required.

Refuel tankers have shutoff valves; however, these valves usually are unmarked. While FARP personnel know their equipment, those who may have to help them in the event of an accident need critical items clearly marked. It's also a good idea for aircrews to familiarize themselves with FARP equipment.

Fire extinguishers

FARP firefighting equipment is another issue of concern. Often fire extinguishers arrive at the field site uncharged due to a pin falling out and inadvertent discharge while traveling rough roads. Many times, there are not enough serviceable fire extinguishers because of limited space to transport them. Borrowing an extinguisher from a vehicle solves the problem temporarily, but creates another one in turn. A solution to this problem is to build fire extinguisher holding racks with 2' x 6' boards using a jigsaw or scroll saw. This will prevent the fire extinguishers from rolling around and damaging the nozzle and actuator handles. The racks can be stacked, thereby increasing the number that can be transported. It is a simple matter to design and build what works for you.

Required Depths for Ground Rods

Type of soil	Depth of ground rod
Coarse ground, cohesionless sands and gravels	6 feet
Inorganic clay, claying gravels, grave-sand-clay, claying sands, sandy clay, gravelly clay, and silty clay	4 feet
Silty gravel, gravel-sand-silt, silty sand, sand, silt, peat, muck, and swamp	3 feet

Table 2-6—Excerpt from FM 10-67-1

Site selection and layout

Site selection is critical; you cannot just pick a grid off the map. The FARP platoon leader should recon the route and the actual FARP site during daylight hours. If the platoon leader is not going to lead the convoy into the new FARP location, the convoy commander should accompany the platoon leader on the daylight recon. This is also a great opportunity for a proactive safety officer to identify any hazards with the new site and recommend ways to control risks.

In the desert, the number one environmental problem with FARP site selection is dust. Soil conditions vary from fine powder to large rocks. The powdered areas have to be avoided and are often associated with roads and high traffic areas. Areas with small rocks have proven to be successful

Items needed:

- **2 - Pieces of plywood (approximately 20"x 30")**
- **1 - Piece of heavy canvas material (approximately 20"x 30")**
- **1 - Solid hinge 20" long**
- **2 - Metal, plastic, or wood strips (approximately 20"x 2")**

Screws, bolts, nuts, and washers as needed plus lots of empty sandbags

FARP Point Marker Panel

■ Build a marker and check out the size for your aircraft operations. It needs to be large enough to see, yet small enough for the load plan. You may be able to get by with putting only 3 or 4 sandbags inside to hold the marker down, but I recommend filling it with as many as will fit.

■ The hinge joins the two pieces of plywood at the top, from the inside. The other two ends will be joined with the heavy canvas. Overlap about two inches of canvas at one of the 20" ends. Attach this to the bottom outside of the base side without the hinge. Repeat this on the other side of your triangle. You may want to reinforce these areas with oversized washers or strips of sheet metal. You could also secure the panel to the ground with tent pegs. Paint to protect the wood if you like. Then apply Glint tape or reverse polarity tape as needed for the systems in your unit. Numbers or geometric shapes can be used.

in holding down dust; however, these rocks present an increased possibility of foreign object damage (FOD) to blades. Vegetation sites will also help minimize the hazards associated with blowing sand.

The use of water to wet down the FARP has some short-term benefits, but generally water must be reapplied at such frequent intervals that it is difficult, if not impossible, to keep up with the demand of water needed. Commercial products that might be used for more permanent sites are addressed on page 14.

Winds

Winds are always a factor in helicopter operations, especially in dusty, desert environments. Attached weather personnel should be consulted during the map reconnaissance. A technique that works well in dusty desert conditions is to land directly at the refueling point—not to a Y short of the point. Landing short only raises additional dust. Set up the Y and use it for reference during approach.

Most of the dust clouds are generated in the last 100 to 200 feet just before landing. If your best conditions are in this area, it will significantly reduce the dust cloud during approach. Vehicle traffic in this approach area to restock ammo or other missions can seriously degrade what was an acceptable area.

Terrain

A holding area in a terrain-masked area should be designated. If air traffic control (ATC) is used, the holding area can be farther from the FARP. The enemy situation will dictate whether the aircraft will hold on the ground or in the air.

Proper use of terrain can increase FARP safety by masking tankers and reducing confusion as aircraft enter for refueling. By placing tankers in the low ground, FARP personnel and equipment are protected from enemy detection and chances of aircraft collision are minimized. The latter can be a real concern as landing aircraft enter the dust cloud, particularly at night. Inadvertent drift can become a problem. Also, by hiding the tankers and other ground vehicles, confusion is reduced for crews as they arrive and begin to visually search for the refueling points.

Fratricide

One aspect the commander needs to consider is FARP location in relation to other units on the battlefield. Coordination with the operational brigade can significantly increase security. Lack of coordination with adjacent units likely will result in fratricide issues.

Crew endurance

Fighter management is always an issue with FARP personnel. FARPs are undermanned and often run by a junior sergeant. Crews must be given the opportunity for adequate rest. In many cases, the 3/5 section is probably the hardest-working group of soldiers in an aviation battalion with possibly the greatest impact on mission accomplishment, yet it remains the element with typically the lowest level of manning and the most junior soldiers.

While commanders typically meticulously manage their aircrew endurance policies, they must be vigilant in attending to the work/rest cycles of thier FARP personnel, paying special attention to sleep requirements and heat injury prevention. A FARP team that is moving every 3 to 6 hours and is chronically undermanned is a setup for a fatigue-related accident or heat injury. ■

—Aviation Systems and Accident Investigation Division, DSN 558-9552 (334-255-9552)

Problem recap and proposed hazard controls

■ An effective SOP establishes the standard and gives guidance to all soldiers so the platoon leader can work on other, less-common problems.

■ Only personnel authorized by the commander can conduct FARP certification. These personnel need to be trained in what to look for and how to use the checklist.

■ The proper way to check the effectiveness of a grounding rod is to take an ohms reading. If method two must be used, the commander must approve it.

■ Dust is a primary concern in FARP site selection and layout. Units must get out of the airfield mentality of landing to a Y and hovering to the refueling point. This raises too much dust.

■ Fire extinguishers must be protected to help prevent inadvertent discharge during movements. Bring extras and don't plan on using vehicle fire extinguishers.

■ Fighter management is a continual problem requiring intense management until manning levels in FARP units can be increased.

Investigators' Forum

Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

The Danger of the Assumption

A recent accident investigated by the U.S. Army Safety Center highlights the consequences of making assumptions about airfield operations and about crew coordination. The following example shows how easily things can go wrong and end up in disaster.

Background

The accident in question involved two MH-47E aircraft at the airfield hot refuel facility. The facility, a four-point forward area refueling equipment system fed by a series of fuel bladders, had been moved to its current location in September 2002 from another location on the airfield. The personnel who initially set up the facility had rotated back to their home stations. The units currently at the airfield assumed that because this was the airfield refuel facility, it had been properly laid out and surveys done to identify the hazards. They also assumed that the personnel running the refuel facility had been properly trained and had procedures for sequencing aircraft through the facility. The reality was quite different.

While the distance between the refueling points was adequate, not having a site survey for the hazards at the location resulted in no one being responsible for the refuel operation. More to the point, no one was aware that there wasn't enough lateral clearance for an H-47 to ground taxi to Points Three or Four if another H-47 was occupying Point Two.

Aircraft receive refueling instructions from ground control personnel who, in turn, receive instructions from refueling personnel over handheld radios. Because there weren't any written procedures on sequencing aircraft into the facility, the soldier on the radio determined which point he wanted the aircraft to occupy. In addition, because there were no ground markings at the refuel points showing where an aircraft should stop, over time the refueling point could migrate several feet from its optimum location.

In the diagram on the next page, the aircraft at Point Two was actively engaged in hot refuel operations when the second aircraft called ground control for refuel instructions. After calling the refuel facility over the radio, ground control cleared the second H-47 to Point Three. The pilot in command (PC) of the aircraft at Point Two then requested that the aircraft be cleared to Point Four so that when finished, he could depart without interfering with the second aircraft. This change was approved and the second aircraft attempted to ground taxi to Point Four.

The PC in the right seat cleared the aircraft on his side, as did crewmembers along the right side of the aircraft. The result was that the aft rotor system of the taxiing aircraft collided with the forward and aft rotor systems of the aircraft at Point Two. Nine rotor blades and three rotor heads were damaged. Both aircraft were shut down without additional damage. Fortunately,

Mission: Refuel Operations

HAZARDS

- Breakdown in crew coordination
- Inadequate training of refuelers
- No site survey for facility
- Chronic fatigue

there were no injuries.

While the board determined that the pilots and crew are ultimately responsible for obstacle avoidance, the board also determined that support failures existed that directly contributed to this accident.

In addition, the soldiers operating the refuel facility were from three different CONUS installations. While they had a strong background in bulk refuel, there was no SOP and the soldiers had only minimal training on aircraft refueling operations. Also, they were not familiar with the use of the fire extinguishers present.

Lessons learned

Rotational units deployed to an airfield are essentially tenant organizations, and that includes some inherent responsibilities. When a headquarters establishes or takes over an airfield, people need only look at their home station airfield to see what basic functions and requirements must be accomplished at their deployment airfield.

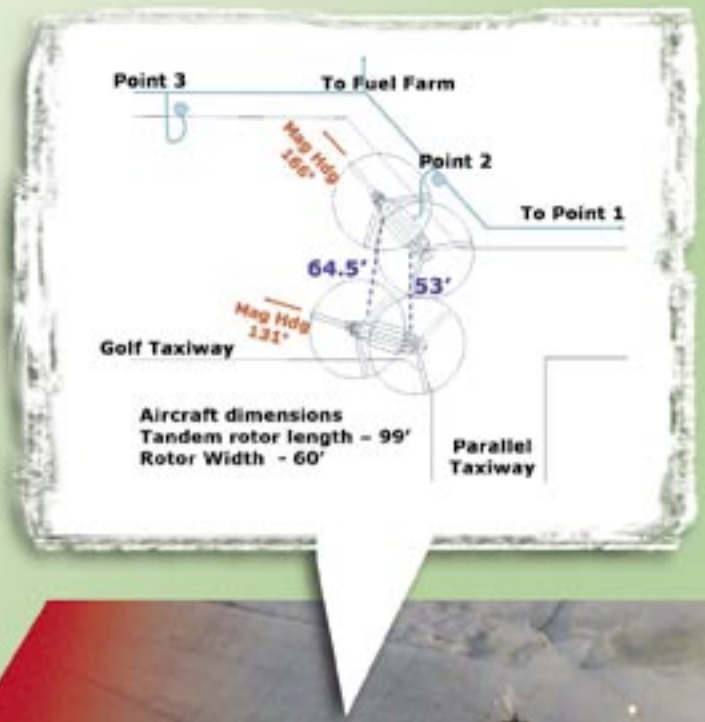
One of these critical functions is airfield operations, and two key positions—the airfield manager and airfield aviation safety officer (ASO)—must be filled. It is critical that personnel in these positions be deployed early in the airflow to ensure the smooth and safe operation of the airfield.

There was no airfield ASO at the time of the accident. During a joint operation, each service must clearly understand the responsibilities of the other services. All aviation organizations must be involved in the airfield operating board and in the monthly safety and standards councils. Procedures covering all aviation-related operations must be established, published, and widely disseminated.

Crew coordination must be done to standard and all crewmembers are responsible for aircraft clearance. If a crewmember sees a dangerous situation developing, that crewmember must speak up immediately and not assume that the pilots are aware of the situation.

Finally, unit ASOs need to periodically get out and "walk the ground" both at their home station and when deployed. Getting out of the aircraft and periodically meeting those personnel who support your operations is the best way to stay abreast of any changes that may be occurring in your AO. It's also a good way to identify hazards that may exist but have been previously missed. Take nothing for granted, assume nothing, and take immediate action to correct deficiencies. ■

—Aviation Systems and Accident Investigation Division, DSN 558-9858 (334-255-9858)



COSTS

- ECOD 1.2$M
- 2 aircraft damaged

CONTROLS

- Recurring crew coordination training
- Implement risk management techniques
- Reevaluate current facility procedures and implement training for refuel personnel

WAR Stories

Risk management lessons learned

I Knew Better

What happened that day changed the way I would do business for the rest of my aviation career...

It was one of those nice, warm, sunny days in May. Just three days earlier, our unit had deployed down to Myrtle Beach to conduct joint air attack team (JAAT) missions with the Air Force for a week. The weather was beautiful; we hadn't seen a cloud in 2 days. The operation was going smoothly and everyone was getting plenty of flight time. Our aircraft were in good shape with very little maintenance downtime. There was plenty of work for all the pilots, both Army and Air Force. I remember hearing our commander comment about how smooth everything was going. Maybe he shouldn't have said anything.

It was a Thursday, about 11 o'clock in the morning. I was the IP of an OH-58C; my left-seater and I were conducting JAAT missions with jets out of Myrtle Beach. Our refueling site, located about 35 miles west of there, had been established to cut down turnaround time. The forward arming and refueling point (FARP) consisted of two fuel handlers and one 49C refueling truck.

We were the first aircraft to come into the FARP on this day. As I retarded the throttle to the flight-idle position, one of the fuel handlers approached the right side of my aircraft. He asked for and received approval to walk under the rotor system to hook the grounding cables to the aircraft. When he got within 4 feet of the aircraft, I heard someone hollering. As I looked to the front of the aircraft, I saw the other fuel handler. He was patting his head, signaling to the other fuel handler that he needed his Kevlar. As I looked back at the fuel handler next to my aircraft, I saw him take off his Kevlar helmet and bounced it along the ground to the other refuel handler.

No big deal, I thought to myself. They know better than to throw a helmet into the rotor system. I told my left-seater that I should probably get out and tell them not to throw things around the aircraft.

My left-seater advised me not to go and re-enforced my belief that the fuel handlers knew better than to throw their helmets into the rotor system.

Famous last words! We decided to finish what we were doing and move out to let the other ship refuel. We moved our helicopter off the refueling pad to a place where we could observe the refueling procedure.

As we watched the refuelers approach our sister aircraft, I noticed they had switched jobs. The guy who had been in front of us operating the pump was now approaching the side of the aircraft to operate the refueling nozzle.

What happened next changed the way I would do business for the rest of my aviation career. The fuel handler next to the aircraft, which was at flight idle, removed his Kevlar helmet and threw it through the aircraft's rotor system. Well, not actually through it; if that had happened, I wouldn't be writing this article.

His Kevlar hit one of the main rotor blades and went flying about 75 yards into the woods. I couldn't believe my eyes! Then I realized that I had become the weak link in a chain of events that leads to an accident.

Here I had the opportunity to stop an accident before it happened, and what did I do? Nothing! This inaction on my part resulted in a lot of time-consuming actions: mission cancellation, aircraft recovery, and accident-reporting paperwork not to mention the mark against our safe-flying record. Luckily, though, no one was injured.

If only I had gotten out of the aircraft and said something to the refuelers, this accident would have never happened. I mean, I knew better! ■

—CW5 (Ret) Bill Ramsey,
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Aviation Maintenance in the Desert

So you think you're ready to deploy? As the aviation maintenance manager, how do you ensure the commander has the necessary assets to meet mission needs? This article addresses some of the most common mistakes that maintainers make while here at the National Training Center (NTC) and some techniques for avoiding those problems in other desert environs.

"Aviation maintenance activities are organized to provide commanders with the maximum number of safe, mission-capable aircraft. These activities must be dedicated to fast, continuous, and reliable aviation maintenance support in the highly mobile, integrated battlefield." —FM 3-04.500. This is the goal of every maintainer. At the NTC, we have observed several trends that cause units not to meet this goal. The NTC is the harshest environment in CONUS and is not very different from the sands overseas.

Trend Number 1: Units deploy with insufficient equipment.

After units arrive in theater is when they discover that tools required for a repair did not get packed. There are several reasons why these tools never made it; the majority of the reasons fall on supervisory responsibility with pre-combat checks and pre-combat inspections (PCC/PCI) as it was overlooked on the packing list.

The key to success is leader involvement prior to deployment. In-progress reviews (IPRs) with key leaders are crucial for a successful deployment. It is important that all sections of the maintenance team understand what equipment is being deployed, to include each type and number of aircraft.

It is important to look at your deployment as if you were deploying to a third world desert country. Do not plan on receiving any maintenance support from external sources until established. Front load as much

maintenance as you can prior to deploying. Units that stop training flights at least a week prior to deploying, using that week to concentrate on maintenance, have the best mission capable rates to support the ground commander.

After arrival in theater, know who is the "rear aviation cell." The rear aviation maintenance officer (AMO) will do the research of the federal logistics log (FEDLOG) or the visual logistics information processing system (VLIPS) to ensure the requisition for the correct item is on request.

If the entire unit is not deploying, the maintenance commander and the production control (PC) officer must have a detailed list of the equipment being deployed, and even more important the equipment left behind.

Ensure that first-line supervisors are completing PCIs. Spot-check their inspections. Review all test, measurement, and diagnostic equipment (TMDE). Just because the torque wrench is packed does not necessarily mean it will not expire and have to get calibrated before receipt or use.

During this planning phase, it is also important to determine the flow of support personnel and equipment. What equipment is handcarried, put on the C5, railed, or put in the back of a 40-foot sea-land van? A maintenance test pilot (MTP) on technical inspector (TI) orders with a couple of crew chiefs should accompany the first aircraft into port and theater. Provide maintenance support to last aircraft deploying as well as the first. Consider the flow of aircraft into theater and how to support the commander with the maximum number of safe, mission-capable aircraft during reception, staging, onward movement, and integration (RSOI), as well as the aerial port of embarkation (APOE).

Trend Number 2: Maintenance personnel have poor tactical situational awareness.

"The combat mission of aviation units must remain the foremost consideration in the functions of AVUM and AVIM units. Resources and priorities must be tailorable to changing combat situations." —FM 3-04.500.

Maintenance soldiers all too frequently perform the same duties they do in garrison without any idea of the unit mission or even when aircraft will depart on missions. Maintenance command posts fail to put out orders, battle track, and disseminate tactical information.

Units must fix problems as they arise. Continually deferring maintenance "until we get time" is a recipe for failure. Always make plans for the next 24 hours, but the trick here is to integrate the tactical situation into the task force and brigade plans. Are we attacking or defending? What happens if the defense fails? This can affect your decision to start deferred maintenance tasks. It also affects your priorities of work; such as which aircraft should you work on and which one should you save until you have a larger window of opportunity.

Is it wise to start a complicated lengthy job the same time the brigade is defending? What is the plan to displace rapidly should the brigade's defense fails? Is there a plan to move forward with the success of the brigade's attack? Maintainers must understand the tactical context in order to tailor their resources.

The staff must identify the assets they need for their plan during the military decision making process (MDMP). The maintenance company needs to be included in the tasks so subordinates can prioritize their efforts. An example is: "*D Company provides maintenance support for four flight hours per aircraft with a minimum of six AH-64s and two UH-60s from 192300AUG02 to 200300AUG02*."

Maintenance test flight areas should be integrated into the A2C2 plan. Ideally, MTF

areas are pre-designated by the unit on the battlefield and are activated as required through the aviation control order (ACO). Ensure the ACO is understood by the MTPs for MTF needs and that the order is clear and concise for sister services to understand needs. Identification, friend or foe (IFF) loaded and operational?

Trend Number 3: Units fail to prepare for and keep up with desert maintenance.

What can you do to help fight off the effects of the desert? Prior to desert operations, ensure the engines are clean (hot and cold sections). Prepare in-flight health indicator test (HIT) check baselines. Ensure pilots know how to do them correctly. This will prevent spending extra time on the ground, which results in dust ingestion.

Main rotor blades and tail rotor blades wear quickly in a sandy environment. Look up "Blade Repairing and Spot Painting" in your aircraft's TM. The two part epoxy-polyamide applied with a small roller lasts longer than flat black spray paint and "Mopp-and-Glow." Paint blades after every mission. Ensure pilots are conducting a thorough post flight to alert maintenance personnel early to blades that need repairs. Assemble kits with all the parts to replace blades and tip caps.

Flushes are one of the most important preventive maintenance tasks. Encourage water flushes every 10-12 hours. TB 55-2840-248-20-17: *Sandy Environment and/or Combat Operations for T700 Engines* (T700, 701 and 701C) recommends "Normal aircraft compressor cleaning in sandy or dusty/dirty environments should be performed every 50 engine hours. Hot section cleaning of engines should be accomplished at 50 hours or sooner depending upon hot section component condition." Keep the aircraft as clean as possible; do not let dust and dirt accumulate. Do you have the necessary items to perform hot end flushes; if not, manufacture while you have the capability.

Best maintenance actions are proactive. Bearings, seals, and rotor blades take abuse in the desert. Use "pressure bug sprayers" to direct water flow on spherical bearings to get the sand out to ease the pitting, erosion, and wear. Keep all surfaces that come into contact with seals as clean as possible (wipe them down after each flight, struts, servos, rod end bearings). Use organic assets—pressure washers from the motor pool, NBC decon sprayers from the NBC section, or FSB work great to keep hydraulic decks and flight controls clean. If there is binding in flight controls, the cause is probably sand and the cure is to clean them regularly. Extend and wipe servos with hydraulic fluid dampened rags or towels to clean and protect seals. Wipe dry to prevent sand from sticking.

Best maintenance actions are proactive. Bearings, seals, and rotor blades take abuse in the desert. Use "pressure bug sprayers" to direct water flow on spherical bearings to get the sand out to ease the pitting, erosion, and wear.

Back to home station

Once the hostilities have ended, the maintenance manager's job is still far from over. The next big hurdle is the plan to get the aircraft back to home station. Do not allow pilots to take shortcuts in a rush to get home. Do not allow current maintenance faults to be deferred until the aircraft is flown back home. Execute echelon maintenance assets to support the redeployment just as you did deploying. What maintenance assets are pushing and who is receiving?

Editor's note: This article has been adapted from an article published in Army Aviation Magazine regarding aviation maintenance at the NTC. Our purpose is to help units win the maintenance battle in any desert environment. This is by no means an all inclusive checklist for success. The Eagle Team Web page, ***http://www.irwin.army.mil/eagle/index.htm****, contains a wealth of information.* ■

—CW4 Thomas Jackson is a member of the NTC Eagle Team at Fort Irwin, CA. He can be reached at DSN 470-4463 (760-380-4463) or E-mail eagle26@irwin.army.mil

CREW Commo

Aircrews talking to each other

The "Crew Commo" is a new addition to Flightfax. It's designed to provide professional updates to aviation safety officers (ASOs) in field assignments. Items of special interest are risk management worksheets, SOP management, reviews of new or modified regulations, information derived from recent Aviation Resource Management Survey (ARMS) inspections, current developments in the Army Safety Program or in Army Aviation that affect you daily. E-mail your questions to safetypolicy@safetycenter.army.mil or call DSN 558-2477 (334-255-2477), and we will address your questions as soon as possible. In addition, we will publish selective questions and answers from the U.S. Army Safety Center ASO list server. Let me remind you that this new segment can only be successful with your active involvement to provide practical solutions to the safety problems we are all facing.

CCR Nozzle Separation

Q. Has your unit's closed-circuit refueling (CCR) nozzles leaked or separated from the helicopter while refueling at a FARP in field conditions? Has any of your CCR ports not accepted CCR nozzles which required the helicopter to be 'cold' refueled? My unit has had a few FARP nozzle-aircraft separations in the last 2 years. I am trying to get feedback of other OH-58D units that have had similar problems.

A. Fort Rucker has experienced five OH-58A/C and one UH-1H CCR nozzle separation in the last 18 months. In one case, an alignment lug was broken on the nozzle, the others happened for undetermined reasons. We are still monitoring this issue. I can send related message traffic to any interested parties.

—Robert L. Beaman, Assistant Director of Safety, LSI BCS Division, 334-255-4183

Aluminum Matting

Q. What are the installation requirements for the aluminum matting used to make helipads? The stuff is about 2 inches thick and it interlocks together. Along the same line, does anyone know of a liquid spray that is used to harden sand or dirt so that it can be used as a helipad? I understand there is an environmentally-friendly product used at Fort Irwin for that purpose.

A. For both questions, see the charts on the next two pages and also check the USAEC/USACERL Technical Report dated September 1996, "Tank Trail and Road Segment Dust Control."

—CW3 William V. Rains, Squadron ASO, 1st Squadron, 1st U.S. Cavalry, Büdingen, Germany, 314-321-4290

Supa-trac Characteristics & Performance

Applications:	Temporary Roadways, Maintenance and Staging Areas, Helicopter Pads, Aircraft Taxiway, Crane Pads, Construction and Beach Access, Heavy Duty Surface Matting
Construction:	High impact, Non-slip ABS/Light Gray & Black Edge
Weight:	4.4-lb/2.02 kg per panel 1.65 lb/sqft - 8.1 kg/m2
Basic Panel Size:	38" L X 10" W/ 950cm X 25cm Three panels plus edge ramps give a 3m (9.85') wide road
Max. Load Capacity:	22,000 lb (11 ton)/axle 10 metric ton/axle
Laying & Recovery Rate:	4860 sqft/hr, 3 person crew 450 sqm/hr, 3 person crew 4000 m road @ 3 m Width by 4 persons in under 8 hours
Area Coverage & Sizes:	Any size, fully modular, including "T" and "+" segments
Length/Width Available:	Assemble to any length & width, continuous/edge ramps included
Transport/Storage Size:	Stored as flat "sections" - Std 40 X 48 Pallet/ 42" h = 378 sqft plus - 463L Air Pallet (stacked to 48") = 1,890 sqft plus 748 edge ramps or 187' of (9.85'W) Roadway Roll-up in 5 m length / 3 m Wide – 2 persons can carry
Anchoring Method:	Ground pegs through 1" holes in edge ramps
Properties: Non-Skid Surface Use Temperature Range Storage Temperature Cleaning Stress/Crack Resistance Corrosion Resistance Petroleum/Solvents UV Resistance Water Resistance Salt Resistance Chemical Resistance Tear Resistance Impact Resistance Flame Resistance	 Unidirectional non-skid tread -40 - 100 °+ F -40 - 100°+ F High pressure wash w/ detergent Outstanding Outstanding Excellent Good Impermeable, Self Draining Good Excellent Excellent Excellent Excellent (UL94HB)
Operational Life:	100+ lay/recover cycles or 700+ days of continuous use
Storage Life:	25+ years (covered storage)

For More Information Contact: Steve Miller at ROLA-North America, Government Sales, C/O INDEF POB 89 Amissville, VA (540) 937-7327; fax 937-7328; e-mail indefsteve@msn.com

COMPARISON (Pro/Con)

The following areas were used to compare the two products listed in priority of importance to the user (7th Group). A brief remark highlights some areas.

FACTOR	DURABASE	ROLIMAT	REMARKS
Proven Use	CON	PRO	Some military use of ROLIMAT but no contact to confirm.
Deployability	CON 27(Cont)	PRO (8 Cont.)	ROLIMAT can be configured for container, pallet, 463L etc.
Terrain Restriction	CON	PRO	DURABASE requires some leveling of surface to ensure connectivity with other pieces. ROLIMAT is flexible and can be configured to meet terrain requirements. Engineer support required.
Versatility	CON	PRO	See configure above as well as deployment platform flexibility.
Maintainability	CON	PRO	Some soil stabilization may be required for ROLIMAT after heavy use (2-3 days). Contact with POC required to confirm.
Weight	CON	PRO	Heavy troop use or MHE required for DURABASE.
Construction Time	PRO	CON	Due to ROLIMAT having more sections, it takes longer to assemble.
Construction Process	CON	PRO	DURABASE requires connectors and tools while ROLIMAT connects with itself-anchored with stakes.

"Photo courtesy of CW5 Alfred Rice, 224 MI BN."

AH-64D Longbow Tool Kit Modification Authorization

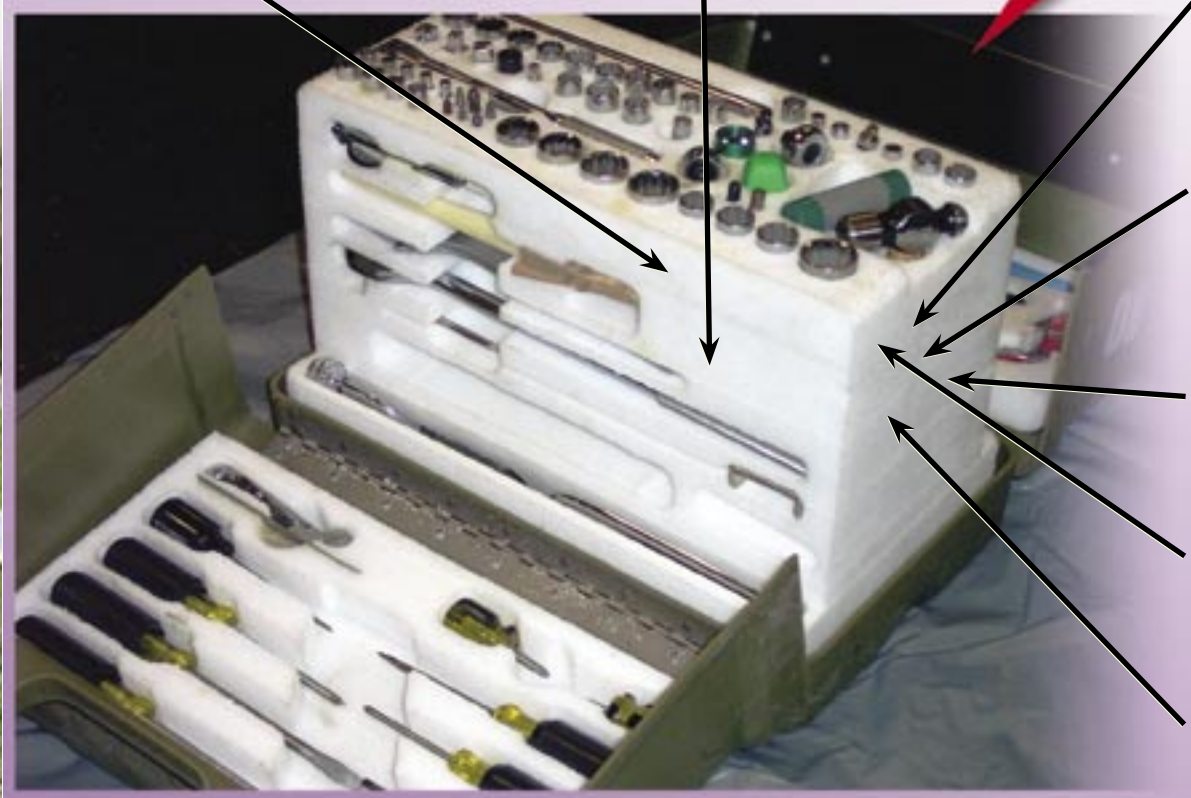
Attention, Longbow mechanics (MOS 67R), you are now authorized to modify your tool kit (NSN 5180-00-323-4692). There are seven additional hand tools required to perform daily maintenance on the AH-64D helicopter; however, there is no approved method to store and secure these additional tools. See below to illustrate how to modify your tool kit.

Contact Mr. Lloyd Hopkins, Apache PM, to request funding to replace foam inserts if a unit is required to return the tool kit to a standard configuration, DSN 897-4072, Lloyd.hopkins@peoavn.redstone.army.mil.

—LTC Earl Myers, Deputy TSM-L, DSN 558-3534 (334-255-3534), myerse@rucker.army.mil

Cut out the Tool Kit, Aircraft Mechanic's, General (Lin W30949) foam in the shape of the screwdriver, ball in the below locations. The screwdriver attachments and extensions are also to be placed in the locations depicted below by drilling holes in the foam end.

Tool Kit Modifications



2002 AAAA Winners!

The Army Aviation Association of America (AAAA) recently presented the annual LTG Ellis D. Parker Aviation Unit Awards recognizing achievements by individuals and units during 2002. The 2002 award recipients are as follows:

■ Overall Winner and Combat Category Winner: **2nd Battalion, 101st Aviation Regiment, Fort Campbell, KY**

■ Overall Winner and Best Combat Support Battalion: **7th Battalion, 101st Aviation Regiment, Fort Campbell, KY**

■ Best Combat Service Support Battalion: **56th Medical Evacuation Battalion, Fort Bragg, NC**

■ Best Table of Distribution and Allowances Battalion: **1st Battalion, 223rd Aviation Regiment, Fort Rucker, AL**

■ Air Traffic Control Company of the Year: **C Company, 1st Battalion, 58th Aviation Regiment, Fort Campbell, KY (CPT Anthony Taylor, commander, and 1SG Kenneth E. Russell)**

■ Air Traffic Control Facility of the Year: **1st Battalion, 58th Aviation Regiment, Kandahar Army Airfield (CPT John Knightstep, former commander, and 1SG Kenneth E. Russell)**

■ Air Traffic Control Manager of the Year: **SSG(P) Christopher D. Briggum, C Company, 1st Battalion, 58th Aviation Regiment, Fort Campbell, KY**

■ Air Traffic Controller of the Year: **CPL Michael L. Taylor, 1-58th Aviation Regiment, Fort Campbell, KY**

■ Air Traffic Control Maintenance Technician of the Year: **Mr. Eric Williams, E Company, 12th Aviation Battalion, Fort Belvoir, VA**

■ Outstanding USMA Cadet of the Year: **2LT Cole Spitzack, D Co., 1st Battalion, 145th Aviation Regiment, Fort Rucker, AL**

■ Outstanding ROTC Cadet of the Year: **2LT Michael J. Milas, D Co., 1st Battalion, 145th Aviation Regiment, Fort Rucker, AL**

■ The Army Aviation Air and Sea Rescue Award: **MAJ James Myrick and 1SG Stanley Wojtowicz, 3rd Battalion, 160th Special Operations Regiment, Fort Campbell, KY (Puerto Rico)**

■ Aviation Medicine Award: **CPT (Dr.) Larry McCord, 101st Aviation Regiment, Fort Campbell, KY**

■ The Fixed-Wing Unit of the Year Award: **15th MI Battalion, Fort Hood, TX (MAJ Kirk E. McIntosh, Executive officer, and CSM Dennis M. Rydell)**

■ Trainer of the Year Award: **CW3 Andrew C. Sentiff, Standardization Instructor Pilot and flight leader with B Company, 2nd Battalion, 160th Special Operations Regiment, Fort Campbell, KY**

Congratulations
to all recipients for their significant achievements in Army Aviation.

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class C:** The crew experienced technical difficulties with the TADS during the second flight of the evening and returned to the Army Air Field. The post-flight inspection revealed that the TADS night-side shroud was missing. Crew had reportedly confirmed the cover was secured during the pre-flight walk-around for the second iteration.

■ **Class C:** During post-flight inspection, the crew noticed damage to all four blades, which indicated some sort of blade strike.

■ **Class C:** Post-flight inspection revealed tail rotor damage from suspected tree strike.

D Model

■ **Class B:** While the aircraft was in phase maintenance, the mast-mounted sight was dropped approximately 12 feet during hoist operations.

CH-47

D Model

■ **Class A:** While conducting a day terrain flight approach to landing at an approved pinnacle site, the ground beneath the aft landing gear collapsed. The aft fuselage fell below the pinnacle surface allowing the main rotor blades to contact the terrain. The aft pylon separated from the fuselage as the aircraft tumbled down the slope. The aircraft came to rest nearly upright at the bottom on the pinnacle, facing approximately 180 degrees from its original heading, and was destroyed in the post-crash fire. Two crewmembers received minor injuries. (This was from a late accident report.)

■ **Class B:** On landing, aircraft experienced a brownout to an unimproved landing zone. The left aft gear separated from the aircraft after striking a berm. The aircraft landed hard, slid 30 feet, and came to a rest.

■ **Class C:** Aircraft landed on uneven terrain resulting in three aft rotor blades striking the ground. The crew landed and shutdown the aircraft without further incident.

■ **Class C:** Aircraft landed on a road and was taxiing forward when the road underneath the aircraft gave way. The left aft landing gear slid into a 3-foot-deep ditch and snapped the swivel housing. The aircraft unloaded its cargo and returned to the airfield.

HH-60

L Model

■ **Class C:** The anti-collision light shield separated during flight and contacted the tail rotor blades. The damage was discovered during the post-flight inspection.

MH-60

L Model

■ **Class A:** Aircraft impacted the terrain during night aerial gunnery training. All four crew members sustained fatal injuries. Investigation is ongoing.

UH-60

L Model

■ **Class C:** Aircraft contacted wires during an ATM training flight. The WSPS functioned as designed and severed all three wires. The aircraft sustained damage to the ALQ-144 and the tail wheel strut area. (The wires were reportedly not depicted on the published hazard map).

OH-58

DI Model

■ **Class A:** During snow qualification training to an unimproved landing area, the crew experienced white-out conditions. The aircraft drifted to the right, struck several trees, and came to rest upright between the trees. The main rotor blades were destroyed and the mast-mounted sight was damaged. Investigation is ongoing.

TH-67

■ **Class C:** While performing a steep approach, the engine (N2) over sped to 111 percent for approximately 10 to 15 seconds. The PC terminated the approach to a hover, which brought the N2 within limits. The PC hovered the aircraft to parking and completed an emergency shutdown.

C-26

B Model

■ **Class C:** The aircraft was performing a service mission. After approximately two hours of flight, the left engine failed. The aircrew performed emergency actions and landed the aircraft.

RC-12

K Model

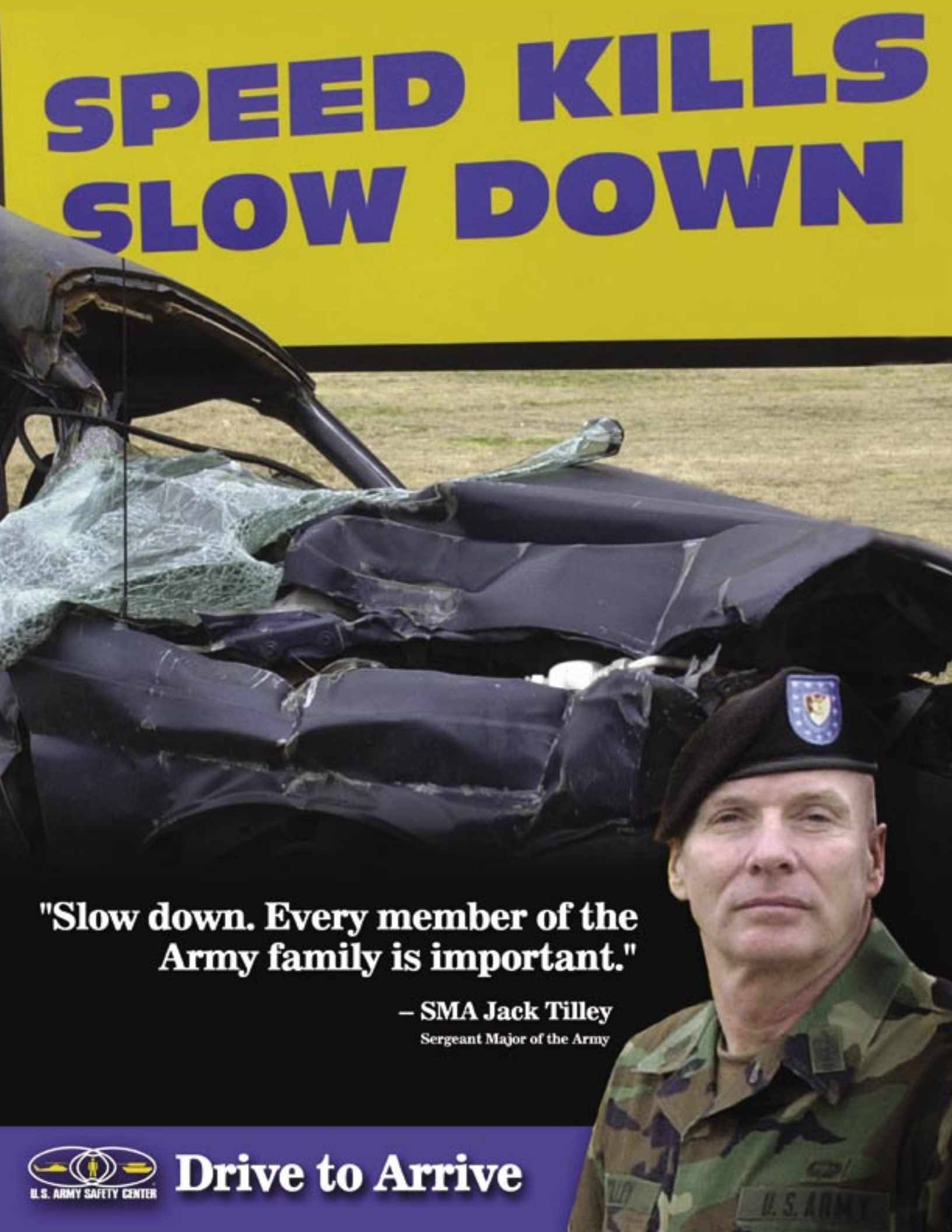
■ **Class E:** During cruise flight at FL290, 70 NMs off the NY coast, the #1 engine oil pressure dropped to zero. PI verified as PC performed #1 engine shutdown IAW checklist. PC declared emergency w/ATC while PI performed unscheduled, single-engine landing. Transient alert tugged aircraft from taxiway to hangar. Maintenance discovered that the oil cooler on the #1 engine was cracked and had blown most of the engine oil (2nd time in 2 days). Maintenance replaced the oil cooler, MOC'ed and released for flight.

N Model

■ **Class E:** During cruise flight at FL270, the left windshield cracked. Aircraft landed without further incident. Windshield was replaced.

Note: For more information on selected accident briefs, call DSN 558-9552 (334-255-9552). Information published in this section is based on preliminary mishap reports submitted by units and is subject to change.

SPEED KILLS SLOW DOWN



"Slow down. Every member of the Army family is important."

– SMA Jack Tilley
Sergeant Major of the Army

U.S. ARMY SAFETY CENTER

Drive to Arrive

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

APRIL 2003 ✦ VOL 31 ✦ NO 4

NVG

DESERT OPERATIONS

LESSONS LEARNED FROM DS/DS

PLUS: The Black Hole Of Night: SHIPBOARD OPERATIONS

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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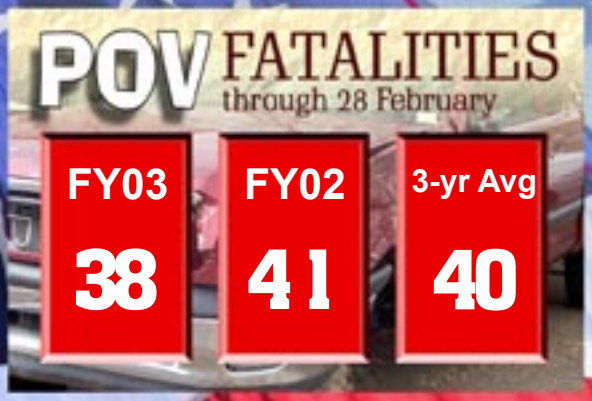

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James E. Simmons
Brigadier General, US Army
Commanding

DASAF's CORNER

from the Director of Army Safety

PPE: It Can't Protect You If You Don't Wear It

Today's soldiers are the best-trained, best-equipped, and best–led in our Nation's history. I could not be more honored or more proud to wear this uniform of the United States Army. From having visited soldiers within every Army division during the last few months, I know that feeling of honor and pride is felt by all of our soldiers, whether they are currently at home station, deployed to Afghanistan, or forward deployed for the potential war with Iraq.

The expenditure of millions of dollars in developing and fielding personal protective equipment (PPE) for soldiers is evidence of the Army's commitment to keeping our soldiers as safe as possible. That PPE—Kevlar helmets, flak vests, Nomex gloves, balaclava hoods, seatbelts, hearing and eye protection, Nomex tank and flight suits, etc.—is provided to soldiers for a reason: to reduce the risk of severe injuries.

The Army standard is that, unless you have a waiver, you will wear all required PPE while performing tasks, duties, and operations that may expose you to personal injury hazards. If it's an Army standard to wear PPE, why do we still have soldiers who are injured or killed because they were not wearing it?

In just the last few months, there has been an increase in the number of instances where soldiers have been severely injured or killed while not wearing required PPE during the performance of their duties. We have had soldiers ejected from vehicles when they were not wearing seatbelts. We have had a company commander killed when a piece of shrapnel struck his bare head. Where was his Kevlar? Why was he, *as the leader*, not setting the example and wearing his PPE when there was no valid waiver permitting the unit to operate without it?

Failure to wear required PPE is clearly and simply a matter of indiscipline—knowing the standard and willfully choosing to violate it. Just because the Spalding vest may dig a bit into even the leanest of waistlines or push up into the chin when sitting inside the tank is not justification for not wearing it. Expended shell casings are hot when they're ejected. Yes, gloves may be a little cumbersome, but they are designed to help keep your hands protected.

The Army holds us as commanders accountable for the safety of our troops. The troops will emulate their leaders; therefore, we as leaders must demonstrate what "right looks like" all the time. So it's a command responsibility that leaders at every level not only set the example by wearing required PPE, but also diligently *enforce the standard* of wearing it.

As great warfighters, we have to be confident and aggressive. But at the same time, we cannot allow that confidence to convince us that we are invincible. There is not a single one of us with a big yellow "S" emblazoned on our chest. If the operation we are conducting has a standard for wearing PPE, we owe it to ourselves to wear it so that it can protect us from the hazards it has been designed to mitigate.

If you will not wear the PPE the Army has invested millions in for yourself, wear it for your family. Whether you are conducting routine training or on the battlefield, they want you back—unharmed. In that critical moment, the finest, most technologically advanced PPE that money can buy will not protect you if it is not on your body and being worn as it was designed to be worn.

Train hard, be safe!

BG James E. Simmons

NVG DESERT OPERATIONS

LESSONS LEARNED—13 YEARS IN THE MAKING

Army Aviation units deploying to Southwest Asia for possible combat against Iraq have a significant advantage over units that saw action during Operations Desert Shield and Desert Storm. Over the last 13 years, units have rotated through Kuwait on numerous training exercises and that experience has been invaluable for those units that now find themselves poised for combat against Iraq.

Pilots who flew missions during Desert Shield/Storm and had trained in the deserts of Arizona and the National Training Center may have noted some similarities in the dry lake beds and scrub terrain; but the shifting sand dunes of the deserts of Southwest Asia presented totally new hazards to helicopter crews, particularly during night vision goggle (NVG) operations. The combination of visual illusions, featureless terrain, and extreme temperatures creates unforgiving situations for NVG crews not trained in this environment.

Today's pilots benefit from those lessons learned and have had 13 years to improve and hone those skills; however it is important that we take a moment to reiterate those lessons learned since Desert Storm.

Illumination

Illumination is one of the most important factors in NVG mission planning. Pilots should use forecast moon position in NVG planning to ensure crews do not fly directly into a rising or setting moon. The angle of the moon has a positive, as well as a negative, effect on how things appear on the ground when viewed through NVGs. The moon at low angles (less than 30 degrees) may distort the shape of terrain features, making them hard to correlate with a map; while higher angles (70 to 90 degrees) and high illumination levels (80 percent) can cause washout of terrain detail with a corresponding decrease of visual cues. The optimum moon conditions for NVG operations in the desert may be 40 to 80 percent illumination and a 40 to 80 degree angle above the horizon.

Sand dunes

Of the three types of desert terrain, the one found to be most hazardous to helicopter NVG operations are the sand dunes. The crews found that in some modes of flight over sand dunes, the aircrew training manual (ATM) authorized airspeeds that were too fast.

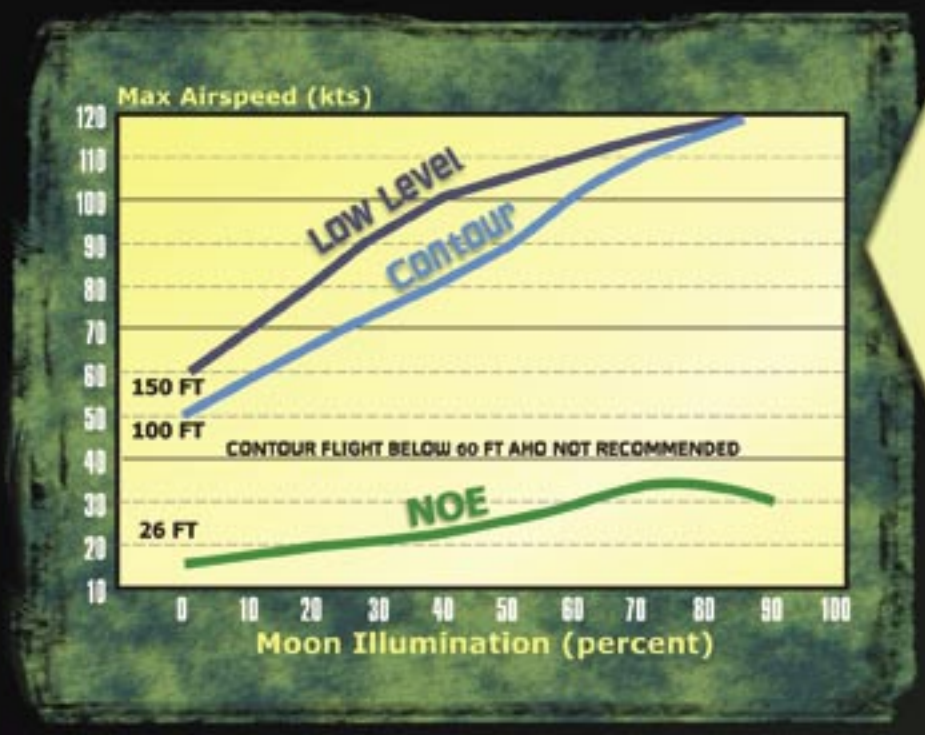
■ **Nap of the earth (NOE)**. The authorized airspeed for NOE flight is 40 knots, but an aircraft flying in zero illumination at 25 feet in sand dunes should fly just ahead of effective transitional lift (ETL). In fact, NOE flight at 40 knots in the dunes is not recommended even at the highest illumination levels. The watchword is when low, go slow. Just keep in mind that at airspeeds below ETL, you may encounter rotor induced blowing sand.

This might bring up a question of whether NOE flight should be conducted at all in the dunes. The answer is yes. By flying low, aviators will be able to see visual cues (such as camel or vehicle tracks) that are not visible at higher altitudes.

Flying in a straight line NOE over dunes is extremely hazardous. Aircrews should follow low ground between the dunes—using scrub, contrast, and texture for cues—instead of trying to go over the tops of the dunes.

■ **Contour**. Flying contour in the dunes is not recommended. It is difficult to judge dune height and adequately assess obstacle clearance.

■ **Low level**. Ground references may be



MISSION PLANNING CHART for FLYING IN SAND DUNES. Numbers include no safety margins; altitude and airspeed must be adjusted for less than optimum conditions.

lost when flying low level (at 80 feet above highest obstacle {AHO}). For this reason, it is imperative that all obstacles in the area of operation or route of flight be identified. However, local maps of the region often lack detail and hazards may not be marked. That means aviators may have to conduct a day reconnaissance if at all possible.

Hazard maps should also identify terrain transition areas. Watching for changes in contrast, texture, and other visual cues can help to identify terrain transitions.

Another important point that must be kept in mind is that hazards in the desert are constantly changing. The sand dune that was located and marked one day may be in an entirely different place and a different height a few days later.

Because ground references may be lost when flying low level, the pilot on the flight controls may be required to refer to basic flight instruments (a situation similar to flying IFR). It is extremely important that during pre-briefing before every flight, all crewmembers are told what their specific duties and responsibilities are, where they're supposed to be scanning, and what they're supposed to be looking for. This is true regardless of the mode of flight. Again, crew coordination and scanning are critical for safe flight.

The TC 1-210, *Commander's Guide*, states that low-level aircrews may fly at whatever airspeed operational requirements dictate and aircraft limitations allow. The chart above shows the demonstrated relationship between moon illumination and altitude as they pertain to optimum condition max airspeed. For example, an aircraft flying low level at 100 feet AHO in the dunes with 70 percent illumination can safely be flown at 110 knots. This is, of course, provided that detailed mission planning and route selection take place where the highest obstacle is known and visibility is unrestricted. It also allows for no safety margin. As in any operation, the risks of flying at higher airspeeds have to be weighed against the risks of not getting to the objective as fast, as well as vulnerability, fuel consumption, etc.

Approach to visibility altitude is recommended when descending from low level or greater altitudes. Aviators flying in the Kuwaiti desert have found the safest technique is to step down to an altitude where ground reference can be regained (approximately 80 feet, depending on terrain and illumination). Recommend an approach airspeed of 40 to 50 knots be maintained until the visibility altitude is reached. After reaching that altitude, continue the approach or transition to another mode of flight; e.g., contour or NOE. In other words, use a stepped-down approach.

Visual illusions

It is critical that pilots be familiar with visual illusions that may affect safe NVG flight. All of the visual illusions listed in chapter 1 of TC 1-204 can occur in the desert environment. The illusions shown in the sidebar to this article (page 8) are the ones most frequently encountered in desert conditions.

Although these illusions can, and do, occur over all types of desert terrain, they occur frequently at all altitudes in the dunes. It is vital that aviators are aware of such illusions and that they crosscheck each other during flight to be sure illusions are not being experienced. Crewmembers can also assist each other by calling out altitude, airspeed, and attitude.

Equipment

The kind of equipment available and the crewmembers' understanding of its capabilities and limitations can greatly affect the safety of desert operations.

■ **Navigation**. The most accurate navigation tool available is the global positioning system (GPS). However, aviation-related intelligence must be actively pursued; i.e., to document wires, towers, and terrain relief and pass it along to flight operations to post on centrally located hazards map.

■ **IR landing/search light**. This light is most effective at near-zero illumination levels; it can cause terrain washout at illumination levels of 30 percent and above. Use of the light tends to limit pilots' scan to within the area of beam spread. Pilots need to be aware of this tendency and consciously expand their scan to either side of the light beam. The light may cause brownout when used below ETL because of the reflection from dust in rotor wash. In dusty terrain, the light should be switched off before approach or takeoff to avoid brownout. A risk that must be kept in mind during combat operations is that this is a light- and heat-emitting active source that persists after the light is extinguished, providing a target for enemy sensors.

■ **Radar altimeter**. The radar altimeter is the most critical flight instrument during contour flight, approaches, and OGE maneuvers. Pilots have been known to misjudge altitude by plus or minus 70 feet when not using a radar altimeter, and it should be required for all flights below 150 feel AGL. Aircrews should remember that the radar altimeter only gives altitude directly beneath the aircraft; it provides no direct measure of terrain ahead.

■ **Night vision goggles**. With the harsh environment that the desert imposes, it is inherent that aviators take extra precaution to properly maintain their goggles. The lenses must be kept clean and the goggles stored in the zipped storage cases when not in use. Also after removing the goggles, the storage cases should be kept zipped to keep out the sand and dust.

Crew coordination and scanning

One of the most critical aspects of safe desert NVG terrain flight is effective crew coordination and scanning. The Southwest Asia Leaders' Safety Guide, published by the U.S. Army Safety Center, provides examples of how effective crew communication and proper sequence or timing of crew actions are addressed during mission planning; how crew responsibilities are assigned, discussed, and possibly rehearsed during the pre-mission brief; and amending responsibilities as necessary during the mission. Procedures for positive communication, directing and offering assistance, announcing decisions, and action sequence and timing are provided along with examples of each element in the procedures.

Crewmember scanning responsibilities for the pilot on the controls, the pilot not on the controls, and non-rated crewmembers are condensed into a table covering the three modes of flight: NOE, contour, and low level.

Crew selection

Keeping the same crews together becomes increasingly important in harsh environments like the deserts of Southwest Asia. Coordination is much easier for crews who

have learned to work together than for those who must constantly integrate and train new crewmembers. While keeping the same crew together may present some difficulties for aviation units, it pays off with more effective crews and improved safety.

Risk management

Risk management is the process of identifying and controlling hazards to conserve combat power and resources. Leaders at every level have the responsibility to identify hazards, to take measures to reduce or eliminate hazards, and then to accept risk only to the point that the benefits outweigh the potential costs. The three basic principles that provide a framework for implementing the risk management process are:

- Integrating risk management into mission planning, preparation, and execution.
- Making risk decisions at the appropriate level in the chain of command. The commander is responsible for the mission and gives guidance on how much risk he is willing to accept and delegate.
- Accepting no unnecessary risk. Risk-taking requires a decision-making process that balances mission benefits with costs.

The Southwest Asia Leaders' Safety Guide provides steps to be used in the risk management process and an overall comparative risk analysis of the most critical NVG mission considerations in the Southwest Asian environment. Also included are METT-T considerations specific to night/NVG desert operations.

Conclusions

The dust of Desert Storm has long settled and since that time, we have reaped the benefits of experience gained in the desert environments of Southwest Asia. Aviators whose training is based on those lessons learned from previous crews flying under extremely treacherous conditions will be better-trained pilots...and better-trained pilots are safer pilots. ●

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Visual illusions

- **False horizon or lack of horizon**. Light-colored areas of sand surrounding a dark area; for example, sand dunes bordering a dry lake bed blending with the night sky can create a false horizon. Sand, dust, haze, or fog may also obscure the horizon.
- **Height perception illusion**. This sensation of being higher or lower than you actually are is due to poor contrast and lack of visual references. It may result in a tendency to inadvertently descend to acquire visual cues.
- **Ground light misinterpretation**. This illusion can occur when ground lights are confused with stars or other aircraft. An aviator who confuses ground lights with stars will unknowingly position the aircraft in unusual attitudes to keep what he perceives as stars above the aircraft. When ground lights are confused with other aircraft, aviators adjust attitude incorrectly based on relative position of misinterpreted ground light.
- **Fixation**. When an aviator fixes attention on high-interest targets/objects and stops scanning, the result may be an aircraft flown into the ground.
- **Crater illusion**. Viewing the periphery of the IR searchlight gives the illusion that flat terrain, such as that found in a dry lake bed, slopes upward. Viewing another aircraft landing using these lights can give the illusion that the observed aircraft is descending into a crater when it is actually in straight and level flight over flat terrain. (This illusion is not covered in TC 1-204.)
- **Lack of motion perception (motion parallax)**. At low level flight altitudes at relatively slow airspeeds, the lack of discernible terrain features may make the pilot think his aircraft is at near-zero groundspeed when it is actually moving forward.

Taking Back the Night

Imagine for a moment that you are the PC of the UH-60 Black Hawk in the following vignette—

The objective, a pocket of al-Qaida near the border of Pakistan, is less than 8 kilometers ahead. The mission is to insert troops near the objective via our flight of five Black Hawks. We're inbound on chalk three and should be landing in a few moments.

At near zero illumination, it couldn't be better for masking our flight; but it also couldn't be worse for getting the 'pucker-factor' way up. The landing zone (LZ) is supposed to be a craggy, dusty bit of low ground just below a ridgeline and out of sight of the objective. All of our aircrews are wearing Type 1 and Type 2 Aviator Night Vision Imaging Systems (ANVIS). Except for the artillery flashes in the distance lighting up my night vision goggles (NVGs), all I see are the ghostly silhouettes and exhaust plumes of the two aircraft ahead of mine. There's plenty of 'video noise' in my NVGs, much like you see on a television that's lost its signal. That makes it very difficult to pick out ground references, but we've all become used to that problem on dark nights like this.

It's time. We've begun our approach to the LZ. We're in a staggered-right formation with our flight stacked down so that our trail aircraft will touch down first. That will lessen the chance that the lead aircraft will brownout the LZ and make it impossible for others to land behind him.

Chalk four has just announced a go-around due to brownout! This could be ugly. He should be passing high and to my right, but I'm way too busy to watch out for him. I'm concentrating on my approach. My crewchief is calling the dust cloud. 'Dust cloud at the tail! MY door! YOUR DOOR!' I feel our tailwheel hit the ground just as we're totally engulfed in a vicious dust cloud.

My main wheels hit the ground hard. I stand on the brakes and we grind to a halt. At that instant, I see a flash of light from my right front that shuts down my goggles for a moment. It seems like chaos as our troops exit left and right and fall to the ground with their weapons extended in front of them. As the dust cloud begins to dissipate I see the underbelly of chalk two to my right. There's a flicker of fire from one of their engines. It looks like they've rolled over in a crevasse. I sure hope they're okay."

The episode you've just read is fiction, but adrenaline-pumping moments like these are familiar to anyone flying these types of missions. Requiring split-second decisions, formation dust landings under NVGs are some of the most hazardous missions our aircrews perform. It's critical that airspeeds and approach angles are closely monitored and that crew coordination is well exercised. Get slow too early and you'll quickly brownout and lose contact with most, if not all, of your references. Land with too much forward speed and you risk colliding with unseen obstacles or other aircraft.

Interestingly enough, about 50 percent of our aircrews perform this tremendously difficult task with the oldest ANVIS in our inventory, the Types 1 and 2. (Type categories of ANVIS are fully defined in the latest ASAM, GEN-02-ASAM-02, available at **www-rucker.army.mil/ATB/NVD/NVDB.html**.)

Type 1 ANVIS are equipped with 15mm eyepieces and a single Interpupillary Distance Pivot and Adjustment Shelf (IPD PAS), or have incorporated either improved 25mm eyepieces or dual IPD PAS. Type 2 ANVIS incorporate both improvements in the 25mm eyepieces and a dual IPD PAS to give the wearer the ability to fully adjust the NVGs for the optimum field of view.

All Type 1 and 2 ANVIS use the earliest intensifier tubes, providing just 20/40 vision during high-light conditions while providing only 20/120 vision during low-light conditions. While this equipment

is still "good" and heads above the earlier ground NVGs flown in the late 1970s and early 80s, it's far from the best equipment produced.

Type 3 ANVIS, used by about 20 percent of our aircrews, are essentially Type 2 ANVIS with improved intensifier tubes. They give the wearer 20/33 and 20/105 vision during high- and low-light conditions, respectively. Type 1 through 3 ANVIS fall under the classification of AN/AVS-6(V)1 and have a typical "halo," a bright haze around light sources, of about 1.5 mm or larger.

Type 4 ANVIS fall under the nomenclature of AN/AVS-6(V)1A or are an earlier AN/AVS-6(V)1 that has been upgraded with the "(V)1A" intensifier tubes. The 160th Special Operations Aviation Regiment (SOAR) and other select aviation units have been using the Type 4 ANVIS for years.

Type 4 ANVIS are nearly twice as good as Type 1 and 2 ANVIS with high- and low-light visual acuities of 20/28 and 20/70, respectively. First delivered in the mid 90s, more emphasis was put on halo reduction in the Type 4s, which resulted in halos of no greater than 1.25 mm in the central viewing area. In addition, these NVGs use more of an amber colored phosphor screen instead of the dark green phosphor screens that so many of us are used to.

The Type 5, the newest member of the ANVIS family, uses the nomenclature of AN/AVS-6(V)3. The Type 5 has already been fielded to the 160th SOAR and some other high-priority units with additional fieldings ongoing. I won't go into detail, but suffice it to say that the technological improvements in Type 5 ANVIS are markedly above that of Type 4 ANVIS. Units fielded with Type 5 ANVIS have improved Military Operations in Urban Terrain (MOUT) capabilities. This is primarily due to the Type 5's ability to maintain crisp, clear images during overly high ambient light that would otherwise shut down other NVGs or provide only washed-out images.

As the Type 5 ANVIS are being fielded, more of our aviators are benefitting from a cascade plan that sends Type 4 ANVIS to the next-highest-priority units. As that plan progresses, more and more aviators will see tremendous gains in their ability to function at night. They'll enjoy higher resolutions, less halo and less video noise during low-light conditions. The cascade plan will continue until all the newer ANVIS are fielded and the older Type 1 and 2 ANVIS are purged from the inventory.

Not resting on our laurels, we are committed to equipping our aviators with the best that industry has to offer so that our aviators can better perform their difficult missions. As I write this, the Type 6 ANVIS is just around the corner with unheard of specifications.

Another bright spot in the area of Night Vision Device (NVD) advancements is with the improvements to the AN/AVS-7, Heads-Up-Display (HUD) and the fielding of the Advanced AN/AVS-7 Heads-Up-Display (AHUD). AHUD incorporates an upgraded computer processor that gives aviators "real-time" information as to their flight profiles. The fielding of AHUD was completed during the third quarter of FY 2001, and is installed in all CH-47 aircraft and approximately half of the UH-60 fleet. The remainder of the UH-60 fleet received a software upgrade to its basic HUD that dramatically improved its speed (there is a plan in place to equip all UH-60s with an AHUD or better system in the near future).

Commanders need to take advantage of the advances in HUD. Incorporating more of HUD in their unit ATP and having their crews use HUD during missions will enhance performance and reduce risk.

Consider again our fictional but realistic troop-insertion mission. Perhaps our crews could have benefited from the use of Type 4 or better ANVIS and/or HUD. Though not the only considerations for a dust approach, better references for gauging aircraft speeds, angles of approach, and rates of descent could certainly aid in successfully landing an aircraft before brownout conditions become too hazardous. Perhaps the crew of chalk two might have been able to adjust their flight profile to avoid that disastrous crevasse if they had a clearer view of their landing point.

Although we are always attempting to mitigate risks associated with "taking care of business," our missions are routinely fraught with danger. NVG flights are intrinsically riskier than other modes of flight, but it's good to know that we are delivering better NVD equipment to our aircrews to more safely take the fight wherever it calls us.

That's what I call taking back the night! •

—MG John M. Curran is the commander of the U.S. Army Aviation Center and Chief of the Aviation Branch.
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The Black Hole of Night: SHIPBOARD OPERATIONS

Most aviators realize the risk inherent with flying helicopters, especially at night. All commanders must fully understand the awesome responsibility of complete risk mitigation in regards to helicopter operations. Joint operations present new challenges to all members involved. The Army continues to answer these challenges in the current high-optempo, widely diverse mission environments.

One of the missions that the Army finds itself thrust into more often these days is operating helicopters aboard Navy ships. In reality, the Army has been conducting shipboard operations for decades and several Army units around the world are currently executing this joint mission. All things being ideal, well planned, and prepared, just flying to a ship is a relatively simple task. Of course elements such as the size of the ship, the size of your aircraft, the sea state, weather, wind, night flight over water, and countless other variables combined to complicate the process and make the challenge a quite formidable one.

Deck Landing Qualifications (DLQs) aboard ships require that a series of aviation training issues be addressed (see DLQ MOU dated Jan'02, Army FM 1-564 and Shipboard Operations and Joint Pub 3-04.1 —*Joint Tactics, Techniques, and Procedures for Shipboard Helicopter Operations*). For the most part, these issues are addressed in Naval standards, since the Navy and Marines operate to, around, and from ships daily. Navy and Marine Corps pilots are taught from "Day One" in flight school to treat all nighttime departures from the deck of a ship as an instrument take-off and that nighttime ship traffic patterns are to be treated as "instrument patterns."

The Army should not hesitate to benefit from the Navy/Marine Corps experience with shipboard helicopter operations, since a great deal of knowledge has been documented and recorded over the years. Navy standards for shipboard helicopter operations exist for good reason, and it only makes sense for the Army

to utilize that invaluable information. The Navy has considerable insight into shipboard operations from which the Army can benefit.

The modern Army fights at night, flies at night, and as such, trains at night. Aided and unaided flight at night is normal ops for the Army. However, the nighttime maritime environment poses special challenges for helicopter crews. Army commanders must evaluate risk and risk mitigation in detail for night flight aboard ship. This risk assessment becomes extremely critical during periods of low illumination and/or periods of reduced visibility. Aboard ship, there may also be a requirement for a visible horizon in three or more quadrants, in addition to weather, wind over the deck flight envelopes, and ceiling and visibility requirements.

Most Army aviators believe that in their heart of hearts, they know the darkness of night better than anyone else does. If they have flown off the deck of a ship at night, they certainly have experienced unusual sensations, as evidenced by the following recent quotes from some seasoned Army aviators:

- "It was like flying through the white letter eight into the inside of the black eight ball." (CW-5 IP/SIP)
- "It was like flying inside of a snake." (CW-4 IP)
- "When we left the ship, I couldn't tell where the sky ended and the water started. I thought I knew darkness, but never, never anything like this." (Captain (O-3))

The seas often produce a "wet haze" just above sea level and as often as not sea fog forms in conjunction with this haze, compounding the already extremely limited visibility prevalent in the night overwater environment. Even with visibility, limited or otherwise, a visible horizon is oftentimes nonexistent in the night overwater environment.

When ships are close to shore and visible lights from the shore fill up part of a quadrant, there may be some visibility and orientation enhancement. However, ships do not normally operate close to the shore and most of the time ships operate "over the horizon" and well away from visible shorelines.

Another potential danger involving overwater flight and artificial lighting involves the "Black Hole Effect." This effect occurs when the aircraft flies from an environment rich in visual cues immediately into a cue-poor environment. The sudden loss of primary visual cues may have devastating effects on maintaining situational awareness and aircraft control. Two situations that are very conducive to this effect include:

- The first opportunity for experiencing this effect is immediately after crossing the coastline going out to sea or going "feet wet" from a highly textured, artificially lit, overland environment. The effect is exacerbated by a flight path that goes from overland with ample visual cues to overwater with low visibility, low illumination, and little or no visual cues.
- The second case occurs immediately upon departure from a lighted flight deck and into an overwater environment with reduced visibility and loss of visual cues.

Aviators must familiarize themselves with all the visual and sensory illusions associated with night flight, and particularly night flight over water. Overland, artificial light

often enhances the total available illumination, a phenomenon that rarely occurs when flying overwater.

During night overwater flight, artificial light is usually associated with the coastline, but a lighted coastline can actually cause negative effects on night situational awareness because it offers a "false horizon" that may actually disorient the aircrew. Even within visual meteorological conditions (VMC), the natural horizon is seldom discernable at night overwater, due to the "sea haze." This may lead to the "ping pong ball effect" in which everything looks the same and "up" cannot be distinguished from "down" by outside visual reference alone, and the aircraft attitude cannot be safely maintained without the use of aircraft instruments.

Adding to this effect are greatly reduced surface texture and a lack of normal terrestrial visual frames of reference. During reduced visibility flying overland, pilots use a variety of night vision techniques to fly "outside the aircraft." They use visual cues closer in their field of view to judge relative distance and closure rates in horizontal and vertical planes. However, when visibility is reduced at sea, the surface of the water does not present these visual cues. When flying VFR with reduced visibility, the pilot must descend toward the surface to bring out usable cues and maintain situational awareness. While flying overwater, in calm seas, more than one pilot has flown into the water searching for visual texture cues to judge rate of descent. The more placid the water, the less texture available and the less visual cues that may be gained from the surface.

Another illusion associated with calm water is caused by the reflection of the sky off the surface of the water. Aircrews have mistaken the reflection of the sky for the actual sky on numerous occasions, sometimes with deadly consequences. Visual cues from natural and manmade surface objects provide known frames of reference overland. These cues allow pilots to estimate distance and perceive depth in their field of view.

When flying with reduced range of view, due to visibility, or low cloud cover, these frames of reference help pilots maintain attitude and altitude. Similar frames of reference are seldom available at sea to assist pilots in maintaining situational awareness. Army FM 3.04.301 (the old 1-301) titled "Aeromedical Training for Flight Personnel" provides excellent examples of night flight techniques, but unfortunately the main emphasis of the text is on overland topics.

The use of flight simulators is highly recommended, not only to improve identification and perception of visual cues, but also to reinforce instrument flight training proficiency. Aviators that fly aircraft not "fully" equipped for instrumented meteorological flight; e.g., AH-64 and OH-58 series aircraft, must be prepared and be extremely proficient at transitioning to instrument flight during night shipboard takeoffs.

Most traffic patterns for ships are flown at 300 feet above the water. Some Army units prefer to "fly on the waves" at 50 feet above the water in order to maintain visual reference to the water and/or for tactical reasons. The Navy is very uncomfortable with this practice

for many reasons. Real-world tactical situations may require overwater flights at very low altitudes; however in the training environment, this allows very little reaction times for aircraft emergencies.

To meet the challenge posed by shipboard helicopter operations, Army aviators must start their planning well in advance of embarkation. Commanders must evaluate the risks associated with shipboard helicopter operations, especially at night, and consider the following:

- Not all ships are night vision device (NVD) compatible. (See Shipboard Aviation Facilities Resume as published January each year, Naval Air Warfare Center, Aircraft Division, Lakehurst, N.J., 08733-500. Hot Line Action Desk: DSN 634-2592 Commercial (732) 323-2592)
- Not all ship's company personnel are NVD trained.
- Individual ships may not have adequate quantities of NVDs on hand and it may be necessary for the embarked unit to provide NVD gear to ships from which they are operating.
- Not all ship's company personnel are familiar with Army aircraft.
- Not all ship's company personnel are familiar with Army night helo operations.
- The landing zone (the deck) is moving across the surface of the sea with variations in vertical and horizontal planes.
- The landing zone (the deck) rolls and pitches with the movement of the sea.
- Depth perception and visual cues are less defined.
- Not all ships have weather forecasting/monitoring capabilities.
- Electromagnetic vulnerability may limit a ship's capability to provide air traffic control information to aircraft.
- Space aboard ship's decks is often extremely limited. Rotor blade clearance from obstacles and other aircraft may be as little as 15 feet, and on some air capable ships clearance can be even less than 15 feet.

Night flight, aided or unaided, from the deck of a ship (and hence overwater) is an unforgiving and perilous mission with little or no room for error. Proper planning and coordination will aid in minimizing risk, maximizing safety, and ensuring successful mission accomplishment. Factors to consider include the following:

- During Shipboard Operations Ground School and DLQ School, the inherent challenges associated with flying to and from ships at night should be stressed.
- Use simulators to practice transitioning from visual meteorological conditions to instrument flight conditions.
- Review visual illusions for night aided and unaided flight.
- Maintain positive control of the aircraft at all times, in flight as well as on the deck.
- Practice precision night vision device takeoffs and landings.
- Re-enforce constant crew coordination.
- Establish a rapport with ship's company personnel early on in the planning and, if instructions are not clear, ask questions. NEVER ASSUME ANYTHING!
- Learn as much as you possibly can about the ship's capabilities and the capabilities of the crew.

The Army must realize that at all times the Captain (CO) of the ship must protect the ship from all hazards. Ships must maneuver to gain favorable winds during launch and recovery, while at the same time maintain a combat posture to protect the ship. Returning to the ship at night, following missions ashore or over the horizon presents a completely separate challenge. When a ship is utilized as a Forward Support Base for joint contingent operations, tactical requirements will dictate the time to strike. The illumination and visual quadrants requirements may or may not be met when the tactical situation dictates launching the assault. Flying from the deck of a ship at night, under all conditions, may be the challenge of a lifetime. Being prepared for the worst case scenario will go a long way toward contributing to mission success. ●

—Michael J. Vandeveer, CW4 Ret., JSHIP–Procedures & Training Area Manager, DSN 342-4936, ext. 211 (301-342-4974 ext. 211), VandeveerMJ@navair.navy.mil. CW4 Vandeveer retired from the Army in 1988. He has had two tours of combat in Viet Nam, holds a Masters Degree from Murray State, Murray, KY, in Occupational Safety and Health, and works for the Office Sec of Def, Joint Test & Evaluation at Patuxent River Naval Test Center, Maryland.

HOT STUFF for Aviators

With summer fast approaching and many of our forces already deployed to warmer climates, it's a good time to talk about heat: how it can adversely affect our performance, and indeed cause us bodily harm. And while we obviously need to be diligent in protecting our troops abroad, it is imperative that we not be lackadaisical about the threat to those "left behind." There is a significant potential for heat injury throughout the United States, especially in the late spring and summer.

Understand the threat

In a culture accustomed to climatically controlled quarters and workplaces, many of us have become cavalier about the adverse affects of heat. We remember "sucking it up" at two-a-day football practices in high school and enduring conditioning drills in basic training and pre-commissioning programs, but that was "back in the day" when we were. . .well, you know what we were!

Many of us now train only enough to pass our semi-annual APFT, while those not subject to an APFT may only be "training" enough to pass the next flight physical. We leave our air-conditioned homes and drive in air-conditioned cars to air-conditioned offices. Some of us even fly in air-conditioned platforms (although we realize the air-conditioning is there for the on-board automation equipment, not for our comfort!). The point is that heat exposure and injury is often insidious in onset, and unless we actively seek to mitigate its effects, it can adversely affect the mission. Even professional athletes are not immune; recent avoidable deaths due to heat injury in major league baseball and the National Football League (NFL) drive this point home.

Acclimatization

Implied in the previous paragraph is an individual responsibility to maintain a degree of fitness commensurate with our job requirements. This necessitates an appropriate level of heat acclimatization when working in a hot environment. You do not get acclimated by exiting an air-conditioned cocoon and entering another as soon as practicable. You get heat-acclimated by being exposed to heat and working in it.

Heat acclimation can be achieved through individual or collective physical training, but it must be a deliberate decision on the part of leaders. Time must be provided to become adequately exposed. Physical training (PT) at noon—in the hottest part of the day—is an excellent method, but it is essential that one uses the "crawl, walk, run" method. You WILL

have heat casualties if you take a group of non-acclimatized soldiers and have them do a 12-mile forced march at Fort Rucker, AL, at noon in the summer.

Remember the cynical wisdom of Noel Coward: "Mad dogs and Englishmen go out in the midday sun!" Cultural pride and intuition aside, there will be times when working in the heat of the day is unavoidable, so we must be prepared and acclimated to do so. Start slowly and build up your heat exposure over a week or so. Make your deliberate exposure in the heat of the day, but plan your harder physical labor in the cooler parts of the day, even after you are acclimated.

Commanders must be present to ensure that soldiers are adequately hydrated and that training is geared toward the less-fit, not the most-fit, members of the unit. Most units will be able to acclimatize within 3-8 days and the physiological benefits are dramatic. As they become accustomed to the heat, soldiers will sweat more, which will cool them off more rapidly, but this will also increase their need for fluids. The body conserves sodium more efficiently when acclimated, so salt losses in sweat will decrease. The soldiers are able to do more because their body core temperature decreases, lessening the likelihood that they may become a heat casualty. After the acclimation process (3-8 days), resume PT at normal hours in the morning or late afternoon.

A decreased total body water of only 2 percent has been shown to adversely affect mental function, and these adverse effects get worse with increased dehydration. We have all seen or heard of heat casualties falling out of runs and forced marches, but did we ever think we were losing IQ points as we dried ourselves out? Add to the dehydration the separate and measurable adverse effects of heat, and it is synergy working against you! Let's not degrade that Pentium 4 that resides in your electric hat! It's hard enough to do what we do with all of our neurons firing.

Drink enough water

Adequate hydration cannot be overemphasized. We all know we are supposed to drink more water when we are in a hot environment, but the vast majority of us do not drink enough water even during our "normal" day. Those of us who drink a lot of fluids often drink coffee, tea, or sodas. Caffeine is a diuretic, which means you lose more water than you consume.

Consider the "seasoned" aviator who finds himself going to the latrine every 60-90 minutes. You've seen these guys in meetings. After 60 minutes, they are "dancing" in their chairs and get up suddenly and leave in a hurry. It's not because they have to solve some important world crisis, it's because they have to go!

Benign prostatic hypertrophy is not so benign when you are getting up once or twice at night, or going to the latrine every 60-90 minutes. You know who you are! You have a prostate the size of a bagel and you seem to always have to go. So what do you do? You cut down on fluids before a flight, right? Unlike the United Nations, you have developed an exit strategy. What I mean is that you are thinking ahead: "If I hydrate like Doc says, when am I going to offload? I can't just "water the tail boom" like I used to when I was a WO1/2LT."

Leaders need to think about this. If the flight line is a quarter-mile from the hangar, your people will not drink enough water. Let's backward plan here for a bit. Show time is 0600. Preflight planning, weather brief, mission brief, hit the head, preflight aircraft, hit the head again, crank, break, get maintenance, crank, hit check, hold, maybe get some hot gas, and finally take-off at 1100 for a flight that was supposed to be back at 1030. Now you return in the heat of the day, at 1300, and the last thing you drank was coffee at 0700. Think you are hydrated? You know the answer. But what's the big deal?

Decreased performance

It's all about performance. Pilots, like surgeons and goalkeepers, have to execute just about flawlessly, or somebody loses. Most of us can't afford a significant performance decrement. I realize the average aviator thinks he is 50 percent better than he needs to be, but the reality is we work in an environment that is terribly unforgiving of any carelessness or neglect. A decreased total body water of only 2 percent has been shown to adversely affect mental function, and these adverse effects get worse with increased dehydration. We have all seen or heard of heat casualties falling out of runs and forced marches, but did we ever think we were losing IQ points as we dried ourselves out? Add to the dehydration the separate and measurable adverse effects of heat, and it is synergy working against you! Let's not degrade that Pentium 4 that resides in your electric hat! It's hard enough to do what we do with all of our neurons firing.

Summary

It is important to plan ahead when your soldiers are facing a situation where heat exposure can pose a problem. In summer months, this is just about anywhere. Develop an acclimatization program prior to deployment and educate your soldiers on the risks of heat exposure. Take actions to reduce those risks by modifying training and work/rest cycles in hot weather, supervising your soldiers' training, and making sure they drink enough water. Ensure there are convenient latrine facilities available, especially when the flight line is distant from fixed facilities. Modify the training if you have a heat injury, and consider the effects of MOPP and other protective gear. Remember that caffeine is a diuretic so sodas, coffee, and tea are working against you. Take care of your body; where else are you going to live? •

—LTC Joseph F. McKeon, USASC Command Surgeon, DSN 558-2763 (334-255-2763), joseph.mckeon@safetycenter.army.mil

Some Helpful Resources for You!

COL REGINA CURTIS
Office of the Surgeon General

The article by Dr. McKeon on heat injury prevention in this issue of *Flightfax* is part of the U.S. Army Medical Command's Heat Injury Prevention Program (HIPP). Each year soldiers die from heat injuries and those deaths are often preventable. However, they are only "preventable" if you know how to prevent them, put that knowledge into practice, and keep a watchful eye on your fellow soldiers.

Here are some places where you can get helpful information:

- U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM). Go on their Web site on heat injury prevention at: **http://chppm-www.apgea.army.mil/heat**.
- The instructional video, *Heat Injury Risk Management,* was developed at Fort Benning, Ga., one of the Army's warmest and most humid training places. To get a copy, go to **http://safety.army.mil**, click on MEDIA, then on DOD AUDIOVISUAL LIBRARY. Type the video's title in the search bar and order either the video or DVD.
- Want to talk to someone for help? Feel free to contact me at (703) 681-3017, or by e-mail at: Regina.Curtis@otsg.amedd.army.mil.

WAR Stories

Risk management lessons learned

A Dark and Stormy Night

We had been in theatre for almost a month. It seemed like summer came early to Bosnia, with high temperatures and hardly any snow by the end of March. But, today was different. We had already logged more than six hours of flying before leaving Split, Croatia and returning in the rain to Banja Luka (BL) with the Commander of Multi-National Division—Southwest (MND SW). It was dusk and the weather was deteriorating, but dodging low cloud and showers, we made it to BL near the end of our crew day.

Bosnia poses a number of difficulties for us as aviators, ranging from minimal safe landing areas to minimal weather reporting or forecasting. The Balkans region is very mountainous and the weather can change drastically from one valley to the next; it's as if each valley has its own separate weather system.

The thought had occurred to us to stay overnight in BL, but a quick estimate of the time required to reach our base in Velika Kladusa (VK) had us getting home inside our eight hours flying limit. A weather call to VK confirmed the conditions there were still good.

We strapped on our night vision goggles (NVGs) after refueling and decided to go for it. Despite en route showers and the occasional thunderstorm cloud that we were able to avoid, we almost reached our destination uneventfully. We were just seven miles out from VK when we noticed something odd. The usual scattering of lights on the hills all around were no longer on our left side and they were disappearing ahead of us as well! The cloud deck was lowering until it was engulfing the hills to our left and up ahead.

The rain was heavy now and we made a quick circuit to assess our options. We realized that the route we followed to get here was closing off behind us and a return trip to BL would be a risky venture. We followed the only open valley in sight, heading north and perpendicular to our intended track. I was starting to breathe heavily now and I could read the headlines back home already, "PRESSING PILOT PILES IN." I felt stupid, knowing I had been safe and sound in BL just forty minutes ago.

Our crew day was nearing its end and we weren't at our best any more. Now we faced the most hazardous situation we had seen that day, that week, and thus far, that tour! In America, we could have simply landed in a field to wait out the weather. But, that was only a last and desperate option in mine-strewn Bosnia.

I must have been through the third iteration of my "Please, God, help me out of this mess" prayer when I saw the opening. I noticed a gap between the hills on our left and I could see the light of the valley beyond clearly. A way past the cloud! We took it, hoping like crazy that our map was accurate and that there weren't any wires strung across the gap as we flew through it.

The rain continued unabated, but beyond the gap, the ceiling was higher and we could breathe easier. We could already see VK ahead of us, glowing like a lighthouse in the fog, less than five miles away.

My arms and legs were rubbery, and the FE's NVGs were literally washed out by the downpour as we made our descent. It took three passes before we landed safely in the helicopter-landing site and we could start breathing normally again.

It doesn't take long for complacency to set in, and sometimes, our "can do" attitude gets in the way of good judgment. It took all the experience and skill we had as a crew to get us safely on the ground. A little more experience and we would have known to call it a day in BL. We all strive to be professionals and we all want to get the job done. We take pride in our ability to do so, especially in trying circumstances or with minimized resources. But, pride, on occasion, gets in the way of sound judgment. •

—Courtesy of Flight Comment, no. 2, 2002

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class C:** Post-flight inspection of aircraft revealed tail rotor damage from a suspected tree strike. Aircraft had been on a support mission at the time of the accident. No personnel were injured in the accident.

D Model

■ **Class B:** While in phase maintenance, aircraft's mast-mounted sight dropped approximately 12 feet during hoist operations. No personnel were injured in the accident.

■ **Class C:** After refueling during aerial gunnery training, aircraft picked up to a hover on one engine and over-torqued to more than 130 percent, damaging the transmission. The aircraft was trucked back to post. No personnel were injured in the accident.

MH-60

L Model

■ **Class A:** After completing a night gunnery engagement, the aircraft continued to descend and impacted the ground, fatally injuring all four crewmembers and destroying the aircraft. Investigation is ongoing.

HH-60

L Model

■ **Class D:** While conducting local area orientation and environmental training (dust landings and takeoffs), the glass lens of the aircraft's FLIR broke.

UH-60

L Model

■ **Class A:** Aircraft crashed during training, fatally injuring all four crewmembers and destroying the aircraft. The investigation is ongoing.

■ **Class C:** Routine maintenance inspection of aircraft conducted the day following a training mission flight revealed damage to one main rotor blade tip cap and evidence of a bird strike (remains).

■ **Class C:** Damage to one main rotor blade tip cap and evidence of bird strike.

OH-58

DI Model

■ **Class C:** Aircrew on a training mission experienced inadvertent instrument meteorological conditions (IIMC) and requested precision approach radar return to the airfield. During the return, the aircraft experienced engine (135 percent/3 seconds) and transmission (127 percent/3 seconds) over-torque conditions. No personnel were injured in the accident.

■ **Class C:** Aircraft experienced engine (135% / 3 sec) and transmission (127% / 3 sec) over-torque conditions.

UH-1

V Model

■ **Class E:** While on a VFR/NVG training flight, at cruise altitude, the engine RPM light and RPM audio came on. The pilot lowered the collective to enter an auto rotational descent and turned toward the airfield to a safe landing area. During the descent, the engine and rotor RPM came back to normal operating limits and an approach was accomplished without further incident. Maintenance investigation could not duplicate the incident.

C-12

D2 Model

■ **Class B:** While on final approach in gusty winds and moderate turbulence, the aircrew realized the landing gear was not down and initiated a go-around. The aircraft propellers contacted the ground during the maneuver, but the aircrew was able to complete the go-around, lower the landing gear, and land the aircraft without additional damage. Post-flight inspection revealed that the propellers were bent from the impact with the ground. No personnel were injured in the accident.

C-26

B Model

■ **Class C:** Aircraft was performing a service mission when, after approximately 2 hours of flight, the left engine failed. The aircrew performed emergency actions and landed the aircraft at a civilian airport. No personnel were injured in the accident.

UAV

Shadow Model

■ **Class B:** During landing procedures, the tactical automated landing system of a UAV defaulted to GO-AROUND. The engine resumed full rpm and began climb-out when the engine failed. The UAV descended to impact approximately 50 feet off the runway and was destroyed.

Note: For more information on selected accident briefs, call DSN 558-9552 (334-255-9552). Information published in this section is based on preliminary mishap reports submitted by units and is subject to change.

Heat Injuries are Preventable

All commanders and supervisors are responsible for heat injury prevention.

1. **Monitor your soldiers.**
2. **Make acclimatization of soldiers a deliberate process.**
3. **Supervise fluid consumption when conditions dictate.**
4. **Schedule heavy work and strenuous physical exertion for early morning or late evening.**
5. **Maintain a high level of physical fitness.**

U.S. ARMY SAFETY CENTER

Flightfax
ARMY AVIATION RISK-MANAGEMENT INFORMATION
MAY 2003 ✦ VOL 31 ✦ NO 5
CH-47 Safety
Performance Review
PLUS: Sustaining Performance in Combat...
Is this one place where drugs and flying can sometimes mix?

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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U.S. ARMY SAFETY CENTER

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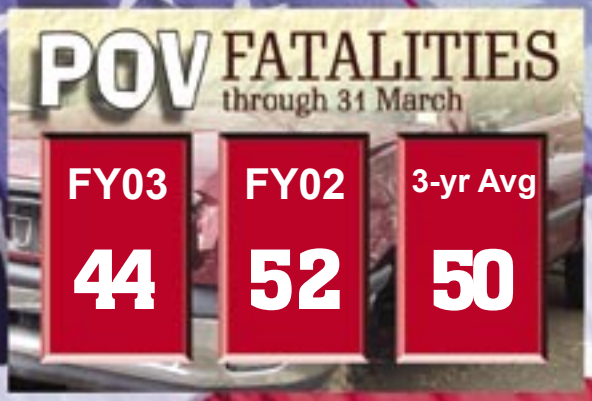

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James E. Simmons
Brigadier General, US Army
Commanding

DASAF's CORNER

from the Director of Army Safety

Remembering Heroes and Keeping Future Ones Safe

By: BG James E. Simmons

Traditionally, we associate the month of May with the unofficial onset of summer's fast-paced activities. We also designate in May a time to pause and reflect on the enduring legacy of our armed forces: their service and sacrifice. Appropriately on Memorial Day each year, we remember those great Americans who have died in battle to preserve for us a heritage of individual freedom and opportunity.

The courage, patriotism, and personal sacrifice of our fallen heroes have made it possible for freedom to be preserved. And we have each in the course of our own service to this nation seen evidence that freedom can never be taken for granted, nor is it ever easily preserved.

As we reflect with pride and gratitude on those members of our armed services who have made the supreme sacrifice in preserving our liberty, we are also extremely conscious of today's continued uncertain and dangerous world. Preserving that freedom for future generations of Americans requires that each of us who wear the uniform renew our commitment and personal resolve to ensure that we, too, are always ready to heed our Nation's call.

While there is none who could doubt that we are today the greatest Army ever fielded, we must not forget that our readiness can be easily degraded by needless losses that result from accidents. Accidental losses of personnel and equipment can and do take a tremendous toll on our resources and seriously impact our combat readiness.

I urge each of you to be exceptionally vigilant in managing risks on and off duty as we head into the summer months. Traditionally, the summer season is characterized by a surge in accidents and injuries—especially heat-, traffic-, and water-related injuries. So let's use extra caution and exhibit responsible behavior in all that we do.

Not just on one special day in May, but often, we owe it to our fallen comrades to pause and appreciate their tremendous sacrifices. And we owe it to our families, our units, and our friends to slow down the off-duty activities we may jump into now that the harsh winter months are over. We should carefully identify the hazards and put controls in place that will prevent injuries. The consequences of failing to do so can be tragic.

Our Army needs each of us—America's current and future heroes—healthy and whole to help execute our Nation's mission of preserving freedom for our future generations.

Train hard; be safe!

James E. Simmons

Spotlight:

CH/MH-47 Safety Performance Review

By: Charisse Lyle

Since fiscal year (FY) 1998, there have been 73 CH/MH-47 Class A through C accidents. These accidents cost the Army $118,849,295 and resulted in 10 fatalities and 23 serious injuries. The most dramatic increase is the Class A accident rate. In the previous 4 years, there was only one Class A accident; however, in FY 2002 alone, there were seven Class A accidents. Thus far this FY, the Army has experienced three more Class A accidents (all involving Operation Enduring Freedom (OEF) in Afghanistan). Highlights of the Class A through C accidents follow.

Over-water operations

During this timeframe, there was a catastrophic accident that illustrates the danger of

encountering spatially disorienting illusions when flying over water without a visual horizon reference.

Scenario: During a night vision goggle (NVG) over-water formation flight at 100 feet above water level and 130 knots indicated airspeed (KIAS) in deteriorating weather conditions, which restricted a visible horizon, the pilot of the trail aircraft rapidly closed on the lead aircraft. The pilot-in-command (PC), who had been heads-down in the cockpit conducting mission management on the multifunction display (MFD), took the controls and executed an abrupt evasive maneuver to avoid contact with the lead aircraft and lost control. The aircraft descended and impacted the water in a 16-degree, nose-down attitude at 157 KIAS. The aircraft was destroyed, and all 10 personnel onboard were fatally injured.

In the scenario above, the pilot (PI), who was originally on the controls, became spatially disoriented and informed the PC of his condition. It is suspected that the PC, who had been heads-down in the cockpit, also became disoriented and lost control when he assumed the controls and executed the evasive maneuver. A combination of factors would have induced disorientation: the lack of visual cues in the over-water environment, the deteriorating weather, and the loss of cues from the lead aircraft's covert lighting.

There were two additional factors that may have contributed to the flight crew's disorientation. The PI's flight controls were coupled to the flight director system in a lateral axis (waypoint coupled), which may have further contributed to his right drift and subsequent spatial disorientation. Also, the PC may not have had immediate reference to his vertical situation display (attitude indicator and radar altimeter display) since he was performing mission management functions on his MFD prior to assuming the aircraft controls.

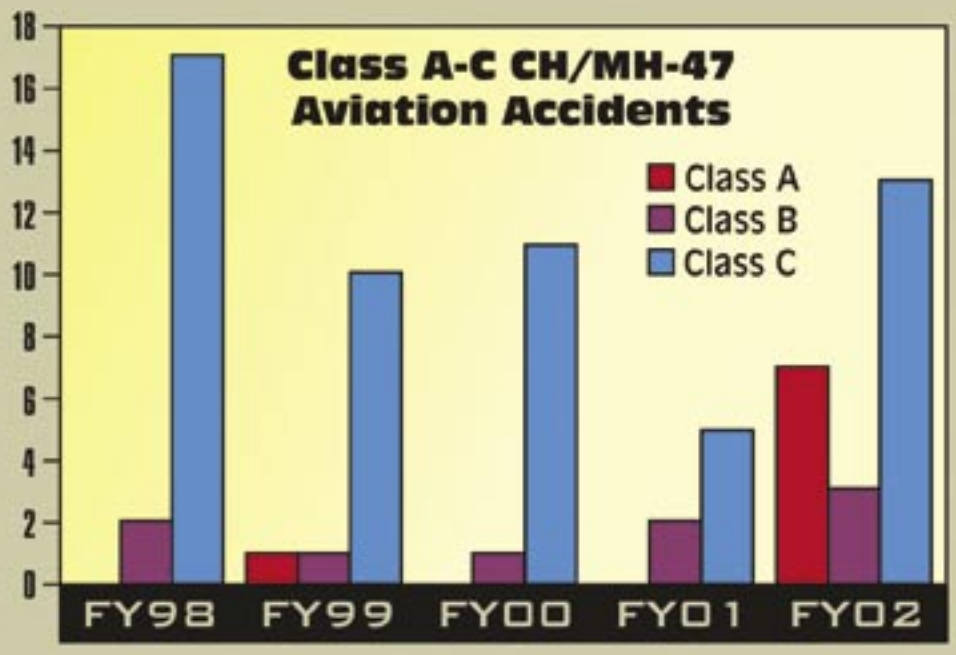
Brownout conditions

There were five accidents involving landing in brownout conditions. All of these occurred in FY 2002, and four of these five (80%) occurred in Afghanistan during OEF. Eighty percent of brownout accidents involved NVG missions.

In one accident, landing gear damage was incurred by a hard landing. In another, spatial disorientation occurred as a result of rotor-induced brownout, and the aircraft drifted right.

In three of these cases, the aircraft landed on an undetected hazard. In one, the landing gear was damaged when the main and aft right landing gear settled into an unseen depression in the desert in brownout conditions.

In another case, the non-rated crewmembers identified hazards at the intended landing



spot and directed the pilots to move forward approximately 50 feet. Near touch down, the anticipated brownout occurred. The aircraft completed a normal limited visibility approach with forward and down movement. During the ground roll, the aircraft's right landing gear struck an unseen obstacle that had been obscured by several inches of dust, causing the right rear landing gear to collapse into the ramp.

In the third case, the left-front landing gear settled into an irrigation ditch (see scenario below). Conditions compounding this hazard were blowing dust, lack of terrain contrast and definition, and full moon illumination that washed out detail. The irrigation ditch was not depicted on any topographical map and, due to the nature of the operation and the tactical situation, a day reconnaissance of the landing zone (LZ) had not been conducted.

The challenging environment in Operations Enduring Freedom and Iraqi Freedom presents many aviation hazards, particularly with respect to brownout conditions. Aircrews can help mitigate the risk by briefing crew responsibilities for a brownout contingency prior to flight. Although not always feasible, this hazard can be mitigated by treating problematic unimproved landing areas to reduce the amount of dust. Combined Land Forces Command has issued guidance on how to deal with extreme dusty conditions in unimproved landing areas. It can be found on the SIPRNET web site at **http://www.swa.arcent.army.smil.mil/sections/c7**.

Scenario: A flight of three CH-47s was executing an NVG multi-ship terrain flight approach into a dirt airstrip. The plan was for Chalk 1 to land at a beacon approximately midfield with a 200 to 300 meter separation between aircraft. The PC of Chalk 3 saw the first two aircraft kicking up heavy dust clouds, backed off, and increased separation to avoid the majority of the dust from the first two aircraft. The PC then identified a clear LZ and proceeded to complete the landing. The aft landing gear first contacted the ground. The PC then lowered the collective to place the front landing gear on the ground, prepared to place the flight controls to neutral and apply the brakes. The right front landing gear settled into an irrigation ditch that was 24 to 27 inches wide and 18 to 24 inches deep. The right-front gear separated from the aircraft at the attachment point and the aircraft settled to the right. The blades on the forward head impacted the ground, the aircraft pivoted approximately 270 degrees, and came to rest on its right side just short of the approach end of the dirt airstrip. The aircraft was destroyed and 16 personnel were injured.

Pinnacle landing

There was a Class A accident during this timeframe that occurred when executing a pinnacle landing.

Scenario: While conducting a day terrain flight approach to land at a pinnacle site, the crew of a CH-47D landed the aircraft on its aft landing gear. The aircraft appeared to stabilize on the gear, but then the ground collapsed. The aft wheels fell down the slope, causing the aft rotor system to contact the ground. As a result, the aft pylon separated from the aircraft and the aircraft entered a series of left yaws, rolls, and pitching moments. The aircraft came to rest nearly upright at the bottom of the pinnacle, facing approximately 180 degrees from its original heading. The aircraft was destroyed in the post-crash fire, and two crewmembers received minor injuries.

Controlled flight into terrain

A problem frequently experienced in Operations Desert Shield and Desert Storm resurfaced in

one accident in Afghanistan—collision with a sand dune. In this Class A accident, the trail aircraft of an NVG multi-ship flight, flying low-level at cruise airspeed, struck a sand dune, causing major aircraft damage and injuring a crewmember. The airborne sand, featureless terrain, and sand dunes prevalent in the area of operations present a hazardous environment for NVG operations.

In December 1990 an Army multi-agency team, sponsored by the Director of Army Safety, was formed to develop controls to mitigate this risk. NVG test flights were conducted in Southwest Asia to determine optimum airspeeds and altitudes for conditions encountered in Operation Desert Shield. The flights were conducted by four highly experienced pilots: two instructor pilots from Fort Rucker and two pilots assigned to Operation Desert Shield aviation units. The results of that effort were used to develop the information contained in the *Aviation NVG Desert Training and Operations Planning Guide*, dated February 1991. This document can be obtained at **http://safety.army.mil**.

Sling load operations

There were 13 accidents involving sling load operations. Over two-thirds of these sling load accidents involved inadvertent release of the external load, and over half of these (9) were attributed to definite or suspected materiel failure. Materiel fixes have since been implemented to correct the failures that caused these accidents. Materiel fixes have also mitigated the risk of crew-induced inadvertent load releases. There were no reported Class A-C accidents after FY 1998 attributed to a flight engineer or crew chief accidentally activating a cargo release switch.

Concerning the remaining four sling load accidents: two involved pilot error (not maintaining a stationary hover during the hook-up); one involved main rotor blade damage of a sling-loaded UH-60 aircraft during an aerial recovery flight; and in the last accident the load tipped, dumping the hook-up team from atop the load.

In-flight part or component detachment

There were six accidents where an external aircraft component or part came loose from the aircraft during flight. One of the six resulted in foreign object damage (FOD) to the aircraft. Over 80 percent (5) of these cases involved a jettisonable cockpit door.

Definite or suspected materiel failure of the copilot jettisonable cockpit door was involved in four of these accidents. Boeing Service Bulletin, #CH-47-02-1009, dated 1 July 1995, addresses the potential for failure of the CH-47D door latch plates and pins and provides specific inspection procedures to identify impending failures. This is currently being addressed by AMCOM.

Human error was suspected in one of the five in-flight cockpit door detachments. It is suspected that the crew chief inadvertently moved the right cockpit jettisonable door release handle with some part of his body or with shop towels when cleaning up approximately 14 quarts of lubricating fluid that had leaked from the forward transmission into the right side cockpit area. During the subsequent flight at 130 KIAS with strong crosswinds, light-to-moderate turbulence and aircraft vibrations, the remainder of the upper locking device actuated sufficiently to cause the door to depart the aircraft.

Aft swashplate bearing failure

There was one Class A accident, which occurred in FY 2002, involving an aft swashplate bearing failure. In this case, the failure occurred during run-up and resulted in the aft rotor blades striking the tunnel cover and control tubes. Safety-of-Flight Message (SOF) CH-47-03-0, published in October 2002, imposes inspection

and maintenance requirements to prevent future mishaps. This problem is currently being addressed by Boeing.

Droop stop failures

There were five droop stop failures reported during this timeframe with the most recent occurring in FY 2001. These were caused by improper installation of the droop stops or related components. SOF CH-47-01-02 (dated 14 February 2002) provides specific information on proper installation of the droop stop.

Cooling fan drive shaft failure

There were two accidents (both occurring in 1998) involving the oil cooler fan shaft in the combining transmission area. This is a previously identified problem currently being addressed through SOF message CH-47-00-07, dated 26 September 2000, which imposes flight restrictions, additional preflight inspection procedures, and a recurring inspection every 100 flight hours.

Rotor overspeed

There were three reported rotor overspeed mishaps. Two were caused by an engine or power plant starter drive bearing failure. In both cases, arctic temperatures were cited as contributing to the bearing failure. The other mishap involved failure of the No. 2 engine actuator, electro-mechanical, which induced the power turbine speed (N_2) to suddenly increase, resulting in overspeed of the rotor RPM.

Engine overspeed or overtemp

There were four accidents during this timeframe that involved engine overspeeds or overtemps. One of these involved an N_2 actuator failure that resulted in a high-side failure on the #2 engine during a health indicator test (HIT) check. This was identified as a recurring problem with the T55-L-712 engine, which will be fixed with the fielding of the T55-L-714 engine.

Landing gear collapse

There were three instances of landing gear collapsing due to materiel failure. In one accident, the left swivel housing assembly broke at the pivot point to the landing gear drag link. This was attributed to a lack of lubrication. The ports used to lubricate the housing were not drilled to a depth that allowed grease to reach the intended components. This long-term lack of lubrication caused the sleeve bearings to seize and fail. Inadequate instructions were cited as the root cause for this failure, which has since been corrected.

Rotor wash

There were four accidents involving rotor wash during takeoff or landing, which resulted in damage to equipment or personnel injury. A soldier refueling another aircraft in icy conditions was injured when he was knocked down by the rotor wash of a departing CH-47D. The flight engineer had failed to notify the PC that there was a refueling operation being completed to their rear. In another case, the CH-47D's rotor wash resulted in oscillation of the main rotor blades of a parked UH-60 aircraft. The crew failed to maintain sufficient clearance from the parked aircraft.

Army Aviation units deploying to Southwest Asia are facing many aviation hazards. Awareness of the hazards associated with past accidents and implementation of risk controls to mitigate these hazards will help prevent future accidents.

Summary

Army Aviation units deploying to Southwest Asia are facing many aviation hazards. Awareness of the hazards associated with past accidents and implementation of risk controls to mitigate these hazards will help prevent future accidents. ■

Editor's note: This review covers FYs 1998 through 2002 (as of 21 March 2003).

—Charisse Lyle, Operations Research and Systems Analysis Division, DSN 558-2091 (334-255-2091), charisse.lyle@safetycenter.army.mil

Sustaining Performance in Combat

Is This One Place Where Drugs and Flying Can Sometimes Mix?

By: Dr. John A. Caldwell

The sun was just rising as I sat in my helicopter waiting to take off on my first combat mission. Was I prepared? I felt alert, but I knew I was tired. How long had it been since I had gotten any sleep? How long would this day be? As I waited for clearance, I tried to remember how all this had started.

Two days ago I was TDY looking forward to a night of shipboard operations training. It was approximately 1600 when I finished the preflight inspection. I had only been awake since late morning and was ready for the evening's training. Then things changed drastically; I received a message instructing me to return to my home base immediately.

We took off at 1730 and arrived at home base around 2230 when we discovered the entire unit was busy preparing for immediate deployment.

All preparations were completed around 0030 the next morning. We were told to go home and get some rest and be back at the airfield by 0500. With so much to think about, I barely got an hour of sleep.

Everyone was excited and anxious the next morning as we (and our aircraft) were being flown aboard a fixed-wing to our destination. I tried to sleep, but just couldn't.

After arrival, we received an intelligence and threat briefing and began the mission planning and map preparation. At 2000, we were waiting to depart to the forward staging base on the

transport aircraft.

Coordination meetings were conducted during the flight. At midnight, I was finally in my seat. I was tired, but restless. Again came the anxiousness. I knew I needed some sleep, but I just couldn't, so I did my best to relax.

We landed at the forward staging base around 0230 and immediately began unloading and preparing our aircraft. By 0600 we were awaiting takeoff clearance. In the preceding 46 hours, I could remember really sleeping for only 1 hour.

As it turned out, I would not sleep again until approximately 2200 that night, when I collapsed in exhaustion. My first day of combat had added another 16 hours of wakefulness, bringing the total to 62 hours. I couldn't help wondering what I would have done if the mission extended any further before I could get some sleep.

Does this scenario sound familiar to you? If so, you're not alone. If not, it could become very familiar in the near future since the U.S. has once again entered battle. Unfortunately, sleepiness and fatigue are common even during peacetime; but in combat the situation becomes much worse.

Operational demands lead to dangerous levels of sleep deprivation as anyone who has ever been deployed can tell you. The "real world" causes of fatigue and the problems associated with being overly tired are of particular concern for the military, but what can we do about it? Is there a place for stimulants (sometimes referred to as "go pills") in our armament of fatigue countermeasures, or should we rely only on other strategies? Before you decide what you will do when the "crunch" comes, consider the information presented here.

Military sustained operations are a tactical necessity, despite some of the problems they can cause

U.S. superiority on the battlefield, in part, stems from our ability to maintain pressure on the enemy by making them fight around-the-clock. By keeping up a 24-hour-a-day operational tempo, we can virtually guarantee enemy forces will suffer from severe sleepiness leading to procedural errors, sloppy judgment, poor planning, and a general inability to react properly to rapidly changing situations. This, of course, gives us the tactical advantage, but only if we guard against severe sleepiness ourselves.

Severe sleep loss creates serious problems

Although predictions about the exact effects of fatigue are difficult to make, most researchers agree that fatigue-related performance and alertness decrements follow a fairly reliable time course. Studies have found certain mental abilities decline about 30 percent after one sleepless night and 60 percent after two nights without sleep. It is also predicted soldiers lose about 25 percent of their ability to perform useful mental work for every 24 hours without sleep. Clearly, 3 to 4 days of sleeplessness produces virtual debilitation of personnel in the operational environment. This raises serious concerns since FM 22-9 makes clear "Soldiers in continuous operations can expect to be deprived of extended regular sleep, possibly any sleep, for as long as three to five days."

What are the strategies for dealing with operational fatigue?

■ **Natural strategies**. Emphasizing proper work/rest management is certainly the first line of defense against fatigue, and the Army rightfully places a great deal of emphasis on this approach. However, when the intensity of combat reaches a certain point, it can be very difficult to properly control work and sleep periods, and this can lead to a huge problem with on-the-job fatigue.

If a full 8 hours of sleep is impossible but there is some time for limited sleep, naps are a great compromise. Naps should be long enough to provide at least 45 continuous minutes of sleep, although longer naps (2 hours) are better. Just make sure at least 15 to 20 minutes of "wake-up time" are allowed immediately following the nap to overcome post-sleep grogginess that can interfere with performance.

■ **Drug strategies**. At various times in our military history, the Army has relied on go pills (stimulants) to maximize aviator safety and effectiveness while accomplishing difficult missions. Go pills can counter high levels

of operational fatigue in intense sustained operations. After every other measure has been tried, stimulants should be considered since their feasibility is not dependent upon creating comfortable sleep quarters in the middle of the desert (or next to an active runway). Also, their effectiveness does not depend on making complex modifications to work schedules in order to ensure everyone works only 8 to 12 hours a day (and gets at least 8 hours of sleep). Caffeine and amphetamines are two possible options.

■ **Caffeine**. Caffeine seems best suited for sustaining alertness in relatively short periods of continuous wakefulness (i.e., 37 hours), but caffeine may not be appropriate for longer sustained operations (i.e., 64 hours or more). Typical users should be aware that the effectiveness of caffeine could be reduced by the chronic consumption of moderate to high amounts of caffeine in drinks, foods, or medicines. Clearly, caffeine is a widely-used and effective stimulant. Every day Americans consume caffeine in all sorts of products, coffee (100 to 175 mg per cup), soft drinks (31 mg), and tea (about 40 mg), as well as in some over-the-counter medications. For instance, just one tablet of Excedrin® Extra Strength contains 65 mg of caffeine. The minimum amount of caffeine recommended to sustain alertness in sleep-deprived people is 200 mg, although higher doses will be necessary for very sleepy people. Currently caffeine (in the form of foods and beverages) is the only stimulant or 'go' substance an aviator can use without restrictions.

■ **Amphetamines**. In the 1940s and 1950s, the military began performing research that showed amphetamines were effective for restoring or maintaining the performance of sleep-deprived people at or near normal levels. These pills can have significant abuse and addiction potential if not used properly, but the military has successfully used amphetamines (under carefully controlled conditions) for years. For instance, the Air Force authorized the use of amphetamines to sustain the performance of sleep-deprived pilots as early as 1961, and dextroamphetamine (Dexedrine®) continues to be authorized under Air Force policy for certain prolonged aviation operations today. In addition, a February 2003 Army Aeromedical Policy Letter has authorized limited use of Dexedrine as a countermeasure for severe aviator fatigue (see **http://usasam.amedd.army.mil/AAMA/policyLetter.htm**).

The effects of dextroamphetamine have been studied extensively in the laboratory and in the field. Walter Reed Army Institute of Research demonstrated a single 20-mg dose could return alertness and cognitive performance to near baseline levels and maintain this recovery for 7 to 12 hours, even after 48 hours of total sleep deprivation.

A Canadian study showed a single 20-mg dose temporarily prevented performance decrements in volunteers kept awake for approximately 34 continuous hours and restored the performance of volunteers deprived of sleep for 48 continuous hours.

Three U.S. Army Aeromedical Research Laboratory (USAARL) studies determined multiple 10-mg doses of dextroamphetamine sustained the performance of helicopter pilots throughout 40 hours without sleep, and a fourth USAARL study showed dextroamphetamine maintained the flight performance of UH-60 pilots even after 58 hours of continuous wakefulness.

What is the bottom line?

Fatigue will be a problem in combat because of the intensity and unpredictability of wartime missions. Obviously, the best way to prevent fatigue on the job is to ensure everyone gets 8 hours of sleep before the mission even starts. If this isn't possible, naps are a good alternative. Remember that solid crew-rest planning is the best way to optimize alertness!

However, combat operations (*not* training in peacetime!) may dictate the use of pharmacologic agents to enhance the performance of aircrews. Safe, effective medications exist, and are aeromedically approved. For more info, contact the Command Surgeon at the U.S. Army Safety Center (334) 255-2763. ■

—Dr. John A. Caldwell, U.S. Air Force Research Laboratory, Brooks City-Base, TX, e-mail: john.caldwell@brooks.af.mil

Investigators' Forum

Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

Gremlin Light—Do We or Don't We?

Does a recurring flashing master caution light mean you should plan on landing as soon as possible or just ignore it like you did the time before and hope there's no real problem?

The mission was a fast rope insertion and extraction system (FRIES) training event. While en route to the landing zone (LZ) at 1000 feet mean sea level (MSL), the pilot-in-command (PC)—who was not on the controls—observed the MASTER CAUTION light illuminate. A scan of his multifunctional display (MFD) indicated an AFT SHAFT PRESS LO warning light. That warning required the pilot to execute the "LAND AS SOON AS POSSIBLE" emergency procedure.

Up to this time, the pilot (PI) was on the controls. The PC immediately announced the emergency to the crew and took control of the aircraft. The PC then radioed flight lead to advise him of the situation and that they were initiating a precautionary landing. The PC broke formation and decided to land in a farmer's field. The aircraft made one final turn to extend final as the aircrew prepared to land.

Meanwhile the PI, at the request of the PC, was checking the MFD POWER TRAIN page to verify the emergency. According to the MFD, all systems were normal! At the same time, the flight engineer announced that there were no abnormal indications on the maintenance panel other than the AFT SHAFT PRESS LO warning light.

After turning onto final, the PC announced that he was going to extend his approach beyond the farmer's field to a more suitable location. At approximately 150 feet AGL, the crewmember in the right cabin door announced "Wires, wires, wires!" At the same time, both pilots and the left gunner saw the wires.

The PC immediately reduced the thrust in an attempt to fly under the high-tension power lines. As the aircraft flew beneath the wires, the bottom strand caught the aft rotor. The PC continued his approach, landed, and completed an emergency engine shutdown, also engaging the rotor brake.

Due to the nature of the emergency, the aircrew did not conduct an LZ recon prior to initiating their final approach. Given these conditions and the common knowledge that wires are difficult to see, none of the crewmembers saw the wires until the aircraft was about to strike them. The result was an accident that cost more than $60,000.

So why did this accident happen? Was it a human, materiel, or environmental error? Was the crew driven by the fear factor to get the aircraft on the ground? Was it a failure to maintain airspace surveillance, or was it a gremlin that caused the aircrew to inaccurately diagnose the problem and react to a nonexistent emergency?

Let me emphasize that this article is not an attempt to find fault with the aircrew. My intent is to demonstrate

how a misdiagnosed problem has the potential to produce catastrophic results. Unfortunately, misdiagnosing emergencies is a recurring problem.

We have all heard stories about crews misdiagnosing illuminated firelights as real fires and causing a panicked descent from altitude. We have also heard about crews shutting off the wrong engine, power lever, or fuel control when it was the other engine that should have been shut off. These are not rare events. In fact, the 1997 "Wrong Engine" study was prompted by a UH-60 accident that involved misdiagnosis. The study pointed out that misdiagnosis was one of the highest problem areas for pilots.

The study also asked pilots what caused them to move the wrong lever. Nearly half of these aviators (111 of 224) indicated they acted as the result of a misdiagnosis of an aircraft condition.

Lessons learned

The pilots' primary concern is flying the aircraft. When on the controls, a pilot must continually scan around the aircraft, particularly during emergencies. Improper scanning and inadequate crew coordination plays a major role in many wire-strike accidents. Crewmembers must provide the pilot on the controls with accurate information on the aircraft's condition and help spot any dangerous obstacles.

Understanding emergency procedures means knowing what happens to the aircraft with every action you take and accurately diagnosing emergencies based on the indications from the aircraft's systems. In this incident, two of three systems did not indicate abnormal readings, so was there ever a real emergency? If confronted with a similar in-flight emergency situation, what would you do? ■

Editor's note: This accident is currently under investigation.

—For more information about this accident, contact MAJ Ron Jackson, Aviation Systems and Accident Investigation Division, U.S. Army Safety Center, DSN 558-3754 (334-255-3754), ronald.jackson@safetycenter.army.mil

Integrating A Fall Protection Strategy

By: Frank McClanahan

She looked up at the clock and noticed that it was already 5:30 p.m. She thought to herself as she took the dinner rolls out of the oven that Bill must be running late. Suddenly she heard the phone ring. She reached over and grabbed the cordless unit to answer it. On the other end of the receiver, she heard her husband's supervisor. "Mary? This is Tom. Bill slipped and fell from the top of a Chinook helicopter. He's in the Medical Center now with a broken left leg and arm."

This is not the kind of phone call a supervisor wants to make, nor is it the kind of call a loved one wants to receive. But unfortunately, because falls are one of the most common workplace accidents, phone calls such as the one described above have become more commonplace. According to the Bureau of Labor Statistics, falls are the second-leading cause of workplace deaths and the third most common cause of work-related injuries throughout the nation. In fact, recent statistics indicate that 808 workers died in 2001 as a result of workplace falls. This is a 10% increase over 2000 levels.

Army ground accident experience over a 6-year period, fiscal years (FYs) 1997 through 2002 reveals that the categories of human movement; maintenance, repair, and servicing; and materials and passenger handling have yielded the largest number of fall-related accidents. Army Aviation accident experience, FYs 1993 through 2002 indicates 27 recordable accidents involving falls from helicopters (see tables below).

Leadership within the Army is fully aware of how injuries to soldiers, civilians, and government contractors can have a significant impact on resources and mission capability. They are also aware that many of our day-to-day tasks closely mirror those within the civilian sector. Because the nation has identified fall-related workplace accidents as such a significant problem, Army leaders have directed that hazards associated with falls be identified and assessed, and that controls be developed and implemented to prevent fall-related accidents.

FALL-RELATED GROUND ACCIDENTS FY97-FY02
Human Movement: 142
Maintenance, Repairs, and Servicing: 108
Materials and Passenger Handling: 56

FALL-RELATED AVIATION ACCIDENTS, FY93-FY02
AH-64 Apache: 8
CH-47 Chinook: 7
UH-60 Black Hawk: 6
UH-1 Iroquois: 3
OH-58 Kiowa: 2
AH-1 Cobra: 1

OSHA has levied citations against government contractors performing aviation maintenance at some Army installations for violation of the 1910.23 (c) (1) standard, which states: **"Every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing (or the equivalent as specified**

in paragraph (e)(3) of this section) on all open sides except where there is entrance to a ramp, stairway, or fixed ladder." Other Army facilities have also been cited for violation of the 1910.23 standard, as well as 1910.26, *Portable Metal Ladders*, 1910.27, *Fixed Ladders*, 1910.29, *Manually Propelled Mobile Ladder Stands and Scaffolds (Towers)*, and 1910.67, *Vehicle-mounted Elevating and Rotating Work Platforms*.

Commanders must develop a plan of attack to deal with fall hazards that exist within workplaces under their purview. Step one is to conduct thorough job hazard analyses of workplace operations in order to identify where potential fall hazards exist. Step two is to increase the awareness of personnel who work in the identified areas. Step three is to develop a strategy to eliminate or control the hazards. The following recommended control measures, in order of importance, should be considered as a possible strategy for dealing with identified workplace fall hazards:

(1) Elimination. Remove identified hazards or hazardous work practices (e.g., lower devices or instruments such as meters or valves to the worker's level) whenever possible. This is the most effective control.

(2) Substitution. Substitute or replace the hazards or hazardous work practices with those that are less hazardous (e.g., prefabricate structures on the ground in lieu of erecting the components at heights in excess of the applicable standard).

(3) Isolation. Isolate or separate the hazards or hazardous work practices from personnel (e.g., installation of a guardrail at an opening or leading edge).

(4) Engineering controls. When hazards cannot be eliminated, substituted, or isolated, use engineering controls to control the risk (e.g., pre-drilled holes for attachment of fall arrest systems to attach anchorage connections).

(5) Administrative controls. This includes measures or practices designed to reduce the risk of personnel falling (e.g., post warning signs or restrict certain areas).

(6) Personal protective equipment (PPE). Consider PPE only when other control measures are not practical, or as a means to provide a secondary level of fall protection.

No one is in a better position to prevent accidental falls in the workplace than commanders. Simply use the information provided above to integrate the requirements of OSHA fall protection standards contained in parts 1910, *General Industry*, and 1926, *Construction*, into existing safety programs. ■

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[References: *Fall Protection Training* by Valerie Overheul, www.ishn.com, and *September 11 Attacks Skew Statistics on Workplace Fatalities*, www.snipsmag.com.]

To Bury a Son

Alex, the only son of Lt. Col. Ron and Dina Hatfield, liked to hunt, hike, and collect coins. But mostly, he loved to fly. That's his father's fault. His dad is an Air Force pilot, so flying was in Alex's blood. He lived to fly. Ironically, that's also how he died.

By: Lt. Col. Ronald L. Hatfield

*<**REWIND**><**STOP**><**PLAY**> The color blue. Two men in military dress. Seven in the morning. I'm on vacation... hotel room. Doesn't make sense. Blink hard, shake the sleep away. Check again. Peephole fish-eye view. The color blue... two men in military dress outside the door. Not a dream. Icy flush, blood turns cold. Can't breathe, weak knees, shaking. Not a dream. Can't find my pants. Wait, mistake... can't be! Not a dream. Dina, get up. Check again. The color blue. Open door, chaplain's cross, solemn voice. "Are you the parents?" "Yes we are!" "On behalf of the Secretary of the Air Force, I regret to inform you" ... not a dream... "died from injuries"... muted scream... "sustained during an aircraft training accident near Silver Hills, AL." Dina's muted mantra echoes mournful... "Ron, what does it mean, what does it mean?" Pacing ... heart racing, lost. "What does it mean?" Wife's ashen face, cradled in my hands. Mother's eyes, fearful, tearful, bleeding, pleading... "What does it mean?" What to say, no soft words... "Dina, Alex is dead." Not a dream.*
*<**PAUSE**>*

Sept. 28, 2000, Beau Rivage Hotel, Biloxi, Miss. This is how my wife Dina and I started our day. Our only son, Alex, was dead only four months into his Air Force career. A 22-year-old second lieutenant in the initial stages of strike/fighter navigator training at Naval Air Station, Pensacola, Fla., we had just spent three wonderful days with him. A visit to see him was the reason for our vacation. Little did we know when we said good-bye 2 days earlier that it would be the last time we would see him.

Alex was really into computers, and we really enjoyed computer war-gaming together. He also liked to collect coins, hunt, shoot (marksmanship), and hike. He was fearless when it came to doing new things.

But most of all, Alex loved flying ... my fault. I started my Air Force flying career in 1978 and continue it today as a T-1A Jayhawk pilot. Alex and I passed countless hours swapping stories and sharing dreams. My fondest memory of Alex is when I commissioned him as a second lieutenant in May 2000. Joining the Air Force to begin his flying career was such a desire of his, and to see that goal realized and to be the one to make it official was awesome.

Alex was almost done with the familiarization phase of his program, the hands-on flying phase, a mini-pilot training, if you will. He had his checkride and a night flight left before he moved to the back seat of the T-34C for navigator qualification. He never made it to the night flight.

Alex and his instructor doubtless had no clue of the events about to unfold. I imagine they stepped to the jet full of anticipation and

jazzed about the chance to turn jet fuel into noise. Alex was effervescent when it came to flying.

I didn't know his instructor pilot (IP), but Alex had flown with him before and liked him immensely. He was, by all accounts, a fast burner. A seasoned pro with 1,300 hours in the P-3 and nearly 600 hours in the T-34C, he was the latest IP of the quarter for the squadron.

The course rules for Alex's checkride called for pattern work followed by aerobatics and area work. The pattern work and aerobatics appear to have gone well. Then came the spin. No one knows for sure, but it would have been next in the profile, and the radar tapes have a classic spin signature.

From spin entry to ground impact was just under a minute. With no ejection seat, the minimum altitude for bailout in the T-34C is 5,000 feet above ground level. That gave Alex and his instructor 25 seconds from entry to the decision to get out. With no cockpit voice recorder, no one knows why the spin recovery attempts were unsuccessful. Post-crash investigation showed the aircraft systems to be working normally at ground impact.

The decision to jump was delayed too long. The instructor pilot bailed out 1.2 seconds from impact, and Alex followed .5 seconds later. The arming lanyard for his parachute never reached its full 6-foot extension. He died from blunt force trauma associated with ground impact.

Alex had 13 hours in the T-34C, counting his last flight. I have 5,400 flying hours and not a scratch—not even a serious in-flight emergency worth mentioning.

As a father and an IP, the accident raises a lot of questions for me. Dina and I will never know in this lifetime what really happened on that airplane that day. The one thing I do know is no one planned it that way.

Students sometimes brief me that we don't need to check local notices to airmen because we aren't planning a full stop. Wrong answer! Stuff happens; things change. The Army has a great saying: "No plan ever survives first contact with the enemy." We have, in our business, a lot of enemies: the weather, complex systems that pick the absolute worst time to get cantankerous, birds with an AMRAAM missile wanna-be complex, busy airfields, you name it.

For me, my worst enemy watches me shave every morning. I'm absolutely terrified of my own weaknesses and work hard to eliminate them on a daily basis. As a brand new lieutenant, I read a lot of aviation books. One of them had a quote that has colored my approach to flying for 25 years: "I am not afraid of the known ... it is the unknown that scares me, for in the end, it is the unknown that will kill me," which is why I strive to know everything there is to know about my airplane. For those of you who have flown with me, you know I live by this creed.

I can never be over-prepared or know enough. If you don't have the answer to "what if" before it happens, when it does you'll almost certainly find yourself behind the power curve. For me, I'm a creature of habit. If I do it right every day, no matter how trivial or routine the mission, I should be ready when things go south. You will play to the level you practice, and every mission should be practice for the day you have to play for real. Teach your students the same lesson.

Perfection is not possible, but that doesn't mean it isn't a worthy goal. Have your "A-game" on every day; I beg you. You never know when you will need it.

*<**FAST FORWARD**><**STOP**><**PLAY**>*
*Honor guard, unfurled flag. Snap, fold. Snap, fold. Blue triangle, white stars. Slow salute, white gloves. "On behalf of a grateful nation"... ready, aim, fire!... 21 reports break the silence. Haunting wail of taps... not a dream. Left to right, four jets fly by. Only three remain. One climbs, lifting higher. Bright sun, autumn sky... the color blue. <**STOP**>* ■

—Lt. Col. Ronald L. Hatfield is the 32nd Flying Training Squadron Assistant Director of Operations at Vance Air Force Base, Okla., where he flies the T-1A Jayhawk. In addition to Alex, the Hatfields also have three daughters.
This article is reprinted with permission from *TORCH* Magazine, March 2003.

NEWS & notes

Update on the New Boot

Since the December 2002 and February 2003 issues of *Flightfax* when we told you that the CG, U.S. Army Aviation Center, waived the "All Leather Boot" regulation in AR 95-1 allowing the wear of the Air Force's Desert Flyer's Boot and the Army's new Combat Infantry Boot, the phone calls and e-mails have been pouring in. The following updated information is provided:

As a reminder, the December 2002 article explained the sand-colored, Air Force-designated Desert Flyer's Boot (Belleville 790) was approved for wear by Army Aviation personnel. The February 2003 article explained the all-black Combat Infantry Boot (Belleville 700) was also approved for wear by Army Aviation personnel. The good news is both boots met the same rigorous testing and both are deemed safe for flight. The bad news is neither boot is immediately available for units to order.

"So when can I order the Combat Infantry Boot for my unit?"

All of the production effort for the Combat Infantry Boot is going to initial issue stock. The earliest this boot may be available through GSA, Clothing Sales, or through the Defense Supply Center Philadelphia (DSCP) is late this summer or early next fall. National Stock Numbers (NSNs) have not been published for the Combat Infantry Boot as of this writing.

"What about the Desert Flyers?"

The Desert Flyer's Boot is already in the supply system, but unfortunately it is on indefinite backorder. All of the production effort for this boot is going to deployed personnel and deploying units. It is unknown when this boot will be available for normal requisition. NSNs may be found at the following DSCP web site: **http://ct.dscp.dla.mil/catalog/pgcs/02702.html.**

"Hey, I heard these are GREAT boots and I really want a pair. Do I have any other options?"

Both boots have been manufactured by the Belleville Shoe Company for several years. Retailers who sell Belleville products may have these boots on their shelves. More information may be found at the Belleville Shoe Company web site: **http://www.bellevilleshoe.com/**. ■

—POCs: COL Ellis W. Golson, Director of Combat Developments (DCD), Ft. Rucker, AL, DSN 558-3203 (334-255-3203), GolsonE@rucker.army.mil; and MAJ Tom Fugate, Aircrew Systems Branch Chief, DCD, DSN 558-3816 (334-255-3816), thomas.fugate@rucker.army.mil

Oops

In the March 2003 *Flightfax* article, "2002 AAAA Winners!" we incorrectly reported the Overall Winner and Combat Category Winner on page 18. The correct winner is 3rd Battalion, 101st Aviation Regiment, Fort Campbell, KY (not 2nd Bn as previously mentioned). We regret this error and congratulate the 3rd Battalion on a job well done. ■

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class B**: Aircraft drifted while at a hover and struck a tree(s). The aircraft began to vibrate excessively. The crew landed immediately and conducted emergency shutdown procedures. The four main rotor and tail rotor blades were destroyed in the accident.

■ **Class C**: Aircraft was at 400 feet above ground level (AGL) and traveling at 100 knots when the crew encountered a flock of birds, resulting in multiple strikes. After landing, the crew discovered a dent on the #1 engine de-icing cowling, dents on the tail rotor blade, and damage to a main rotor blade tip cap.

D Model

■ **Class E**: The #2 engine of an AH-64D incurred an overspeed condition (N_p: >119%) during contractor maintenance test pilot training. The engine subsequently failed and was followed by a main rotor system overspeed (N_r: 120%).

MH-47

E Model

■ **Class C**: The aft transmission vertical shaft OIL PRESSURE LOW caution light illuminated in flight. The crew landed as soon as possible to a nearby onion field. During the approach, the aircraft fuselage and aft rotor system contacted a wire just prior to touchdown. The crew landed and shut down the aircraft without further incident. Damage to the aft transmission and two aft rotor blades was discovered during post-flight inspection.

OH-58

D Model

■ **Class C**: Aircraft rotor blades contacted trees while at an out-of-ground effect (OGE) hover during Hellfire gunnery training. The crew landed the aircraft without further incident.

DR Model

■ **Class C**: Aircraft experienced a Full Authority Digital Electronic Control (FADEC) failure warning with audio while at a 3-foot hover from refuel to parking. The engine oversped to 124 percent N_p for 6 seconds during throttle reduction and activation of the FADEC AUTO/MAN switch. The aircraft was shut down without further incident.

■ **Class C**: Aircraft engine and rotor system oversped (146 percent for 1 second and 135 percent for 2 seconds, respectively) during touchdown from hovering autorotation.

■ **Class C**: Aircraft incurred engine and suspected rotor system overspeed conditions (125 percent for 4 seconds and 124 percent, respectively) while in manual throttle operation.

UH-60

A Model

■ **Class B**: Aircraft made contact with a metal light pole while ground taxiing with a ground guide. The four main rotor blades and three tail rotor blades were damaged in the accident, which also caused foreign object damage (FOD) to a hangar and a civilian aircraft inside the hangar.

■ **Class C**: During dual engine start, the aircraft auxiliary power unit (APU) failed. The instructor pilot (IP) advanced the #1 engine power control lever. When the generators came online, the #2 engine turbine gas temperature (TGT) was 980 °C and peaked to 1008 °C. The IP performed emergency engine shutdown procedures.

L Model

■ **Class A**: Aircraft crashed during a nap-of-the-earth orientation flight with nine passengers and four crew onboard. The aircraft was discovered during search and rescue efforts after having been reported overdue. The aircraft was totally destroyed; 11 of the 13 personnel onboard sustained fatal injuries and the other 2 suffered serious injuries.

WHEN FLYING IN THE FACE OF Risk

- Bird Strike
- Wire Strike
- Tree Strike
- Thunderstorms
- Lightning
- Dust or Snow
- FOD

Use Risk Management

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

JUNE 2003 ✦ VOL 31 ✦ NO 6

A Closer Look at FY03 ACCIDENTS

Flightfax

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U.S. ARMY SAFETY CENTER

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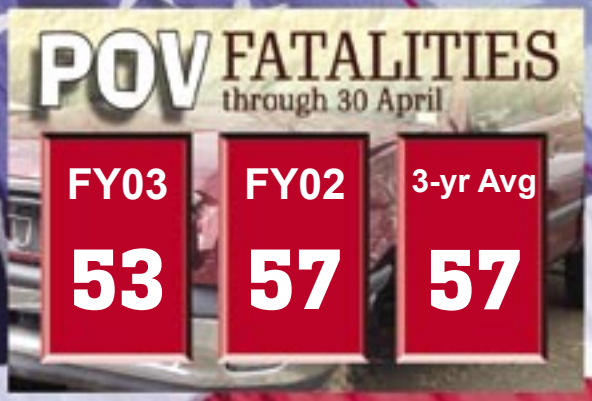

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James E. Simmons
Brigadier General, US Army
Commanding

DASAF's CORNER

from the Director of Army Safety

Keeping Our Guard Up

The majority of the enemy's guns in Iraq are now silent. The scenes from the fall of Saddam Hussein's statue in the center of Baghdad and particularly the dramatic rescues of our brave young men and women once held captive now have been added to the collection of our proudest moments in the history of the United States of America.

Equally as important, the rescues themselves will serve as a comfort to all present and future generations of soldiers and their families. Let no one doubt that for your selfless service and the many sacrifices you make for this great country, this Army, and this Nation, we will not forget you—no one will be left behind—and those who would willfully inflict harm on you will not go unpunished. This is yet another lesson that any present or future enemy of our great Nation should heed.

Staying intensely focused was easy when the mission before us was to liberate the Iraqi people, protect each other, and recover our comrades. Maintaining situational awareness isn't an option when the enemy is firing back or when our fellow soldiers' lives are in peril. A momentary lapse in vigilance could be deadly. But now that the major pockets of resistance have been overcome, the Iraqi people are getting a daily taste of that precious thing called freedom that we, as Americans, have long been willing to defend and even to die for. Sadly, some of our American and coalition soldiers have paid the ultimate price in helping them secure that freedom.

The loss of any life is a tragic event, whether it occurs while engaging the enemy or whether it happens as the result of a moment of carelessness. History shows that we repeatedly lose more soldiers to accidents than to enemy action. We survived the early stages of the war with minimal accidental losses, and I believe that this is a testament to the training of each soldier and commander's emphasis on properly integrating risk management into mission planning, preparation, and execution.

Historical data also tells us that often the most dangerous portion of any mission is when it is almost over and we are starting to feel the symptoms of "get-home-itis." Time and again, the majority of our losses have occurred once the battlefield guns have fallen silent and the flight crews are headed home. That's when the adrenalin slows, our guards drop, hazards are overlooked, and accidents happen.

Your determination, skill, discipline, and execution of each trained task to standard has helped us be overwhelmingly victorious in the early main battles—but the dangers have not yet fully passed. I urge you to maintain vigilance, being ever alert for new hazards as situations and conditions change.

It has been said many times before that "He is safe who is always on guard."

Keep your guard up!

James E. Simmons

A Closer Look at FY03 ACCIDENTS

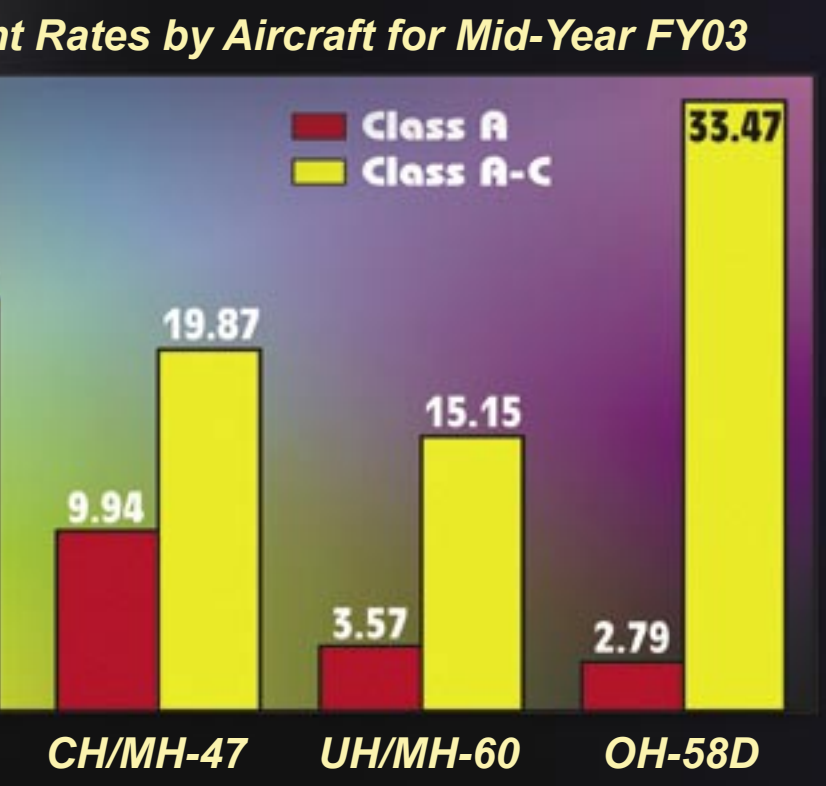
By: Charisse Lyle

Since 1 October 2002, the Army has experienced 54 Class A through C aviation accidents. These accidents have resulted in 25 fatalities and more than $84 million in damage and injury costs. Almost a third of the accidents (16 out of 54) occurred in Operations Iraqi Freedom and Enduring Freedom. Brownout conditions were a contributing factor in half of these accidents (8 of the 16).

Airframes

The bar chart above compares the accident rates for each of the force modernized aircraft.

- **UH/MH-60 Black Hawk (17)**. The Black Hawk had the lowest Class A through C rate; however, the majority of accident fatalities occurred in this aircraft. Ninety-six percent (24 of 25) of the fatalities during this timeframe occurred in four Black Hawk accidents. The high number of fatalities was due, in part, to the fact that the Black Hawk had troops onboard in one of the accidents. In that accident alone, there were 11 fatalities. Of the four Class A accidents, low moon illumination, low contrast, and poor terrain definition were common hazardous conditions in two (both in Southwest Asia). Inadvertent instrument meteorological conditions (IMC) were a definite contributing factor in one Class A accident and a suspected factor in the remaining Class A accident. Pilot reports (PIREPs) and planned and rehearsed



emergency instrument recovery procedures are important controls to help mitigate the risk of these deadly accidents.

■ **AH-64 Apache (14)**. The Apache had the second highest Class A and Class A through C accident rate of all the force modernized aircraft. Brownout conditions were contributory in four of the Class A and B accidents. Other events included inadvertent drift while at an out-of-ground-effect (OGE) hover resulting in a tree strike, a wire strike (wires were reportedly unmarked on the map), and a bird strike. In one accident, the main rotor blades contacted the pilot night vision system (PNVS) during an evasive maneuver to evade a training surface-to-air radar. In two Class C accidents, suspected tree-strike blade damage was noted during the post-flight inspection.

■ **OH-58D Kiowa Warrior (KW) (12)**. The KW had the lowest Class A (a whiteout and subsequent tree strike), but highest Class A through C accident rate for this timeframe. Half of the KW Class C accidents involved emergency procedure training {autorotations (2), manual throttle operations (2), and a simulated engine failure (1)}. These resulted in rotor or engine overspeeds or overtorques and/or hard landings. One Class C accident involved inadvertent drift into a tree while at an OGE hover during night battle position operations ("Hellfire" training). Another involved a wire strike during night vision goggle (NVG) terrain flight. In this case, a flight of two KWs conducting NVG multi-ship training descended into a valley for low level flight. The lead aircraft struck a set of three power lines. The crew escaped without injury and there was minor damage to the aircraft.

■ **CH/MH-47 Chinook (7)**. The Chinook had the highest Class A rate. All of these accidents occurred during Operation Enduring Freedom. Five of the seven (71 percent) Class A through C accidents occurred during approach and landings. Two of these involved brownout conditions resulting in hard landings; one involved a wire strike during a precautionary landing; and in another, the three aft rotor blades struck the ground when landing on uneven terrain.

Summary

Environmental conditions were a contributing factor in many of the accidents during the first half of FY03. Brownout conditions, in particular, presented a challenge to flight safety. Crews must use effective crew coordination and be prepared to execute a go-around when the touchdown point is lost. Inadvertent IMC is a deadly hazard that continues to claim needless lives every year. Failure to commit to instruments immediately upon entry into inadvertent IMC conditions is a fatal mistake. Periodic hands-on training for this contingency is critical in preparing aviators to confidently and successfully react to this emergency.

Editor's note: These statistics are current from the USASC database as of 25 April 2003. Delayed reports could change these figures somewhat in the coming months. ♦

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Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

UH/MH-60 Lessons Learned

By: MAJ Ron Jackson

Midway through FY03, the Black Hawk has experienced an uncharacteristic increase in Class A accidents. As of 31 March, the Army has experienced 12 aviation Class A accidents, of which 4 involved the H-60. These accidents include the UH-60A, UH-60L, and MH-60L. The most disturbing detail is that in these four accidents, we experienced 24 fatalities.

Accident #1

The mission was to conduct night vision goggle (NVG) continuation training and crewchief NVG readiness-level (RL) progression training. The crew conducted preflight with no deficiencies and the crew brief was completed.

The crew departed the airfield and completed a frequency change to the local flight-following facility. When the UH-60 crew failed to provide a position report at the required time, the flight-following agency requested that a sister ship try to establish communication. A UH-60 was successful in contacting the crew and relayed to the flight-following facility that her sister ship had arrived at their destination and would contact them via landline after shutdown.

While waiting for refuel, the PC contacted the flight-following agency and informed them that they were having communication problems on all frequencies. He further relayed their anticipated departure time; however, the crew did not update their weather forecast. The aircraft departed on time and was following an established route structure. As weather began to deteriorate, the crew decided to circumnavigate the worsening weather conditions by

turning to the east of the route. Approximately 20 minutes into the flight, the aircraft impacted the crest of a ridgeline. Results: Aircraft destroyed and five fatalities.

Accident #2

The mission was to conduct day direct action penetrator (DAP) familiarization and night multi-ship DAP training. The air mission brief (AMB) was completed, the crew conducted preflight with no deficiencies, and the aircrew brief was completed with emphasis on DAP familiarization and procedures.

It took approximately 50 minutes to complete the DAP familiarization, at which time the aircraft returned to the airfield to re-arm and swap out pilots. The instructor pilot (IP) remained aboard as the crew swapped out. After completing re-arm, Chalk 2 departed to link up with Flight Lead at the range.

The crew linked up with 'Lead' and began the night portion of the training, with the pilot (PI) on the controls. Approximately 30 minutes after arriving, Flight Lead reported they were out of ammunition and were returning to the airfield; Chalk 2 remained on station to complete their training. At this time, the PI transferred the controls to the IP.

The aircraft was cleared left after the IP completed his second engagement. They began a left break to prepare for the next engagement. Seconds after initiating the break, the aircraft impacted the ground with an estimated 54-degree left roll and 22-degree nose-low attitude. Results: Aircraft destroyed and four fatalities.

Accident #3

The mission was to conduct multi-ship day and night exfiltration training of four 6-man long-range surveillance (LRS) teams in preparation for future operations. The company that was assigned the mission usually

conducted command and control operations in support of higher headquarters; but due to the task organization of the aviation task force, the unit was given the mission to conduct the exfils. The crew conducted preflight with no deficiencies and the crew brief was completed.

During taxi to the runway, tower informed the flight that the field was under instrument flight rules (IFR) conditions with visibility 2½ miles and requested their intentions. Flight Lead requested a special visual flight rules (SVFR) departure, which was approved by tower. The flight established staggered left formation and flew toward their first checkpoint. As the flight continued, the weather, coupled with blowing sand, made it difficult to maintain visual reference with the ground. With conditions continuing to worsen, the aviation mission commander (AMC) announced to the personnel on his aircraft that they were returning to base and the mission was cancelled. The crew initiated a climbing left turn only to find themselves in inadvertent instrument meteorological conditions (IIMC).

As Flight Lead continued to climb, one of the crewmembers still maintained visual reference with Chalk 2, which had not followed Flight Lead. Suddenly he observed a bright flash as Chalk 2 impacted the ground at an estimated 165 knots. Results: Aircraft destroyed and four fatalities.

Accident #4

The mission was to conduct day multi-ship infantry battle skills training, loading and unloading, and orientation flight. The crew conducted a preflight after a mandatory 10-hour inspection. There were no deficiencies found on preflight and the crew brief was completed.

After departure from the airfield, Chalk 2 moved to staggered right formation. Once the flight transitioned to low-level flight, the formation changed to free cruise. Shortly thereafter, Chalk 2 noticed Chalk 3 separating from the formation. The PC of Chalk 2 anticipated this due to the training that was being conducted by the IP in Chalk 3. After completing the orientation, the flight began its approach to the airfield. Flight Lead contacted tower and reported a flight of three for landing. However, tower replied "Understand flight of two for landing" and Lead responded, "We are a flight of three." Tower replied, "There are only two aircraft in your formation, cleared to land Bravo Two."

The accident aircraft impacted flat, marshy terrain at an angle of impact of approximately 30 degrees nose-low attitude and an undetermined left bank angle. Results: Aircraft destroyed, 11 fatalities, and 2 serious injuries.

Lessons learned

Preliminary investigations have ruled out mechanical factors in all the accidents, therefore leaving human or environmental factors as causal or contributory. Although these accidents occurred in a variety of locations with a range of crew experience, there are common trends among the causes.

■ **Environmental hazards**. Three of the four accidents occurred during zero percent lunar illumination, whether natural or due to cloud cover, and in areas of low-terrain contrast, making it even more difficult for aircrews to accurately estimate altitudes and closure rates. Two of the four had limited visibility due to precipitation and deteriorating weather; however, investigation indicates that neither crew attempted to transfer to instrument flight.

■ **Inadequate weather dissemination and forecasting support**. In two of the four accidents, inadequate weather observations made it difficult for forecasters to accurately determine weather conditions beyond their local flying area. In the remote areas of operation, it is incumbent on Army aviators to submit accurate pilot reports (PIREPs) so that weather personnel can maintain an accurate picture of changing weather conditions. Without these PIREPs, forecasters cannot effectively produce forecasts, amendments, or advisories.

■ **Lack of proficiency in IIMC recovery procedures**. Every year aviators conduct their annual instrument evaluation; but how often do aviators practice IIMC procedures in the aircraft? Generally this evaluation is conducted via table talk or in a flight simulator. Regardless of how this procedure is trained or evaluated, there is still reluctance for aviators to commit to IIMC.

■ **Leaders fail to enforce standards**. Leaders are failing to enforce standards and integrate risk management into planning, preparation, and execution of missions. These varying degrees range from active leader involvement to minimal leader involvement. Risk management is an ever-evolving process that must be continually assessed from the start to the finish of every mission; it does not end when the mission brief sheet and risk assessment worksheet are signed.

To date, we have lost 24 of the Army's most precious resources in four Class A Black Hawk accidents alone. Our missions are never easy; danger lurks in the environments in which we train. We must work hard to protect our soldiers and learn from our mistakes. ♦

—MAJ Ron Jackson, Aviation Systems and Accident Investigation Division, U.S. Army Safety Center, DSN 558-3754 (334-255-3754), ronald.jackson@safetycenter.army.mil

Aircraft Refueling and Defueling Aboard Navy Ships

By: CW4 Micheal J. Vandeveer, U.S. Army Retired

A wise man once said, "Going to sea is a great deal like going to prison, with a good chance of drowning." I don't believe that he realized the depth of that statement. For the past few years, a dedicated group of professional military men, government employees, and a few civilian contractors at the Joint Shipboard Helicopter Integration Process (JSHIP) office have been struggling with an age-old problem: what happens when Army and Air Force rotary-wing aircraft are required to deploy aboard Navy ships? JSHIP, a joint test and evaluation effort by the Office of the Secretary Defense, was chartered to address that specific issue.

In this article, I would like to address just a single small facet of that challenge: refueling and defueling Army rotary-wing aircraft aboard Navy ships.

General procedures for refueling and defueling operations

Refuel and defuel procedures MUST be closely coordinated with the ship's crew and flight deck control. Firefighting crews, in proper uniform, must man their equipment and be in constant communication with flight deck control. All activities on the flight deck will be coordinated with flight deck control. If at all possible, it is recommended that all refuel and defuel procedures be discussed at length prior to embarkation. In almost every case, the ship's crew is not familiar with Army aircraft, and Army aircrews might not be familiar with refueling and defueling procedures aboard Navy ships.

Jet fuels

Jet fuels constitute the principal problems in aircraft firefighting. The Navy uses the following aircraft jet fuels: JP-4, JP-5, and JP-8. However, aboard Navy ships, only JP-5 will be used. JP-5 has a freeze point temperature of -51°F, yet does not have anti-ice or anti-static additives other than fuel system icing inhibitor (FSII). If available at a shore facility, it is recommended that aircrews refuel with JP-5 before embarking.

The following has been extracted from Aircraft Refueling NATOPS Manual, NAVAIR 00-80T-109, and NWP 3-04.1:

The ship's refueling personnel are called "Grapes" because of the purple jerseys they wear. Grapes usually conduct all refuel and defuel

operations. Crew chiefs or plane captains, trained and qualified in accordance with NAVAIR 00-80T-109, may also conduct shipboard refueling. Additionally, if the Grapes are unfamiliar with the embarked aircraft, they will need to receive aircraft-specific fueling systems orientation as soon as possible prior to or immediately after embarkation aboard the ship. This orientation brief is recommended to be conducted in conjunction with the required crash, salvage, firefighting, safety, and egress training brief(s).

A minimum of three people are needed for refueling an aircraft aboard ship: refueling crewman, refueling station operator, and a crew chief or plane captain. A crew leader (safety person) also is recommended for each refueling; however, a crew leader may supervise multiple fueling operations simultaneously. Refueling personnel routinely conduct "in-line" fuel sampling at the hose prior to fueling. Consequently, expect minor fuel spills during the sampling process.

Prior to refueling the first aircraft each day, fuel should be flushed through the refueling hose and nozzle and tested for contamination. The fuel from each hose in use will be tested every 24 hours at a minimum. Fueling should not begin until the acceptable results listed below have been obtained:

- Less than 2 milligrams or liters solid contaminants.
- Less than 5 (PPM) free water.
- Over 0.03 percent FSII (for aircraft, including H-60s requiring FSII) to prevent water-ice formation.

Debark all passengers aboard the aircraft to be refueled. The crew chief or plane captain will check for "hot brake" conditions, and grounding and bonding cable(s) from the deck to the aircraft will be attached. Aircraft windows and side doors (if installed) should remain closed during the entire fueling operation—aircraft refueling operations should be stopped if a window or side door is opened.

Crew changes and hot seating should not be conducted during hot refueling. Exceptions: rear cargo doors and/or doors on opposite sides of aircraft from the refueling adapter may be open. However, the refueling hose must be positioned so that in the event of a nozzle or adapter malfunction or hose rupture, fuel will not enter the aircraft passenger, cargo, or cockpit compartment(s).

Personnel in the vicinity of the refueling aircraft will wear full flight deck gear. Standard flight deck personal protective equipment (PPE) includes long sleeves, float coats, goggles, cranials (helmets) with hearing protection, and flight deck steel-toed boots. Refuelers will wear additional protective gear, such as gloves.

Hot refueling

Hot refueling will be performed using only single-point refueling (SPR) or closed-circuit refueling (CCR) nozzles and aircraft receptacles. Aircraft will not be gravity refueled or open-port refueled with the engines operating because of the increased probability of a fuel spill and fire. This policy is contained in NAVAIR 00-80T-109 and applies to Navy and Marine Corps Air Stations and tactical refueling sites, as well as naval ships.

Single-point refueling (SPR)

The Navy uses the NATO Standard D-1 Pressure Refuel Nozzle to both refuel and defuel their aircraft, and it can be used to refuel most joint aircraft; however, the D-1 cannot be used to defuel Army aircraft. Ensure refueling personnel are aware of this limitation.

Closed-circuit refueling (CCR) nozzles

The two types of CCR nozzles usually found aboard ship are the Navy "Wiggins" or "North Island" CCR Nozzle (model AE87549) and the Navy NATO High Capacity (NHC) Nozzle used for helicopter in-flight fueling rules (HIFR) operations. These nozzles can fit onto Army helicopter adapters, but they regulate pressure to 45 pounds per square inch gauge (psig), in contrast to the standard 15 psig Army requirement. All Navy aircraft can be refueled up to 55 psig, while Army aircraft allow a maximum of either 15 psig or 55 psig, depending on model. The UH-60 Black Hawk

and AH-64 Apache can be refueled with the 45 psig CCR HIFR nozzle, while the UH-1 Iroquois, AH-1 Cobra, and OH-58 Kiowa can only be pressure-refueled at 15 psig. The Navy's CCR nozzle might overpressure Army UH-1 and OH-58 CCR systems and possibly damage them.

MH-6 aircraft do not have CCR capability. The Army's AE83206R Nozzle (connects to the quick-disconnect [QDC] or QDC adapter) and the AE83501R Nozzle (designed for unisex coupling) deliver a maximum 15 psig and are appropriate for shipboard use. It is recommended that units include one Army CCR nozzle per OH-58 aircraft that embarks or receives fuel from ships on a regular basis.

Procedures (IAW NAVAIR 00-80T-109)

■ The pilot will select fuel loading, ensure that the cockpit switches are in the proper positions, and monitor UHF radio with the primary flight control (PriFly).

■ The pilot will secure (turn to OFF position) all unnecessary electronic and electrical equipment not required for refueling.

■ The pilot will place all armament switches in the SAFE position.

Aircraft auxiliary power units (APU):

The aircraft APU can be used to supply electrical power for pressure refueling on aircraft so equipped on the flight deck. However, refueling with the APU running should not be conducted in hangar bay areas because "hot refueling" is prohibited in all ship hangars.

One person should be located at the APU controls in the cockpit. The pilot or qualified crewmember and the refueling personnel should communicate by hand signals, signal wands, or aircraft internal communications systems (ICSs) to ensure immediate response in the event of an emergency.

Cold refueling

Cold refueling is conducted with closed- or open-port refueling adapters. Open-port or over-the-wing refueling (gravity refueling) is authorized for aircraft that are shut down. When required by operational necessity (combat), the Navy may waive hot open-port refueling and allow shipboard open-port hot refueling of aircraft.

Additionally, the Army may waive its prohibition IAW Field Manual (FM) 10-67-1 under the following conditions:

■ During combat operations, open-port hot refueling may be used for helicopters when, in the judgment of the aviation commander and at the discretion of the captain of the ship, the requirements of the tactical mission and the benefits of reducing ground time outweigh the risks of this method of refueling.

■ During non-combat situations, there must be compelling reasons in order for open-port hot refueling to be allowed.

Gravity refueling

Some Army helicopters have external drop tanks, known as the extended range fuel system (ERFS), which do not have SPR or CCR capability and must be gravity refueled. MH-6 aircraft must also be gravity refueled because they lack CCR systems.

Extended range fuel tanks

Should your unit be required to have extended range fuel tanks of any type, it is HIGHLY RECOMMENDED that they be filled with JP-5 prior to embarking. If this is not possible, it is recommended that these fuel tanks arrive aboard the ship empty so they can be filled with JP-5 aboard the ship. Defueling fuel tanks aboard Navy ships is extremely difficult. ♦

Editor's note: There are many challenges that an embarked unit might face concerning aircraft refueling and defueling aboard Navy ships. For more information, go to the JSHIP Web site at ***http://www.jship.jcs.mil*** *and find an in-depth analysis of fueling and defueling procedures and training, to include compatibility issues for all types of aircraft that were tested by JSHIP.* Due to space, we were unable to publish CW4 Vandeveer's full story. *Check our website for his complete story –* ***http://safety.army.mil***.

—Micheal J. Vandeveer (Retired CW4 Army Aviator), JSHIP Procedures and Training Director, Patuxent River Navy Test Center, MD, DSN 342-4974 x211 (301-342-4974 x211), Vandeveermj@navair.navy.mil

Power Management—What Is It?

By: CW5 Mike Moore

The term "power management" was coined by the High Altitude Army Aviation Training Site (HAATS) to describe its particular training system and techniques. This training system was devised to promote a greater understanding of the forces at work in the operation and application of the helicopter. Failure of pilots to recognize simple relationships between these forces and aircraft instrumentation is at the root of many of Army Aviation's accidents.

The HAATS, through extensive testing over the years, has developed a particular type of training that directly addresses these relationships and forces pilots to come to terms with them consciously and continuously. This type of training formulates a higher awareness of these issues and creates positive habit formation that benefits pilots when they're under severe stress—the kind of stress one expects in high gross weight, high density altitude (DA), and combat operations. It's just these kinds of operations to which Army Aviation routinely deploys.

At the foundation of power management are three tasks simulating max gross weight: the reconnaissance, landing, and takeoff. The term "simulated" is important for three reasons. First, by being able to effectively simulate maximum power, the pilot obtains a reference by which he can objectively gauge performance. Secondly, the simulated reference is used to hold the pilot completely accountable for assessment, planning, and execution throughout the maneuvers. Lastly, since it is only simulation, all the true power available is available in the event of a failure in assessment, planning, or execution. This makes it a truly productive, yet safe, method of training.

In flight, the tasks are presented in a simple training format to aid the pilot in organizing and prioritizing the recon. This format, known as the landing zone sequence (LZS), is a compelling, logical way to assess important information with respect to the pilot's and aircraft's maximum capability in a landing zone (LZ). Its constant use trains the aviator to quickly, efficiently, accurately, and reflexively assess a situation. This need becomes apparent in combat when only seconds might be available to see, assess, plan, and execute.

The LZS has nine steps: (1) identification of the LZ; (2) power assessment; (3) wind drift circle; (4) wind and terrain analysis; (5) routes (in, out, and escape); (6) low recon; (7) target torque; (8) approach and departure; and (9) post-task analysis.

It is worthy of reiteration that the format is designed to train a pilot to assess a situation reflexively and accurately. It is not a combat maneuver where the tactical threat curtails the time available to conduct a lengthy assessment. A brief summary of the issues and training goals is outlined below using the LZS.

(1) Identify the LZ. This step demands the pilot's immediate and instinctive assessment of the overall suitability of the LZ. Can helicopter operations be conducted in this location? In addition, he must decide if more than minimum hover power is required to operate in and around the LZ (in-ground effect (IGE) to out-of-ground effect (OGE)). This assessment will either be confirmed or refuted at step 9.

(2) Power assessment. Using tabular data, the pilot determines the maximum weight he can lift to OGE in the LZ, what the aircraft currently weighs, whether he possesses OGE capability

and by how much, actual maximum power available, and the power required to hover IGE for the current weight. The power determined to hover IGE at the current weight will be used as simulated maximum power until step 7. In restricting the power available to the pilot during the recon, he is forced to pay particular attention to all aspects of his flight maneuvers until such time as the approach is executed. Awareness of aerodynamic, power, and environmental issues is heightened throughout the recon through this increased accountability. This provides powerful insights into the requirements involved for precise speed, altitude, and bank angle control, as well as escape routing when low and slow.

(3) and (4) Wind drift circle and wind and terrain analysis. These steps are used to determine horizontal wind flow over the terrain. Useful information anywhere, it's of particular use in mountainous terrain. Knowing the direction and velocity of the wind allows the pilot to use the wind zones and rules of airflow (wind and terrain analysis) taught by the HAATS to accurately predict the wind flow in all three dimensions, but particularly in the areas where he will be low, slow, and vulnerable. Once the direction, velocities, and zones are predicted, they must be proved, either now or in the low recon. This immediate feedback verifies or refutes predictions allowing the pilot immediate feedback on his ability to perform this analysis.

(5) Routes (in and out). Routes in and out and their associated escape routes (of which there can be several for the entire maneuver) generally are self-evident after completing the first four steps. The escape routes must account for all visible and invisible hazards. Invisible hazards are those hazards where the pilot must know that certain conditions, when joined, produce specific results (e.g., high DA, high gross weight, and high closure rates can lead to loss of tail rotor effectiveness (LTE) or rotor droop). Steep approaches of approximately 300 feet per minute rate of descent, low forward speed, 20 to 100 percent of power applied, and near max gross weight produce conditions for settling with power. Strong downdrafts close to the surface or strong turbulence near the touchdown point are also examples of invisible hazards. Pilots must be able to visualize the convergence of these conditions, know their early warning signs, and have a plan designed for these specific occurrences. At some point on all approaches, the aircraft is too close to the ground or obstacles to get away to the safety of altitude. This point must be recognized, and plans to escape to the surface are then implemented. This requirement demands a detailed assessment of the surface conditions. The surface must allow for an escape to the ground.

(6) Low recon. Information gained in steps 1 through 5 provides the basis for a plan for both the approach and departure. The low recon will be used to verify the viability of this plan. It provides the time and opportunity to scrutinize it at close quarters. Escape routes are checked for viability—can I really decrease collective, turn right, lose altitude, and still get away from the terrain from this point? If not, they must be adjusted. Are the winds exactly from the direction predicted, etc.? Is the precise landing point safe for touchdown if an escape to the ground becomes necessary? Are environmental conditions the same as used in tabular data? Army aircrew training manuals (ATMs) call for the low recon to be performed on final approach. However, for pilots training at simulated or real max gross weight with the attendant limited power and options, extra time and attention is required to perform this maneuver correctly. Consequently, under the simulated standards of our tasks, the low recon and approach are executed separately.

During the low recon, special attention is paid to what are known as

cockpit indicators. These are aircraft instruments which, when combined with ground cues, provide specific information with respect to wind conditions. Comparing indicated airspeed to groundspeed quickly alerts the pilot to the presence of a head or tail wind. Crab angle (heading compared to ground track) speaks to a crosswind. Instant vertical speed indicators (IVSIs) or vertical speed indicators (VSIs) reveal updrafts and downdrafts. During the approach, these and other indicators will be used to continue to monitor the wind situation and closure rates, both horizontal and vertical.

(7) Target torque. This is a very critical step in the power management process. The training system revolves around four separate and important torque settings. The first, hover torque, was derived in step 2 from tabular data. It serves as a reference during the recon—as simulated maximum power—and forces the pilot to consider how the aircraft is maneuvered in the airspace available so as not to compromise his limited capability. Just as importantly, it provides a reference to construct target torque, the pilot's prediction for the approach, of what power setting will be required to hover in the LZ at a given hover height. The information contained in tabular data reflects the influences of DA and gross weight. The only influences left to consider for hovering are those of wind direction, velocity, and surface issues. Consequently, target torque uses tabular data as a starting point from which to estimate the effects of the wind and surface. In addition, the pilot must predict the target torque for takeoff. This power setting is often different than the prediction for the approach.

(8) Approach and departure. Here the decision is made whether to attempt the maneuver. If attempted, the crew is briefed and the maneuver executed. Cockpit indicators are monitored throughout the approach for the earliest signs of a changing wind situation or that closure speeds, horizontal or vertical, are anything other than what they should be. When a deteriorating situation is detected, a go-around is immediately initiated. If the situation is not detected and is allowed to deteriorate past the point of resolution, the escape is executed. The go-around is defined as a proactive maneuver where full control is still available. An escape is a reactive maneuver where full control is not available and typically the collective must be lowered, airspeed increased, or both. This greatly increases the rate of descent, and this higher loss of altitude must be factored into the escape plan. In both the approach and departure, the non-flying pilot must note the maximum power used and where it was used in relation to the planned touchdown point.

(9) Post-task analysis. This step is conducted upon the completion of the maneuver, either approach or departure. *This is the most important step in the power management training system: it is here that the most learning will occur because the pilot must explain and prove correct any discrepancies that exist between the four torque settings*. The first, hover torque, comes directly from tabular data and is used as a reference to construct the second, target torque. The non-flying pilot captured the third, expended torque, while the fourth, actual torque, is a simple confirmation of the torque actually required to hover at the location and height selected. When compared, however, some interesting results can be discerned. When the target is compared to the actual, target being the prediction of actual based on the perception of wind and surface conditions, the pilot is evaluated on the quality of that perception. Discrepancies direct him back to the quality of the recon and his ability to conduct wind and terrain analysis, a key skill around any obstacles, particularly mountains. Rechecks of the surface—slopes, vegetation, or any obstruction to ground effect—as well as of the winds teach him their qualities, effects, and the

actual and precise impact on power and/or controllability. Differences between hover torque, obtained from tabular data, and actual torque can be directly attributed to the effect being examined. This is priceless information, particularly when one is heavy and the demand for precision is high.

Discrepancies noted between expended torque and actual torque reveal the quality of the execution of the maneuver. It is assumed in this training that no more power is required to execute than that required to hover. This is, in fact, true with the notable exceptions of very steep and downwind approaches. In these exceptions, the pilot is required to predict both target torque (the prediction of the power required to hover and actual torque) and expended torque, because expended torque is known to be higher than actual torque. The requirement to predict both allows for complete accountability, both for the approach profile conditions of steep and downwind approaches as well as the LZ itself (where the effects of LZ winds and surface conditions must always be acknowledged). In addition, always having to verify the accuracy of actual torque aids the pilot in determining just how steep an approach must be to consume more than hover power. Returning to the study of discrepancies, failure to execute well is almost always caused by a failure to perceive well—failure to see important visual cues or failure to correctly interpret what is seen. Most pilots rely exclusively on external cues to control the aircraft. In environments where such cues are weak or absent—over water, night, desert, or mountains—pilots are particularly vulnerable to control issues. This vulnerability is dramatically intensified when power is limited in high-DA, high-weight operations. Power management demands the informed use of internal cues known simply as cockpit indicators. Habitual use of these cues dramatically lessens reliance on external ones and provides the basis for accurate dissection of the maneuver and precise, repeatable control.

Post-task analysis is the most important step in the power management training system: it is here that the most learning will occur because the pilot must explain and prove correct any discrepancies that exist between the four torque settings.

The takeoff post-task analysis operates similarly, except there are only three torques with which to compare: hover torque (the torque actually required to hover prior to takeoff), target torque (the prediction of the maximum torque required to execute the maneuver), and expended torque (the amount of power used and captured by the non-flying pilot). Target torque is compared to expended torque only, and within the comparison lies the awareness and understanding of environmental and execution factors similar to the approach, although not as readily categorized.

Upon discerning the suspected reasons for any discrepancies, the pilot must determine how to correct them and what indicators will be used to accomplish the correction, be it in the recon or the execution. The pilot must repeat the maneuver or recon using the techniques prescribed until the power settings match. At this time, it can be stated that he has learned what affects or influences the aircraft, the degree to which it is affected (in terms of percentages of torque), and what indicators are used to control, repeat, or detect the influences. Constant training to this standard lays the required habit foundation for the high, hot, and heavy flight environment where immediate, reflexive action is required—the environment to which Army Aviation so routinely deploys. ♦

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NCO CORNER

I Am Still Here

By: MSG Shane Curtis

Motorcycles were my thing as I grew up. I raced in motocross competitions just about every weekend and worked for the shop that sponsored me. I fell often enough to learn the hard way that my helmet, gloves, elbow and shoulder pads, boots, long-sleeved jersey, and riding pants really did work. But it wasn't until one night after I joined the Army that I learned just how important my helmet was.

I bought a new Yamaha 650 street bike and ordered a full-face helmet that looked cool. That cost me some money. I always needed more money, which meant I needed to get my sergeant stripes. To get that promotion, I needed to go to night school to further my education and gain an airframe and powerplant (A&P) license. Riding my motorcycle was part of that process. When I got off duty, I rode home, grabbed my books, and then headed off to school on my new bike.

But all that would change one night. As I was going down the four-lane road heading towards our house, a teenage girl who'd had her license less than a week came toward me from the opposite direction. She saw me coming her way, but thought the car behind her was going to rear-end her, so she turned in front of me thinking she could make it. She didn't—instead, she hit me head-on!

I flew over the handlebars and into her windshield. The back of my head bounced off her steering wheel, and then I was thrown face-first into a telephone pole on the side of the road. The doctor said that if I hadn't been wearing a full-face helmet, parts of my head would have been smashed into the windshield and the left side of my face would have been left on the pole.

I was in and out of consciousness for the first 4 days after the accident. I woke up long enough to say that I wasn't unconscious the whole time, but I was in a semi-unconscious state for the next 2 weeks. By the time I realized what was going on, a month had passed. Although my parents had come to see

me, I didn't even know they were there. Some of my co-workers were there every day to help my wife, who basically lived in my hospital room with me—but I didn't remember that either.

I spent more than 2 months in the hospital receiving physical and occupational therapy. I had suffered a double brain concussion, and my brain swelled so badly the doctors thought they would have to drill holes in my skull to relieve the pressure. Fortunately, they didn't have to do that because the swelling went down.

I lost most of my memory and even had to learn how to walk again. One day, the doctor gave me a razor and told me to shave, but it wasn't until after I was released from the hospital that I found out the razor didn't have a blade in it. The doctors just wanted to see how good my coordination was—they didn't trust me with a blade.

I also had a problem with my memory; I knew names and people, but that was about it. Part of my therapy was going back out to the airfield to learn stuff that I once knew. It was only after I was told what an item was that it rang a bell and came back to me. I'd say, "Oh yeah, that's what that is, now tell me again what it does." Once they would do that I'd say, "Oh yeah that's right, I remember now!"

After a little more than 2 months passed, the doctor gave me a quick test. He told me to remember three things: the number 7, ice cream, and blue sky. After he talked to me for what seemed like an hour, he asked what the three things were. Once I told him, he said I was ready to go home.

The things listed on my profile that I couldn't do made me feel like there was little that I *could* do! No driving for a year, no climbing on top of aircraft, no going inside an aircraft unless the ramp was down and I could walk up it. I couldn't stand for more than 10 minutes, walk more than a mile, run, do physical training, and—for the fear of black-outs—go anywhere alone. My flying and crewing days were over for the next couple of years.

It took years of hard work before I got back to normal—well, about as normal as I will ever be. I still have some minor problems with my memory, but I did make it back on flying status after several years. For me, life is good. I am living a life that would have ended if I hadn't been wearing my helmet the night that girl turned in front of me.

You hear people argue that wearing a helmet gets in the way of their "personal freedom" or keeps them from hearing or seeing dangers around them. Well, I can tell you from experience that helmets work because I AM STILL HERE. ♦

—MSG Shane Curtis is an Aviation Systems Safety Manager for the CH-47 at the U.S. Army Safety Center. The Curtis' have been married for 26 years and have a 17-year-old daughter.

Operations Fax Number Changes

If you wish to fax your aviation accident report (DA 7305-R) or ground accident report (DA 7306-R) to the Safety Center, the Operations Office has recently changed their fax number. It is now DSN 558-3749 (334-255-3749) instead of x3743. ♦

—Cissy Presnell, Operations Office, DSN 558-3410 (334-255-3410); manuela.presnell@safetycenter.army.mil

Correction

In the March 2003 *Flightfax* accident briefs, the AH-64D Class B brief should have read—*"While the aircraft was in phase maintenance, the mast-mounted "radar" was dropped approximately 12 feet during hoist operations."* We regret this error. ♦

SAFETY MESSAGES

RECAP OF SELECTED 1ST & 2ND QTR FY03 SAFETY MESSAGES

The following is a listing of selected aviation safety action messages (ASAMs) and safety-of-flight (SOF) messages issued by Aviation Missile Command (AMCOM) from 1 Oct 02 through 31 Mar 03. Complete copies are available on the AMCOM web page at ***https://ams14.redstone.army.mil/safety/sof.***

AH-64

■ **AH-64-03-ASAM-01**, 141300Z Nov 02, maintenance mandatory, RCS CSGLD-1860(R1), all AH-64 series aircraft, main landing gear upper shock strut. POC: Joseph Creekmore, DSN 788-8630.

■ **AH-64-03-ASAM-02**, 201405Z Nov 02, maintenance mandatory, RCS CSGLD-1860(R1), all AH-64D aircraft, main rotor driveshaft retirement life. POC: Joseph Creekmore, DSN 788-8630.

■ **AH-64-03-ASAM-03**, 241500Z Feb 03, informational, RCS CSGLD-1860(R1), AH-64D, cockpit canopy fogging. POC: Howard Chilton, DSN 897-2068.

■ **AH-64-03-ASAM-04**, 241550Z Feb 03, maintenance mandatory, RCS CSGLD-1860(R1), all AH-64 series aircraft, wing-mounting nuts/bolts. POC: Howard Chilton, DSN 897-2068.

■ **AH-64-03-ASAM-05**, 241600Z Feb 03, maintenance mandatory, RCS CSGLD-1860(R1), all AH-64 series aircraft, pylon attachment bolts. POC: Howard Chilton, DSN 897-2068.

■ **AH-64-03-SOF-01**, 201355Z Nov 02, technical, RCS CSGLD-1860(R1), all AH-64A aircraft, main rotor driveshaft retirement life. POC: Joseph Creekmore, DSN 788-8630.

■ **AH-64-03-SOF-02**, 271800Z Jan 03, technical, RCS CSGLD-1860(R1), all AH-64 series aircraft, main transmission replacement time. POC: Howard Chilton, DSN 897-2068.

■ **AH-64-03-SOF-03**, 241520Z Feb 03, technical, RCS CSGLD-1860(R1), all AH-64D aircraft, cyclic stick. POC: Howard Chilton, DSN 897-2068.

CH-47

■ **CH-47-03-ASAM-01**, 251331Z Mar 03, maintenance mandatory, RCS CSGLD-1860(R1), all H-47 aircraft, engine drive shaft. POC: Russ Peusch, DSN 788-8632.

■ **CH-47-03-SOF-01**, 042115Z Oct 02, technical, RCS CSGLD-1860(R1), all H-47 Chinook aircraft, swashplate bearing, fwd and aft. POC: Joseph Creekmore, DSN 788-8630.

OH-6

■ **OH-6-03-ASAM-01**, 121445Z Nov 02, maintenance mandatory, RCS CSGLD-1860(R1), all OH-58D, H-6J, and H-6M aircraft, fuel filter bracket. POC: Ron Price, DSN 788-8636.

OH-58

■ **OH-58-03-ASAM-02**, 051502Z Dec 02, maintenance mandatory, RCS CSGLD-1860(R1), OH-58D aircraft, installation of throttle mark. POC: Ron Price, DSN 788-8636.

■ **OH-58-03-ASAM-03**, 211405Z Jan 03, maintenance mandatory, RCS CSGLD-1860(R1), OH-58D aircraft, engine barrier filter screw retaining ring. POC: Ron Price, DSN 788-8636.

■ **OH-58-03-ASAM-04**, 252220Z Mar 03, maintenance mandatory, RCS CSGLD-1860(R1), OH-58D aircraft, performance charts. POC: Ron Price, DSN 788-8636.

■ **OH-58-03-SOF-01**, 031200Z Oct 02, technical, RCS CSGLD-1860(R1), all OH-58D aircraft, copilot cyclic lockout. POC: Ron Price, DSN 788-8636.

■ **OH-58-03-SOF-02**, 182125Z Mar 03, operational, RCS CSGLD-1860(R1), all OH-58D aircraft, hellfire missile. POC: Ron Price, DSN 788-8636.

UH-1

■ **UH-1-03-ASAM-01**, 231345Z Oct 02, maintenance mandatory, RCS CSGLD-1860(R1), all UH-1H/V series aircraft, main rotor grip retirement life/inspection. POC: Ron Price, DSN 788-8636.

UH-60

■ **UH-60-03-ASAM-01**, 091330Z Dec 02, maintenance mandatory, RCS CSGLD-1860(R1), all H-60 series aircraft, bellcrank support assembly retirement life. POC: Ron Price, DSN 788-8636.

■ **UH-60-03-ASAM-02**, 091335Z Dec 02, maintenance mandatory, RCS CSGLD-1860(R1), all H-60 series aircraft, tail rotor servo retirement life. POC: Ron Price, DSN 788-8636.

■ **UH-60-03-SOF-01**, 201415Z Nov 02, technical, RCS CSGLD-1860(R1), all UH-60A, EH-60A, and UH-60Q series aircraft, main module planetary carrier assembly. POC: Ron Price, DSN 788-8636.

■ **UH-60-03-SOF-02**, 071705Z Jan 03, technical, RCS CSGLD-1860(R1), all H-60 series aircraft, inspection of main rotor blade cuff assembly. POC: Ron Price, DSN 788-8636.

■ **UH-60-03-SOF-03**, 151600Z Feb 03, technical, RCS CSGLD-1860(R1), all UH-60A, EH-60A, and UH-60Q series aircraft, main module planetary carrier assembly retirement life. POC: Ron Price, DSN 788-8636.

All Army Aircraft

■ **GEN-03-ASAM-01**, 161700Z Dec 02, maintenance mandatory, RCS CSGLD-1860(R1), all Army aircraft, single channel ground and airborne radio (SINCGARS) ARC-201 battery box. POC: Russell Peusch, DSN 788-8632.

■ **GEN-03-ASAM-02**, 131313Z Mar 03, informational, RCS CSGLD-1860(R1), all Army aircraft, M18/M19 landing mat set operations. POC: Harry Trumbull, DSN 897-2095. ♦

Point of contact for SOF/ASAM message distribution, compliance reporting, and administrative matters is the AMCOM Safety Office. Technical or logistical questions should be addressed to the points of contact indicated in the messages. AMCOM Safety Office representatives can be reached at: (256) 842-8620 or 313-2097 (DSN 788); E-mail: safeadm@redstone.army.mil.

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class A**: While in cruise flight at approximately 100 knots, 100 feet above ground level (AGL) in a six-aircraft staggered right formation, the pilot-in-command (PC) of Gun Two announced to the flight that he heard a strange noise in the aircraft and was going to land. Guns One and Four informed Gun Two that smoke was coming from their aircraft and that the aircraft was on fire. As a result, the PC of Gun Two landed the aircraft. The crew executed an emergency engine shutdown and performed the auxiliary power unit (APU) fire emergency procedure, employing at least one of the fire bottles into the APU compartment. Both crewmembers egressed the aircraft uninjured. The aircraft was destroyed by the fire.

CH-47

D Model

■ **Class A**: Aircraft experienced a hard landing following failure of the #1 engine

■ **Class C**: While conducting hilltop operations, the front rotor blades struck a tree, damaging three blades.

■ **Class C**: While attempting a sling load pick up of a flatbed, the aircraft encountered a wind gust that caused the aft portion of the aircraft to make contact with the aft portion of the flatbed. Damage to the aircraft consisted of buckled main (former) supports, three to four sheets of punctured metal, and three rivots ripped out along station 460.

OH-58

D Model

■ **Class D**: While hovering in a confined area, a noise was heard with no other indications. The PC landed at an airfield that was less than a quarter-mile away. Post-flight inspection revealed damage to the tail rotor blades.

DR Model

■ **Class B**: Aircraft crashed. Details of the accident were not provided.

■ **Class B**: Aircraft crashed during manual throttle operations. No other details were provided.

■ **Class C**: Aircraft reportedly experienced a full authority digital electronic control (FADEC) failure warning with audio while at a 3-foot hover from refuel to parking. The engine oversped to 124 percent engine power turbine speed (N_p) for 6 seconds during throttle reduction and activation of the FADEC AUTO/MAN switch. The aircraft was shut down without further incident after a cool-down period.

■ **Class C**: Aircraft crashed. Details of the accident were not provided.

■ **Class C**: Aircraft experienced inadvertent engine and rotor overspeed during engine run-up.

EH-60

A Model

■ **Class D**: As the main wheels broke ground during takeoff to a hover for the first flight of the day, the crew heard a loud noise and the aircraft lurched several feet. The crew then landed the aircraft without further incident. Subsequent inspection revealed that the tail strut and tail tire had blown. Failure of the tail strut caused minor damage to the tailboom.

UH-60

A Model

■ **Class B**: Aircraft crashed. Details of the accident were not provided.

■ **Class C**: During approach, crew experienced brownout conditions. Aircraft tail wheel made hard contact with the ground, damaging three main rotor blade caps and the tail rotor drive shaft cover.

■ **Class C**: Aircraft tail rotor blades contacted trees while aircraft was operating in a confined area landing zone.

■ **Class D**: While conducting FM Homing Operations inbound to airfield, the pilot and instructor pilot noticed an electrical odor in the cockpit. They completed the emergency procedure for electrical fire in flight and landed at the airfield without further incident. Maintenance determined that an improper clamp installation had been performed during a previous HUD modification to the aircraft. A short occurred, destroying the FM radio.

L Model

■ **Class A**: Aircraft crashed. Details of the accident were not provided.

■ **Class A**: Accident aircraft was Chalk 4 in a flight of six for assault training when its main rotor system was reportedly contacted in flight by the right main landing wheel of Chalk 5. Chalk 4 crash-landed, sustaining extensive damage; Chalk 5 landed without further incident.

AN-2/COLT

■ **Class C**: Aircraft nose contacted the ground during takeoff, damaging the propeller system and wings.

Note: For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Enduring Freedom. We will publish those details in a future *Flightfax* article.

WRONG ASSUMPTION!

A military C-5 was stopped by the efforts of two airline employees. The two employees frantically chased after the C-5 upon noticing it had run over a 100-pound fire extinguisher. The extinguisher was lodged in between the nose gear and sparking as it rolled forward. The crew never realized they had run over the fire extinguisher, but did wonder why there were two crazed women chasing their C-5.

Ensure all ramps are free and clear and wing-walkers are in place prior to taxiing.

Submitted by: CW3 Ron Kammeyer, Airfield Safety Officer (Johnson Controls Inc.), Bicycle Lake Army Airfield, Fort Irwin, CA, (760) 380-3902/4326, ronald.kammeyer@irwin.army.mil

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

JULY 2003 ✦ VOL 31 ✦ NO 7

a new look at an old problem...

Dynamic Rollover

PLUS: SMA Jack Tilley sends... "Get On-Target With Your Weapons Training!"

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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U.S. ARMY SAFETY CENTER

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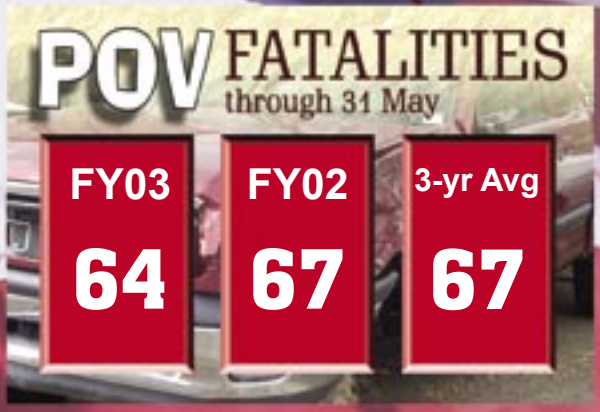

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Joseph A. Smith
COL(P), USA
Commanding

DASAF's Corner

FROM THE DIRECTOR OF ARMY SAFETY

I'm Excited to Join Your Team!

BG Jim Simmons has done a truly remarkable job over the past two years as the Director of Army Safety (DASAF). He has helped chart the right strategic course for Army safety and has already transformed the multifunctional Army Safety Center into an organization that daily addresses risk management and safety issues from platoon level to Department of the Army level. BG Simmons' forward thinking has set a new standard in managing safety throughout the Army.

As your new DASAF, I will do my very best to continue to steer the course outlined in the Army Safety Strategic Plan and ensure that Army safety and risk management are embedded fully into our interim and objective forces. More importantly, I am committed to helping each of you as we protect the force today and preserve our combat power for tomorrow.

The Army holds us, as commanders, **responsible** and **accountable** for the safety of our soldiers. This is an awesome responsibility. It's one that often prevents sleep in the early morning hours and triggers a mental review of the mission risk assessment just prior to a training event, a major exercise, or imminent enemy contact. It is a responsibility that no commander can, or does, take lightly.

Statistics clearly prove that commanders who use all the tools available to identify hazards and mitigate risks have the biggest impact on their units. The chain of command who ruthlessly enforces standards and discipline while using unit safety personnel and those within the Army safety community will continue to make the difference. The Safety Center stands ready to assist. Give us a call!

Having just returned from deployments in both Afghanistan and Iraq, I personally saw commanders aggressively applying risk management with tremendous results; however, there is still work to be done. Thanks to the quick dissemination of information from our accident investigations, many of the safety lessons learned from both ground and aviation operations are already available, and we're taking a hard look at them. For example, we have had a number of negligent discharges of weapons. This clearly indicates that we need to better address this issue in our ground accident prevention programs. We'll look at ways to address this problem, possibly having soldiers perform more training with magazines in their weapons to ensure they know proper clearing procedures.

I truly appreciate the opportunity to serve in the United States Army. I am particularly excited to join the team of dedicated professionals who every day diligently seek ways to make the Army a safer place for our soldiers to live and work.

This month as we celebrate our Nation's independence, let us not forget to reflect on the service and sacrifices of those who secured our freedom. Let us be especially grateful to all those who today willingly serve to maintain our free way of life. Have a **safe** and happy Independence Day!

Joe Smith

COL(P) Joseph A. Smith

a new look at an old problem...

Dynamic Rollover

We usually think of dynamic rollover as something to be avoided during slope operations. FM 1-203: *Fundamentals of Flight* addresses dynamic rollover in the section on "Slope Operations"; aircrew training manuals include a note in the maneuver description that the aviator must understand dynamic rollover before conducting slope operations; and dash 10's include a slope-landing limit intended to minimize the chances of dynamic rollover.

Then why do we continue to average one Class A or B accident involving dynamic rollover each year? The answer is that dynamic rollover accidents are happening on flat

ground. In fact, since Fiscal Year (FY) 1992, 75 percent (9) of dynamic rollover accidents have occurred on level ground. The attention we've given to preventing dynamic rollover during slope operations has paid off; rollover during slope landings and takeoffs is now rare. If we understand dynamic rollover and take the same precautions when operating on flat ground as we do when operating on slopes, we should be able to significantly reduce these accidents.

Definition

Dynamic rollover is the occurrence of a rolling motion; while any part of the landing gear is acting as a pivot, which causes the aircraft to exceed a critical angle and roll over. Dynamic rollover is caused by the main rotor thrust. Untrimmed lateral main rotor thrust causes the roll rates that make the aircraft exceed its critical rollover angle. Other physical factors that contribute to dynamic rollover are center of gravity, tail rotor thrust, crosswinds, ground surface, slopes, and main rotor design.

Main rotor thrust

Main rotor thrust is laterally trimmed when it is acting more or less vertically. When hovering, a helicopter is laterally trimmed when ground movement is zero. If the helicopter has a pivot point in contact with the ground and the main rotor thrust is not laterally trimmed, the sideward component of that thrust will roll the helicopter around the pivot. The roll rate depends on the cyclic input from the trimmed position and on the amount and rate of collective input. If the roll rate is high, the aircraft can rapidly reach its critical rollover angle.

Pilots can do two important things to avoid dynamic rollover. First, they must ensure that the cyclic is positioned to keep main rotor thrust laterally trimmed when touching down or lifting off to a hover. Secondly, they should stay alert to changes in aircraft attitude.

When touching down, pilots should adjust the cyclic only as necessary to maintain lateral trim and ensure a vertical descent until the entire aircraft weight is on the landing gear. In most helicopters, once the collective is fully down, the cyclic should be placed in the neutral or central position. In the AH-64 and UH-60, cyclic adjustment is coordinated with collective reduction.

When lifting off, first position the cyclic to ensure that main rotor thrust is vertical. As a guide, the main rotor tip path plane should be parallel to the horizon. As collective is increased and the helicopter becomes light on the gear, adjust the cyclic to compensate for winds, aircraft loading, and translating tendency. To ensure a vertical ascent, make further adjustments as each wheel or skid leaves the ground.

The pilot on the controls must always be alert to the cyclic position and all control movements must be smooth and coordinated. Maintain lateral trim with the cyclic and do not apply excess cyclic to pin a wheel or skid to the ground during landing or takeoff. When landing, fly the aircraft until the entire aircraft weight is on the gear. When taking off, start flying the aircraft before raising the collective. To avoid dynamic rollover, these landing and takeoff techniques must be employed regardless of whether the aircraft is on flat or sloping ground.

Center of gravity

The critical rollover angle changes as the location of the center of gravity (CG) changes. Helicopters generally have different CGs and, therefore, different critical angles in different configurations. The CG and angle change as fuel and ammunition are used. Asymmetric loading will also change the critical angle and make the aircraft more likely to roll toward the heavier side.

Be conscious of the changes in CG that occur during the mission, and avoid asymmetric loading. When landing or taking off, think about the effect of the aircraft's CG *before* beginning the maneuver.

Tail rotor thrust

In single-main-rotor helicopters, tail rotor thrust can contribute to high roll rates. Because tail

rotor thrust acts to the right, the tail rotor tends to roll the aircraft in that direction, especially when the right skid, wheel, or float is acting as a pivot.

Since FY92, 75 percent of dynamic rollover accidents have involved rollover to the right. Many of these accidents might have been avoided if the pilot on the controls had adjusted the cyclic to compensate for tail rotor thrust (translating tendency), especially while lifting off to a hover. Care must be taken when applying pedal inputs to ensure they are smooth. Adjust lateral trim with the cyclic whenever tail rotor thrust is changed by pedal inputs. When increasing the collective, apply left pedal. As thrust is increased, adjust the cyclic to the left to compensate for the increasing tail rotor thrust to the right.

Crosswinds

Crosswinds acting on the fuselage can help roll a helicopter over. Avoid lifting off or touching down with crosswinds. If there is a crosswind, make the proper cyclic adjustment into the wind to keep the aircraft laterally trimmed. Crosswinds also necessitate tail rotor pedal inputs to maintain directional control. Again, these tail rotor thrust changes must be trimmed by cyclic inputs as necessary.

Ground surface

Rough ground or obstructions that pin a wheel or skid to the ground can contribute to dynamic rollover. Several rollover accidents have been caused by hitting an obstruction with the landing gear or by attempting a takeoff with an obstruction next to the gear. Accidents have also occurred when the aircraft was allowed to slide laterally across the ground. This can cause fuselage roll rates to develop, leading to dynamic rollover.

When operating close to the ground, watch for obstructions and carefully select a landing point. If you inadvertently land with the skid or wheel against an obstruction, it would be safer to shut the helicopter down and have it towed away or remove the obstruction than to attempt a takeoff. It shouldn't be necessary to mention the need for a proper preflight inspection.

Slopes

When landing or taking off from a slope, a helicopter will roll over if the maneuver is continued after the cyclic control limits are reached. Once a limit is reached, correct lateral cyclic trim cannot be maintained. Observe caution when operating on any slope, and take particular care to avoid slopes greater than the aircraft's slope limitation.

Main rotor design

If you're an AH-64, UH-60, OH-58D, or CH-47 pilot, you already realize how sensitive these aircraft are to lateral cyclic inputs. These aircraft have good control authority; that is, they respond rapidly to cyclic inputs. Hence, they are quick to develop roll rates, but the cyclic is also very effective in stopping that roll rate once it is detected.

Teetering-head helicopters—the OH-58A/Cs, UH-1s, and AH-1s—are slow to develop a roll rate, but the control authority is so poor that cyclic inputs alone are unlikely to prevent a rollover once a roll rate has developed. This characteristic is reflected in the accident data for the past decade. Fifty percent of dynamic rollover accidents have involved teetering-head helicopters.

While the aviator has no control over the design of the aircraft's rotor, he does need to be aware of its characteristics. In a teetering-head helicopter, collective reduction is most effective at stopping a high roll rate. In other helicopters, cyclic input also has a rapid effect. Regardless of the design, actions needed to correct a roll rate are the same and should be instinctive: simultaneously reduce the collective, and adjust the cyclic to maintain lateral trim.

Other factors

Physical factors—main rotor thrust, center of gravity, tail rotor thrust, crosswinds, ground surface, slopes, and main rotor design—cause dynamic rollover. However, it is important to understand that the pilot can prevent dynamic

rollover by avoiding the physical factors that cause it. Unfortunately, the pilot usually fails to avoid these physical factors because of human factors.

■ **Inattention**. If the pilot on the controls is inattentive to the aircraft's position over the ground or its attitude while lifting off or touching down, he risks dynamic rollover. Use extra care when operating close to the ground.

■ **Inexperience**. Over forty percent of dynamic rollover accidents have occurred with low-time pilots on the controls. If you are the pilot-in-command, you are always responsible for your aircraft. Guard the controls and monitor the pilot on the controls.

■ **Failure to take timely action**. The time to take action is *before* a roll rate develops. Remember that by the time you notice that a roll rate has developed, a rollover may be inevitable, especially in a teetering-head helicopter. When you detect a roll rate developing, simultaneously reduce the collective and adjust the cyclic to maintain lateral trim.

■ **Inappropriate control inputs**. Applying inappropriate control inputs is the root cause of almost all dynamic rollovers. If the pilot pays adequate attention to applying control inputs smoothly and carefully, dynamic rollover accidents are avoidable.

■ **Loss of visual reference**. If you lose visual reference while operating close to the ground, take off or execute a go-around, using instrument techniques if necessary. A less desirable option is to continue forward to the ground. If the aircraft contacts the ground while drifting sideward, rollover can occur.

Dynamic rollover is avoidable

Dynamic rollover can be avoided by paying attention to contributing factors, both physical and human. Trim the aircraft with the cyclic during landing and takeoff and remain alert to the aircraft's attitude. Above all, *FLY THE AIRCRAFT*: when landing, until the entire aircraft weight is on the landing gear; when taking off, before any collective is applied. And remain alert to the cyclic position and maintain lateral aircraft trim with the cyclic at all times, regardless of whether the aircraft is on flat or sloping ground.

Editor's note: This article is an 'oldie but goodie' and a favorite for many aviators. This was first published in Flightfax in 1991 and is still being used today (some have copied it so many times that it is hardly legible). Since we have had so many requests for copies, we decided to update the statistics. If you have other favorites that need to be updated, call us and let us know. ♦

Assessing Mission Risks Versus Just Checking the Block

MAJ David Schoolcraft
U.S. Army Safety Center

The commander has just appointed you as the aviation mission briefer for all low-risk missions. What are your duties as a briefing officer? Certainly they are more than approving and signing the risk management worksheet (RMW) prepared by the crew. So then, what exactly are your duties?

Let's start with the basics. Army regulation (AR) 95-1, 2-14b, states that briefing officers are responsible for ensuring that key mission elements are evaluated and briefed to the mission pilot-in-command (PC).

What should the mission briefer consider as he evaluates the mission using the unit's RMW? The mission briefer should be evaluating, at a minimum, those key elements identified in AR 95-1, 2-14b (1)-(7). Unfortunately, the RMW is not a cure-all to the risk management solution. The mission briefer still must take into consideration all information concerning the mission, environment, and crew, as well as all the hazards inherent in aviation operations.

Ideally, the mission briefer is an experienced aviator who has a personal aviation knowledge base to draw upon. If he doesn't have that experience, the mission briefer should know which questions to ask to make informed decisions and to implement any needed controls for the crew to safely accomplish the mission.

Risk management is not just filling out and signing the RMW. As outlined in Field Manual (FM) 100-14, it is a five-step process that includes *identifying hazards*, *assessing hazards* to determine risks, *developing controls and making risk decisions*, *implementing controls*, and finally *supervising* to ensure that the controls identified are being used and are working with the desired results. After the RMW is signed, the mission briefer must back-brief the modified mission to the PC to ensure he understands what he is approved to do.

The experience of those of us here in the Aviation Systems and Accident Investigation Division at the Army Safety Center has been that most units do an adequate job of identifying and assessing mission risks (steps one and two). Unfortunately, the five-step risk management process ends when the RMW values fall within the mission briefer's authority and he signs the worksheet. After that, little is done on steps three through five of the risk management process to mitigate or eliminate risk.

Low-risk missions cannot be taken for granted or written off as a routine event. There are plenty of things that can go wrong. Mitigating risks to their lowest level is not only prudent, but also necessary when the situation and mission permit. Where will your unit's next accident be? Will it occur on a very complex collective training event in which an operation order (OPORD) has been published and rehearsals and rock drills have been completed? Or will it occur on a typical, routine low-risk aircrew training manual (ATM) flight in the local area?

Mission briefers must not fall into the trap of just "checking the block" so a crew can conduct a low-risk training mission. We must identify and assess the risks on *all* missions and then make decisions at the appropriate level and implement controls so the mission can be completed safely. Commanders must ensure their approved aviation mission briefing officers are trained to perform these duties, which include a thorough understanding of risk management. ♦

—MAJ David Schoolcraft works in the Aviation Systems and Accident Investigation Division, U.S. Army Safety Center, DSN 558-9858 (334-255-9858), david.schoolcraft@safetycenter.army.mil

NCO CORNER

Get "On-Target" With Your Weapons Training

SMA JACK L. TILLEY

Recent Army accidents have revealed a disturbing trend: our soldiers are being killed and injured by improper weapons handling. These accidents occur for a variety of reasons including insufficient training, ineffective supervision, negligence, inattentiveness, or outright indiscipline. This must come to an end—now! One hurt soldier is one too many.

All soldiers, regardless of their MOS, must be proficient with their assigned weapon. Operation Iraqi Freedom clearly demonstrated that *any* unit might have to engage the enemy. Weapons proficiency is a cumulative and degradable skill that must be instilled into each soldier and constantly maintained.

We train as we fight and we fight as we train. Soldiers in combat areas wear body armor; why not have them wear it when qualifying and training with their weapons? Training must reflect battlefield conditions as closely as can be safely done. Hard, realistic training is critical to success in future operations. Anything less is a disservice to our soldiers.

Muzzle control, selector switch operation, and fire discipline are critical to weapons safety and can't be taught solely in the classroom environment. They must be incorporated into your regular training, and you must always enforce the standard. Soldiers should become so comfortable with their weapon that its safe and proper use is second nature. The selector switch stays on SAFE and the soldier's finger stays off the trigger unless engaging targets or when enemy contact is imminent. A well-trained soldier can follow these safety procedures and still rapidly and accurately engage the enemy. Whenever you see a safety violation, correct it. A moment's inattention can lead to disaster.

Annual range qualification doesn't necessarily indicate weapons proficiency. Soldiers not only must effectively engage targets, they must also perform other associated tasks including:

- **Clearing procedures**
- **Loading and unloading procedures**
- **Immediate action**
- **Remedial action**
- **Disassembly and reassembly**
- **Weapons maintenance**
- **Functions check**
- **Preventative maintenance checks and services**

Can your soldiers perform these tasks to time and standard? If they can't, they're not properly prepared.

While the basic operating principles remain the same for many small arms, there can be significant differences that can put the untrained soldier at risk. Does your M249 Squad Automatic Weapon gunner understand how an open-bolt weapon operates? How about the rest of your soldiers? Soldiers unfamiliar with open-bolt weapons have had accidental discharges while attempting to chamber a round. When cross-training your soldiers, make sure they become proficient with all of your unit's weapons. Circumstances might require a rifleman to become a machine gunner in a hurry. Would that rifleman be ready? Would you be ready?

Weapons proficiency is the province of the NCO. From the youngest corporal to the Sergeant Major of the Army, we are the primary trainers and guardians of the standard, and competence is our watchword. We must take ownership and make it happen. If we don't, then who will? Our young soldiers depend on us for our experience and our expertise. The soldiers we train today will become the Army leadership of tomorrow. We must arm them with the tools, techniques, and procedures to prepare them for that task.

You have proven yourselves as the most professional NCO Corps in the world, a force that stands ready to fight and win on the modern battlefield. Now I challenge you to continue that tradition of excellence. Train our soldiers well, train them to standard, and keep them safe. ♦

WAR Stories

Risk management lessons learned

Get-Home-Itis!

Bob McGaffin
CP-12 Intern

I was an aircrewman on a military transport aircraft that was bringing home a contingent of sailors and cargo after a 6-month deployment. We departed a Naval Air Station on the West Coast at 0800L with an empty aircraft, except for the normal Space A passengers hitching a free ride.

After refueling mid-country, we arrived at the East Coast debarkation port mid-afternoon. Joining the line of other transport aircraft awaiting loads of personnel and cargo, it was up to our loadmaster to expedite the loading process. We knew that returning to our home duty station that day would place us very close to our crew duty limit of 18 hours.

After sorting out our share of the carrier air group and their cargo baggage, we departed for the long flight home. Spirits among the passengers were high, as might be expected after 6 months of separation from loved ones. Refueling was once again accomplished mid-country uneventfully and the final flight leg commenced.

Due to the weather conditions commonly encountered on the West Coast during the summer months and the vicinity of relatively cold bodies of water, areas of dense ground fog can form unexpectedly. The condition can occur at any time of the day or night, remain for several hours, and then dissipate.

After 16 hours of crew duty, the cockpit and cabin crew were starting to feel the effects of fatigue and were looking forward to the end of the flight. Bringing home sailors after deployment is considered one of the finer points of duty. Nothing is more inspiring than enabling family reunions. With families waiting, the crew was determined to do everything within reason to ensure that the flight arrived on time.

Approximately 30 minutes before the scheduled landing, the cockpit crew was advised by approach control that fog was starting to form on the airfield. This was not the kind of fog that most people observe—but a layer 35 feet deep! Since the field was technically above minimums and the alternate was only 30 minutes away, a visual approach was attempted. Wouldn't you know that the only runway with centerline lighting was not available?

A flyover of the field noted that the streetlight cones, tops of structures, and outlines of streets were visible, but partially obscured. On final approach with the aircraft fully configured for landing and checklist complete, we began the flair at 50 feet and reduced power. Upon entering the fog layer, the landing light reflection turned the outside view into a virtual whiteout. Visual reference with the left runway border lighting was lost and the aircraft drifted right. As the right set of border lights drifted under the aircraft, the landing was aborted and maximum power applied.

The pilot realized that the

aircraft had drifted right, so he side-slipped the aircraft to the left. During the correction, the main landing gear touched down momentarily before the engines achieved maximum thrust and the aircraft lifted from the ground. The cockpit crew sensed that, in all probability, at least one of the main gear wheels had touched down on tarmac rather than the runway since the left-edge lighting had not been reacquired before touchdown. The landing gear was left extended, in case of damage, and the flight proceeded to the alternate destination where an uneventful landing was performed.

Post-landing inspection revealed mud and moss imprints on both right main landing gear wheels and moss on the right flap assembly directly behind the wheels. The runway at home base was found to be covered with gravel and dirt, caused by the thrust of the engines going to maximum power and high angle of attack during rotation. Wheel imprints were found 4 feet from the right runway edge and 200 feet from the approach end of the emergency arresting gear motor.

Under different circumstances, would the crew have attempted this landing? Probably not. Fatigue, marginal weather, and poor lighting, combined with the desire to complete the mission stacked the deck and nearly caused a disaster. This story has a happy ending, as 14 hours later the passengers and crew were reunited with their loved ones.

Despite the fact that crew duty days have been shortened and that the aforementioned runway now has centerline lighting, attempting that landing would still be a poor decision today. The sad fact is that someday, under different circumstances, 'GET-HOME-ITIS' will strike again. Don't let it affect you! ♦

—Bob McGaffin is a recent graduate of the U.S. Army Safety Center CP-12 Occupational Safety and Health Course here at Fort Rucker, AL. He is currently assigned to HQ, 2nd Brigade, APO AE 09226; e-mail: bob.mcgaffin@us.army.mil.

Bob is a retired Navy Chief Petty Officer with over 21 years of naval aircrew experience in five different types of aircraft.

Editor's note:
While Bob McGaffin's story is about his experience in a Navy aircraft, the same decision-making problems occur with all aviators in all aircraft. The photo depicted here is an Army accident that happened a few years ago with much the same Get-Home-Itis-type decision making. This crew wasn't so lucky; the aircraft was destroyed and *two of the four* crewmembers were fatally injured.

Improper Hardware Installed on OH-58A/C

Recent Directorate of Evaluation and Standardization (DES) visits have found several OH-58A/C aircraft with incorrect bolts installed on the tail rotor trunnion bearing caps. Many times, maintenance personnel install weights under these bolts {IAW TM 55-1520-228-23-1, para 5-238} to adjust for static chord wise balance. The problem arises when bolts that are too short are used and there is not at least 0.250-inch thread engagement as required by the maintenance manual.

TM 55-1520-228-23 para 5-238 b (2) and (3) states: Remove bolts (11) from housing (9) and yoke (1) of tail rotor hub and install weight and/or washer combinations under bolt heads until chord wise balance is achieved.

NOTE: Ensure at least one washer (12) remains under the head of each bolt (11) after balancing is achieved.

Use NAS 1304-2H through NAS 1304-8H bolts (11) as required to secure weight and/or washer combinations. Ensure a minimum of 0.250-inch thread engagement of bolt.

Apparently some confusion exists about the use of a washer under the bolt if a weight is being used. Paragraph 2 says "weight and/or washer combination." This does not mean a washer is not required if a weight is being used. The combination of the two is for balance purpose only, a washer is mandatory at all times under the bolt IAW the NOTE.

Part of the problem stems from the insert being recessed in the yoke approximately 0.125 inch. This depth is not taken into consideration when selecting the proper length bolt; see figure 5-74, item 14, on next page. To ensure at least 0.250-inch bolt thread engagement, only one washer can be used with an NAS 1304-2H or -2 bolt. Each bolt dash (-) number represents an additional 1/16-inch grip length. When additional weights are required, use the following guideline to ensure the proper bolts are installed. The dash (-) number is stamped on the head of each bolt.

- **NAS 1304-2H or -2 bolt:** No more than one washer installed under bolt head (one must be a washer).
- **NAS 1304-3H or -3 bolt:** No more than a combination of one weight and a washer (one must be a washer).
- **NAS 1304-4H or -4 bolt:** Combination of three weights and a washer (one must be a washer).
- **NAS 1304-5H or -5 bolt:** Combination of four weights and a washer (one must be a washer).

Now, here is another twist. In the maintenance manual, TM 55-1520-228-23-1, para 5-238 b(3), the bolt part numbers referred to as NAS 1304-2H through NAS 1304-8H have been changed. When you go to the parts manual, TM 55-1520-228-23P, figure 60, item 22A, the required bolt part numbers are NAS 6604H2 through NAS 6604H8. The 6604 part numbers are the replacements for the 1304 part numbers.

Longer bolts may be used provided they don't bottom out in the yoke. A bolt that is too long will contact the bottom of the yoke and prevent the trunnion cap from being tightened to the proper torque of 30 to 40-inch pounds, IAW para 5-238c(4). ♦

—POCs are CW4 Carl McFarland, DES, NGB Western Area Aviation Training Center (WAATS), DSN 853-5514 (520-616-5514), e-mail: mcfarlandc@az.ngb.army.mil; and CW4 Jeff Putnam, DES, Fort Rucker, AL, DSN 558-2427/1758 (334-255-2427/1758), e-mail: PutnamJ2@rucker.army.mil.

Article references are TM 1-1500-204-23-6, TM 55-1520-228-23-1, and TM 55-1520-228-23P.

1.Yoke
2. Bushing
3. Trunnion
4. Liner-inner
5. Shim
6. Thrust Plug
7. Seat
8. Bearing- Needie
9. Housing Assembly
10. Grease Fitting
11. Bolt (2 Reqd)
12. Washer - Steel (9 maximum)
13. Weight (4 maximum)
14. Insert
15. Date Plate

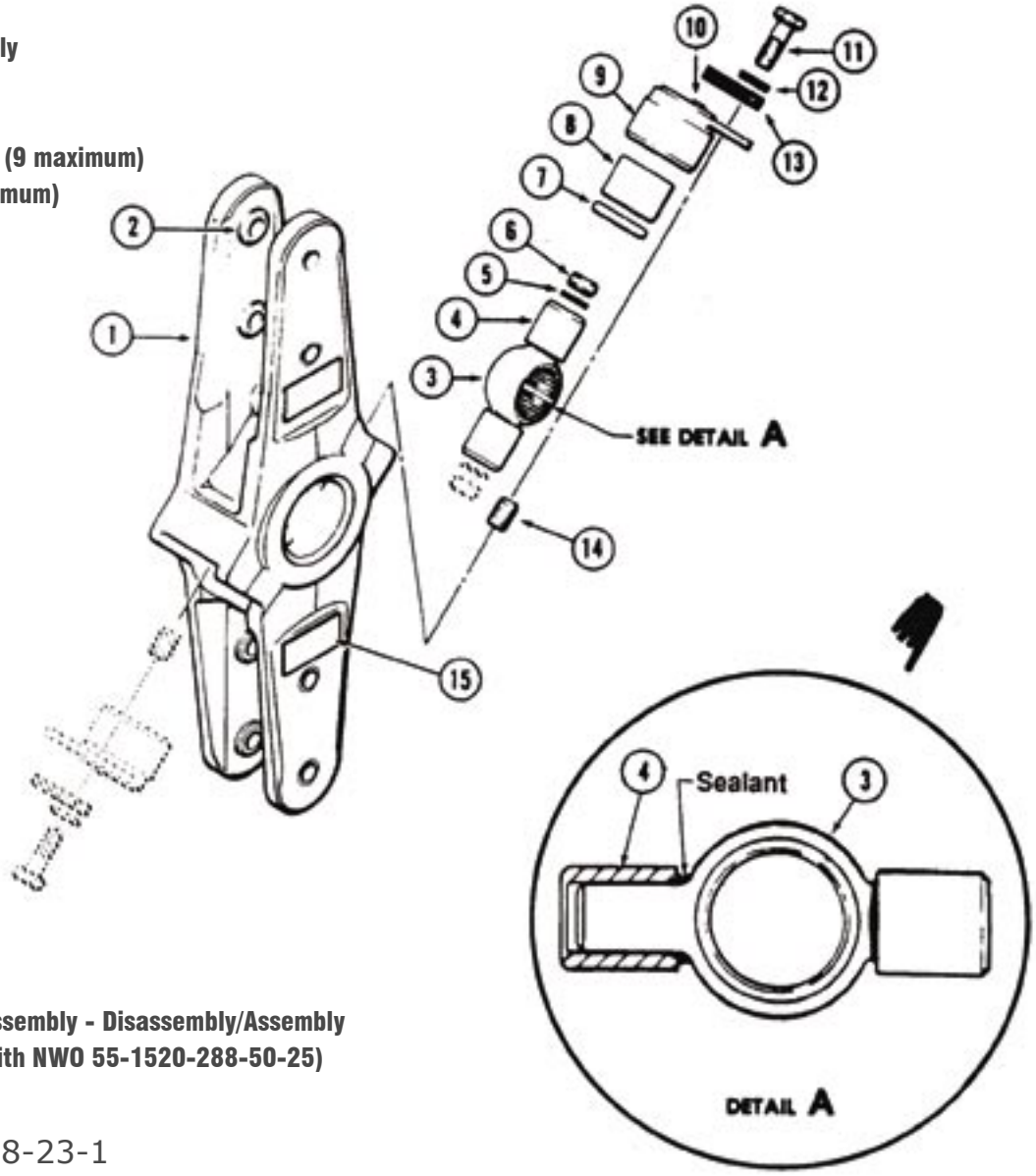

Figure 5-74. Hub Assembly - Disassembly/Assembly (After compliance with NWO 55-1520-288-50-25)

TM 55-1520-228-23-1

Ensure Faceplates Are Correct For PDUs

There is a potential problem that has been brought to light by a unit in the field concerning the interchangeability of the UH-60A and UH-60L pilot display units (PDUs). The problem is that the PDU fits both the UH-60A and UH-60L cockpit displays. One can easily see this could lead to a possible over-torque or over-temp problem; thus resulting in not having the required power to accomplish a given task or mission.

The PDU faceplate is depicted in TM 1-1520-237-23P-2, Figure 197, item 6. There are three different types listed that mate to three different type PDUs that are part specific. The 245-473851-000, 245-601130-000, 245-601538-000 PDUs mate with 622-473870-000 or the 622-601137-000 faceplate, while the 245-601561-000 and the 245-601581-000 PDUs mate with the 622-601530-000 faceplate.

If a UH-60L faceplate is mounted on a UH-60A PDU, or if the wrong PDU is installed on an aircraft, there is a risk of unwittingly exceeding aircraft limitations.

Let's make sure that we are mating the correct faceplate with the correct PDU. Even though a faceplate fits, that does not mean it is the correct faceplate. ♦

—Contributing to this article were CW3 Dean Bailey and Tim Scott, from Data Inc., Utility PM Shop, Redstone Arsenal, AL, and Bob Giffin, USASC UH-60 System Safety Manager, Fort Rucker, AL.

All But One

MSG Shane Curtis
U.S. Army Safety Center

It can happen to anyone.
A moment's inattention almost allowed a Class A accident and possibly many lives lost.

It started one night about 1800 hours. The CH-47 flight crew had just returned from a day mission and the maintenance crew started pulling maintenance—taking oil samples and performing the 100-hour inspection.

Time passed and some of the maintenance had to be done late into the evening. That didn't mean a whole lot, because most of us in the aviation field are used to that. It was 2300 hours when we finished up for the night. The maintenance test flight (MTF) was scheduled for the next day.

The next morning, the crew chief got the aircraft ready. The preflight went without a hitch, everything was closed up, blade ropes were removed, and the aircraft was ready to fly. The MTF went well and only took 40 minutes. The crew completed several checks and the aircraft was back on the ground.

The pilot didn't stick around long because he had other aircraft to check. However, the crew chief needed to clean up from the last mission and get his aircraft ready for another mission that day.

It wasn't until the crew chief opened the driveshaft cover that he realized just how lucky he and his crew had been. He froze when he saw a wrench that he had used the previous night. He thought back to the previous evening and suddenly remembered he hadn't done a tool accountability check. If the driveshaft had come apart in flight, the Army would have had another Class "A" accident to investigate, and possibly a lost crew.

Yes, this guy and the crew were lucky. The crew chief had completed all of his maintenance checks, except for one—the tool accountability check. **ALWAYS, ALWAYS, ALWAYS** account for your tools! Do your tool accountability check each and every time you use your tools. ♦

—MSG Shane R. Curtis, USASC Aviation Systems and Accident Investigation Division, DSN 558-9859 (334-255-9859), e-mail: shane.curtis@safetycenter.army.mil

Correction In the April 2003 *Flightfax* accident briefs, we published two UH-60L Class C accidents and two OH-58D Class C accidents that were duplicates. We regret this *error.*

91,000 Hours and Counting

Julie Shelley
Writer-Editor

Army aviators know that flying can sometimes present precarious situations for themselves and their crew. With a combination of skill, confidence, and maybe a little luck, most aviators will never experience a tragic accident doing what they love. But, how does one gain the skill and confidence required to be "above the best" and safe at the same time?

Experience comes with age, but those first lessons learned in flight school at the U.S. Army Aviation Center, Fort Rucker, AL, set the stage for success for Army aviators. Among those lessons, safety is top priority for both students and instructors. One unit in particular at Fort Rucker has set a standard for others to follow, and recently was awarded a Department of the Army-level honor for their hard work.

In a ceremony this spring CPT Andrew Benjamin, Commander, A Company, 1/212th, Aviation Training Brigade, was presented the Army Award of Excellence in Safety for his unit's outstanding dedication to and accomplishments in safety. The award is presented to units who have gone 36 consecutive months without experiencing a Class A, B, or C accident, a true feat for any unit. A Company, 1/212th, however, surpassed even that goal: at the time their award was presented in March 2003, it had been not 3, but 5 years since their last recorded accident, with a total of nearly 91,000 consecutive flight hours on the logbooks in that time.

The 1/212th's mission is instructing initial entry rotary wing (IERW) common core students in night and night vision goggle (NVG) flight in the OH-58A/C just prior to their graduation. The 20-hour qualification course can be taxing for new and inexperienced aviators, but CPT Benjamin credits what he calls a "blend" of dedicated Department of the Army civilians, contractors, and active-duty personnel within the unit for maintaining their exceptional record.

"I think it's that blend that helps us out a lot. Our civilians stay with the company a lot longer than the active duty, so they don't rotate in and out," he said, explaining that the civilian instructor pilots (IPs) bring a great deal of combined experience to the unit, as well as familiarity with the local terrain and weather patterns. "They provide a lot of continuity for us. The active duty, on the other hand, come in and bring freshness to our training, so no one gets complacent."

In fact, seven civilians still with the company have been in the unit since the last recorded accident: Bob Portman, Denise Aylesworth, Ron Donkowski, Jim Mitchell, Chuck Smith, Gregg Damms, and Rich Guilmette. CW3 Wylie Mathis is the unit safety officer.

CPT Benjamin said the students respond extremely well to the older, seasoned veterans—perhaps too well at times, because they can get a false sense of security thinking nothing can happen to them. To combat complacency and other safety issues, IPs err on the side of conservatism and abide by a "there's always tomorrow night" mentality. In addition, the unit also has what CPT Benjamin terms "outlet valves," such as weekend flying and reallocation of resources. Every night the unit presents a mission briefing to talk over student trends, maintenance problems, and risk mitigation; every month brings a safety meeting; and safety stand-down days are conducted semi-annually and annually.

The unit's safety officer also plays a vital role in the company, according to CPT Benjamin, because the

knowledge he passes down to students will stay with them for the rest of their careers.

"One thing I can say is that I've always had good safety officers," he said. "They're definitely one of the key links. You can have a safety officer that will inhibit training by telling you all the things you can't do. I've been fortunate in that my safety officers have told me ways that we can do things better. They're a big factor in success."

CPT Benjamin said his safety philosophy is one that is passed down from his brigade commander, COL Michael Zonfrelli, and doesn't allow room for interpretation.

"Safety is the one thing that's non-negotiable. A lot of times in the Army, people are afraid to have a zero-defect or zero-tolerance policy. I let everyone know up front that there are some things we can never deviate from, and that is safety. Safe operation of the aircraft should never be in question," he said. "Safety cannot be negotiated."

It appears as though that philosophy is paying off. Congratulations to A Company, 1/212th! ♦

—Contact the author at DSN 558-1218 (334-255-1218), or e-mail shelleyj@safetycenter.army.mil.

24th Annual National Aerospace FOD Prevention Conference

The 24th Annual National Aerospace Foreign Object Damage (FOD) Prevention Conference will be held 22-24 July 2003 at the downtown Adams Marks Hotel, 111 East Pecan Street, San Antonio, Texas. There will be two joint military only breakout sessions during the conference. Full multi-service attendance and participation is encouraged.

The hotel room rate is $91 per night. Reservations can be made by calling 1-800-444-2326 and asking for the FOD conference block of rooms. This conference is unit funded and each attendee is responsible for making his own hotel and travel arrangements. Hotel reservations must be made NLT 30 June 2003 to ensure room availability.

Participants are encouraged not to use rental cars due to limited downtown parking. Local shuttle service will be available from the airport to the hotel by San Antonio transit.

There will be a $250 conference registration fee that applies to those who register before 30 June 2003. The registration fee after 30 June 2003 will be $300. The registration fee is fully reimbursable by including it in the "remarks section" of your travel orders. A registration form can be obtained on line at **www.nafpi.com** or by calling HQ ACC LGMP at DSN 574-1826 or (757) 764-1826. All registration forms must be sent or faxed to the conference coordinator listed on the form. The registration fee is payable upon arrival at the conference.

Participation is highly encouraged for FOD program managers and monitors, safety, CE and airfield management personnel. The goal is to ensure all FOD prevention personnel interact in at least one forum to reduce and fight costly FOD.

Uniform requirements will be the service uniform for all military attendees and appropriate civilian attire for all others. ♦

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A "Sometimes Humbling" Experience

During April 2003, Ms. Julie Shelley and Ms. Paula Allman, both writer-editors for the U.S. Army Safety Center's publications *Flightfax* and *Countermeasure*, traveled with the CP-12 Safety Professional intern class to the National Training Center (NTC) in Fort Irwin, CA. Below is an excerpt from their briefing to BG James E. Simmons, Director of Army Safety and USASC Commanding General. Look for more NTC stories coming soon in both publications!

The NTC is a place designed to push our soldiers to the limit, both physically and mentally. After spending 5 days there, I now know on a very limited scale that a rotation to the NTC isn't a fun-filled TDY trip for our soldiers. To say the very least, the USASC editors' trip to the NTC with the CP-12 intern class was an eye-opening and sometimes humbling experience.

When you sit in an office all day and see accident reports listing nothing but rank, MOS, unit name, and cause of injury or death, it is easy to become desensitized to the reality of what our soldiers face every day—no name, no face goes along with those reports. At the NTC we were able to see, in flesh and blood, just why we are here. Our jobs are about more than checking for correct punctuation, grammar, and spelling—we, too, are committed to keeping our soldiers as safe as possible.

On this trip, we had the privilege and honor of meeting dedicated green-suiters, including COL(P) Joseph Martz and CW3 Mike Burnside; NTC Safety Director Mike Williams, a.k.a "Safety Mike," who is easily one of the most devoted civilians I've ever met; and also enthusiastic contractors with a passion for their work. But an equal honor was meeting some of the junior enlisted soldiers of the Stryker Brigade, who had just come in from a rotation and were tired, hungry, and dirty, but answered all our questions with both pride and a smile. Those are the guys we are here for—the ones who will fight our Nation's wars.

We learned about obvious hazards, but we also gained insight into the subtle hazards desert warfare presents to our soldiers. Who would have thought that a small washout on a sandy road could flip a HMMWV or other tactical vehicle? Someone even had to point out an unexploded simulator round to me because I didn't see its fins sticking up out of the ground—not a hazard I generally encounter in Room 246, U.S. Army Safety Center. I had never flown in a helicopter before, and I've worked with aviation-related documents for the Army for more than 2 years. We slept in barracks and ate MREs. How can you effectively write about something if you've never experienced it? Needless to say, this trip offered us these and many other experiences that we will never forget.

It is stories like these that give us the insight we need to convey to our readers the real dangers that are out there, not only at the NTC, but at any military installation and certainly any battlefield in the world. We have now seen firsthand what the "war stories" are all about, but there are so many more, and we are here to tell them.

On this trip we made invaluable contacts. We've all heard the saying, "It's not what you know, it's who you know." From experience, I can tell you that it's much easier to get information for a story when your POC can put your face with your name. Since we got back, we've even had calls come into our office from NTC personnel, asking us safety related questions! And we cannot leave out the contacts we made in this CP-12 class—these are the people who will be in the field with their soldiers in places we'll probably never see. We are the mouthpiece for Army safety professionals, and these students know they can call us anytime and that we WILL be calling them!

Never before have the USASC editors been given the opportunity to see so much or get to know so many of the people we are here to support. We send many thanks to Dr. Brenda Miller, the CP-12 class, and the NTC staff for allowing us this chance. ♦

—Julie Shelley, Writer-Editor, U.S. Army Safety Center, DSN 558-1218 (334-255-1218), e-mail: shelleyj@safetycenter.army.mil

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class A:** During student training, aircraft yawed left and impacted the ground in a tail-low attitude during training flight and sustained significant damage.

■ **Class C:** The aircraft experienced an auxiliary power unit (APU) clutch separation from the APU drive while in flight. The crew performed a precautionary landing.

■ **Class E**: The #2 engine failed in flight. The pilot-in-command smelled smoke inside the aircraft, but there was no evidence of fire. Aircraft landed safely.

MH-47

E Model

■ **Class D:** While conducting an aft two-wheel landing on a 7,000-foot pinnacle during an infiltration mission, the aircraft became unstable on the aft wheels and yawed right. As the aircraft departed the site, the AFT CARGO HOOK OPEN light illuminated. The flight to home station was uneventful. Post-flight inspection revealed the loss of the aft cargo hook and damage to the underside of the aircraft.

OH-58

C Model

■ **Class C:** Aircraft landed hard while the instructor pilot (IP) was demonstrating a low-level autorotation during contact training.

DI Model

■ **Class C:** During a post-flight MOC, the engine experienced a 134 percent overspeed condition (following reported chip-light landing).

UH-60

A Model

■ **Class A:** Aircraft crashed during a MEDEVAC mission, resulting in three fatalities. No further details were reported.

■ **Class C:** While conducting aircrew training manual (ATM) and goggle training, the aircrew was making an approach for landing when the aircraft drifted toward the trees on the opposite side of the CE. The crew corrected the drift, but did not notice the main rotor blades striking the trees and continued training for an additional 40 minutes. Post-flight inspection revealed damage to all four tip caps and potential damage to one blade.

■ **Class D:** On final, the MASTER CAUTION light flickered twice, the #2 engine oil pressure began to drop (40-50 PSI), and an unusual noise started coming from the #2 engine. As pressure continued to drop and the noise level increased, the crew initiated an emergency engine shutdown of the #2 engine and executed a roll-on landing to the runway without further incident.

L Model

■ **Class B:** Aircraft was Chalk 4 in a flight of four when their mission was cancelled due to deteriorating weather. The aircraft were departing for the airfield from their pickup zone (PZ) when, during a right turn to avoid weather, Chalk 4 impacted the ground with its main landing gear. Damage to the right front portion and right side stabilator was noted, and structural damage is suspected. Two crew members were injured in the accident.

■ **Class E:** Following normal start of the #1 and #2 engines, both power control levers (PCLs) were advanced to FLY. After "droops out" was called by the crew chief, the pilot on the controls reduced the collective. The #1 engine's power turbine speed (N_P) and RPM continued to accelerate to approximately 120 percent. The pilot not on the controls reduced both PCLs to IDLE, with no effect. Both engines were then shut down. It was determined that the hydromechanical unit (HMU) had failed.

■ **Class E:** The aircraft's stabilator failed during final approach after the auto control was reset. The manual control gave 24 degrees of stabilator movement, and the final approach was completed without incident. It was determined the electro-mechanical unit actuator failed.

RC-12

D Model

■ **Class E:** During takeoff roll prior to V1, the aircraft struck a bird. The crew taxied back to the ramp. Maintenance inspected the aircraft and found the taxi light bulb broken. Maintenance repaired and released the aircraft for flight.

P Model

■ **Class E:** The pilot's windshield cracked in numerous spots at flight level (FL) 300. The mission was terminated due to the damage.

■ **Class E:** The aircraft experienced total electrical failure in flight. The mission was terminated without incident. Failure of the #1 starter generator and #2 GCU was noted during the post-flight inspection.

■ **Class E:** During flight, oil seepage was detected on the #1 engine cowling. The aircraft mission was terminated. Post-flight inspection revealed failure of the #1 prop seal.

Editor's note: Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Enduring Freedom. We will publish those details in a future Flightfax article.

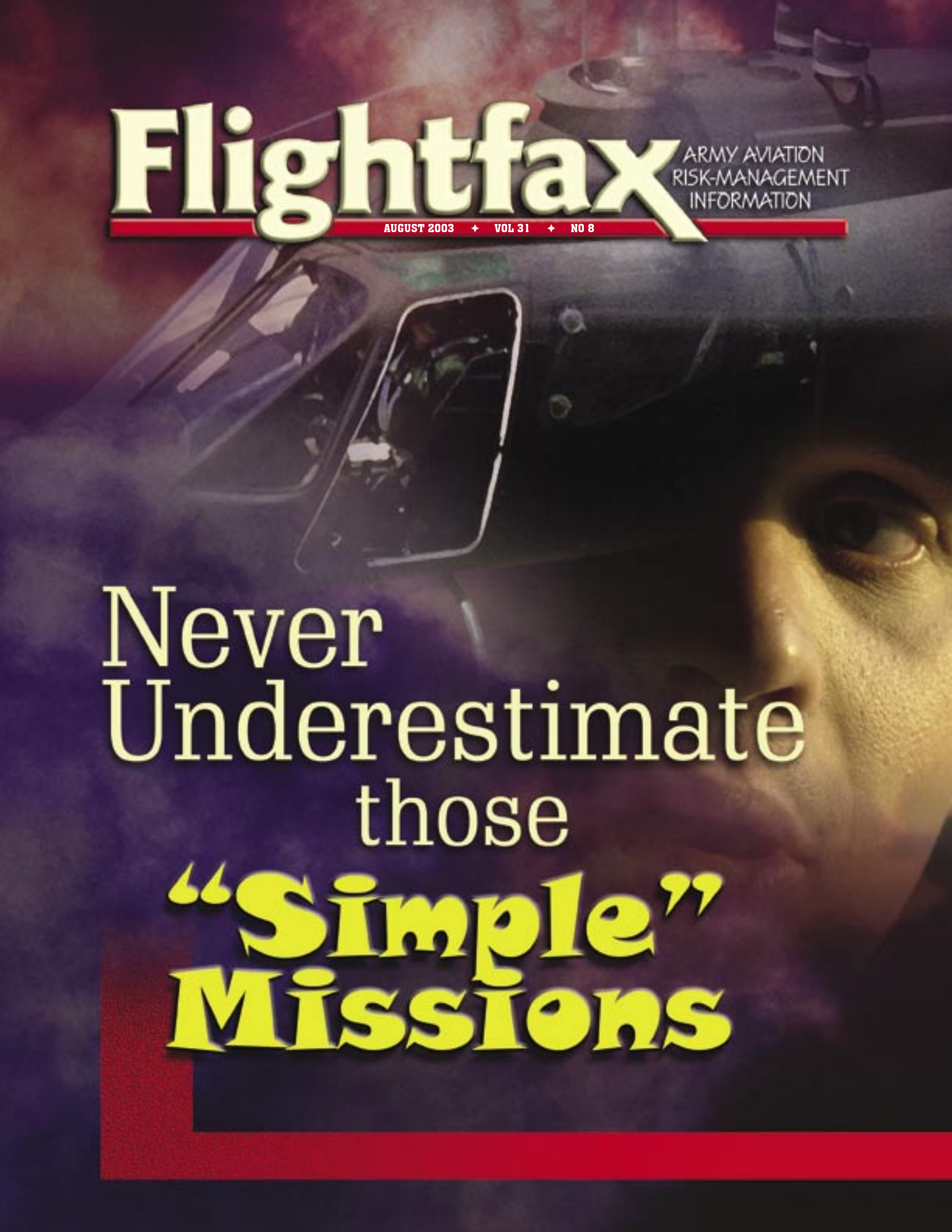
YOU DON'T NEED A SLOPE TO HAVE A Dynamic Rollover

Since 1992 75% of dynamic rollover accidents have occurred on LEVEL GROUND

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

AUGUST 2003 ✦ VOL 31 ✦ NO 8



Never Underestimate those "Simple" Missions

Flightfax

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U.S. ARMY SAFETY CENTER

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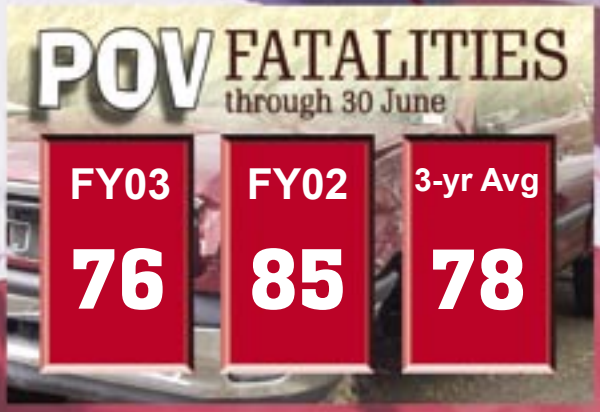

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Joseph A. Smith
BG, USA
Commanding

DASAF's Corner

FROM THE DIRECTOR OF ARMY SAFETY

Keep Your "Leader Lights" On...

We're an Army of 228 years of standards-based experience. Today's leaders understand how to manage risks to protect their soldiers, enforce standards, and demand soldier discipline. These are the foundations of our Army Safety Program.

Although our leaders have made great progress in their safety programs, there is much work to be done. When we look at the accident statistics over the last 10 years, we see that the Army's rate of accidents and fatalities during recent years mirror those of a decade ago. The hazards are clear and generally remain the same: 40.6 percent of accidents involve POVs, with military vehicle accidents accounting for just under an additional 20 percent. Sports and off-duty recreational activities caused 17 percent of recent Army fatalities. Tragically, in our current combat theater of operations, we have lost 11 soldiers simply to the negligent discharge of weapons. The statistics tell us that we continue to be our own worst enemy.

Our goal over the next two years and the Secretary of Defense's mandate is that we reduce accidents and fatalities by 50 percent—a tall order, but one within the ability of the world's greatest Army. Success will require more than standard risk assessments and casual weekend safety briefs. It will require innovative tools to help commanders in the field refine control measures for known hazards. It will require an effective link between the Safety Center's databases and the Army's first-line supervisors, giving them information in lieu of experience to properly risk-mitigate. Most importantly, it will require Army leaders to take an open-eyed, proactive approach toward their safety programs. Simply stated, it means that we must all turn our leader lights "on."

Currently we have large numbers of soldiers preparing to come home and unite with family and friends after months of successful and stressful operations. Let's be mindful that these soldiers have not been behind the wheels of their POVs for some time. Take a proactive approach to ensuring they're not fatigued when they take that first road trip. Visit our Post-Deployment POV Special Update and an updated "Leader's Guide to POV Accident Prevention" posted on our Web site at **http://safety.army.mil**. These are excellent tools to use when talking to your soldiers regarding the common, and not so common, hazards associated with POVs and redeployment.

Clearly, this is a challenging time for our Army. The Army Safety Center, your team member, is working hard to develop additional tools and initiatives to assist in protecting your soldiers' lives and your unit's readiness. In the meantime, I ask you to keep your leader lights "on" and be the leader who prevents the next accident.

BG Joseph A. Smith

Never Underestimate those "Simple" Missions

CW5 John H. Strickland
FORSCOM Safety, Aviation Division

The mission was simple. An OH-58C had made a precautionary landing out on the range and needed a part flown out. It would take about 30 minutes to replace the part. The aircraft could then be signed off and flown back home. CW3 J was tasked to perform the support mission single-pilot. He was told to take along a technical inspector (TI) and a crew chief who could perform the work and return to base in the other aircraft.

CW3 J did the normal things—preflight, weather check, and mission planning. The mission brief was simple; after all, it was a simple mission. He knew the range by heart—every landing zone (LZ), road, and checkpoint. Navigating was a cinch; he wouldn't have to rely on a map. Of course he'd take it, along with all the other required publications. He believed in doing things the right way and by the book.

The only thing that bugged CW3 J was the weather. He didn't like flying single-pilot at night. Since he had gotten used to night vision goggles (NVGs),

night unaided had lost its luster. Besides, quite honestly, he hadn't flown unaided in a good while. This was the Cav—where night flights meant goggle flights. He looked at the weather information closely: Clear, the moon would be up, and visibility unrestricted. As he prepared a local flight plan, he thought about the fact that this was the fall of the year—hot in the day and cool at night. Ground fog came up fast on the range.

"Oh well," he thought, "I know that range like the back of my hand—every creek, every lake where the fog likes to hide." Besides, he would be returning early, before the fog began to settle in over the low areas.

The flight out to the downed aircraft was uneventful. After shutting down, the TI and crew chief went to work. CW3 J talked with the two aviators from the downed aircraft. CW3 J kidded the pilot-in-command (PC) about causing him to miss getting home early and having supper with his family.

"Should have let you stay out here—good survival training," he joked.

The work took longer than expected; but about an hour later, it was time to head for the barn. The pilots of the now-repaired -58 at first suggested that CW3 J follow them back. However, as they discussed it, they all realized that they had not been briefed for formation flying. So that was not a good idea.

CW3 J told the other crew to take off first. He would wait a few minutes and then follow. After all, they were going in the same direction. As long as they were not in formation, it should not be a problem. Everyone agreed.

On the return flight home, the two aircraft kept their distance but maintained internal FM radio communication. CW3 J maintained visual sight of the lead aircraft's position lights as they followed the route to exit the range.

Except for the fact that it was about 90 minutes later than he had initially expected, everything was going smoothly. It was simple to follow the route back—mostly range roads—but patches of ground fog were beginning to show in low areas.

About 5 minutes from home, things began to go wrong. The fog was getting worse, and CW3 J lost sight of the aircraft ahead. One call assured him they were okay and that they had the airfield in sight.

Suddenly the fog thickened. CW3 J told the TI, who was in the left seat, to let him know if he began to lose sight of the ground to his left. CW3 J slowed the aircraft a little but decided to maintain altitude.

Should he turn around? He could still see the ground, and the PC of the lead aircraft had just flown through this and stated he had no problems. CW3 J knew the other crew had followed the same route, and they were no more than a kilometer ahead of him.

When he was almost to the exit point where he would change frequency from range control to the airfield tower, he looked to his right. It was mostly open fields; at night, it appeared to be a black hole.

Suddenly, they were engulfed in fog and rapidly lost all visual contact with the ground. How deep was this fog? How high was it? Was it a simple scud layer? Single-pilot at night on instruments? Should he climb? Descend?

Do a 180? That didn't sound smart. Neither did the idea of flying in this soup.

"Your left, sir." The TI had seen a sucker hole.

CW3 J immediately turned left, descended through the hole, leveled off, and looked for an open field. He knew there was a field somewhere to his left off the range road. It was getting difficult to maintain visual reference. Below were trees and more trees. Then, straight ahead, there was the field he had been searching for. Before landing, CW3 J made a quick call to unit ops that he was landing and shutting down. They could come get him—he had no intentions of flying this aircraft back tonight.

As the two crewmembers sat by the fire they'd built in the field they'd landed in, the fog continued to roll in. CW3 J looked over at the TI and realized that he could have killed this young soldier. Of course, the fact that he could have died along with the TI didn't make that realization any easier to take.

What had seemed a simple mission had turned into a close call—brief seconds of fear and decisions involving high risk.

This is a true story. It happened many years ago. I was the pilot.

Same song, second verse

Years later, I was an accident investigator for the Army. One day I found myself walking around the wreckage of an AH-64 that had entered a fog bank. The pilot had initiated a right turn and, within seconds, both crewmembers experienced spatial disorientation and loss of situational awareness. Now one was dead and the other was seriously injured.

Theirs also had been a simple mission—to fly an aircraft back to the airfield. They were both experienced, high-time pilots. What went wrong? The same thing that went wrong many years before at another time and another place to another much luckier guy.

Much can be said of the safety programs and improved technology in aviation that have reduced risk and resulted in significant reductions in our overall accident rates. However, regardless of that progress, we aviators are still the same human beings who flew the first biplane. Though more knowledgeable, we are still capable of making the same errors we've always made.

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We have been successful at standardizing our equipment; technology allows us to improve machinery across the board. Human beings, however, have to improve one at a time. That is the reason standardization is critical. It allows us to train each aviator to a particular level and standard.

What went wrong on both those nights I talked about earlier was that the humans involved were not adhering strictly to standards. I had not flown unaided in quite a long time, and flying unaided is not the same as flying NVGs. I knew that, but I wasn't going to turn down a mission because of it. I didn't consider it to be a serious factor. I had completed the risk assessment sheet with all the right numbers, and it had come out "low risk"—nice if everything goes perfect, but which it seldom does.

In addition, we fudged on the formation flight. Sure, we were legal, but we weren't very smart. My intentions were to keep the other aircraft in sight—we would "unofficially" flight follow each other. What I did not know was that the other crew was flying NVGs, and that's why they had fewer problems than I did. Of course, since we were not "flying formation" there had been no need to brief, so critical information never was shared.

Last, but hardly least, was the weather. The risk level changed when the timeline changed—

the weather was changing even as we were discussing our takeoff. And my decision-making process left out still another critical fact as we droned along that night: the other aircraft was a kilometer ahead, and that made a difference.

The only weather you should trust absolutely is what you are seeing outside your cockpit window. The weather that night was saying "*Land Now!*" I hesitated almost 30 seconds too long, and that could have cost me my life and the life of the TI. I realized years later as I surveyed the crash site that this crew had made the same mistake. They anticipated better weather, they saw a low risk, and they were confident they could handle any situation that might occur. After all, it was a simple mission, they knew the area, and it was a short flight back home.

The ability to learn from your own mistakes is a blessing, not a given. I was allowed to learn from my experience. As I walked through the wreckage of the Apache, I knew that the pilot in the front seat of this aircraft would not have the same opportunity.

It's not our equipment or the environment that causes most of our accidents. Machines and environment are fairly predictable. We can plan on these with acceptable accuracy. Human beings are not quite as predictable; they make decisions that lead to accidents. It's not too difficult to determine what they did wrong, but determining why is more challenging.

Lessons learned

From these two separate events, I learned what I call my top five "WHY" lessons.

1. Aircrew coordination must involve effective communication and teamwork. One thing I remember most is the silence between the TI and me during our flight. I never communicated my concerns to him or he to me about continuing to fly that night as visibility grew worse. He was ready to land and get out several minutes before we ultimately did. The crew of the other aircraft never communicated to me that they were giving weather observations under NVGs. Same thing happened with the crew of the accident aircraft years later—they never effectively communicated to each other during the last critical 2 minutes of the flight. Two highly skilled pilots do not automatically equal good aircrew coordination.

2. Risk management during every phase of mission planning reduces unpredictable "human" actions. We reduce risk by reducing unpredictable actions. Accident-causing errors usually result from individuals' unplanned actions, and unplanned actions are usually due to unidentified risk.

3. We must seek to anticipate and eliminate every possible risk. Every aviator will be faced at least once in his or her life with making a decision whose outcome can mean the difference between an accident, a close call, or a good no-go choice. Each one must be prepared to identify risk and work the process through to completion. Don't accept unnecessary risk, no matter what phase of the mission you're in.

4. There are no simple missions. The more we identify and eliminate risk, the greater our opportunity for success.

5. Every flight should start and end with standardization. Human beings are the most complicated of the man-machine-environment mix. There is no substitute for training to standards and enforcing those standards. Ignore standards and accidents will occur.

Summary

My top five "WHY" lessons are not all-inclusive. When it comes to safety, nothing is. Accidents do not just happen—they are caused. The goal of every individual in the unit should be to ensure that nothing he or she does will cause an accident. And, because you may not get the chance to learn from your own mistakes, take every opportunity to learn from someone else's.

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Easy Approach to

Butch Grafton
Lear Siegler Services Incorporated

The following story is one that has made instrument flying the easiest thing in the world to do. Having taught instrument flight training at Fort Rucker, AL, for 23 years, I have learned the technique that really makes a difference in pilots' attitudes regarding instrument flying. Here is how I present it to my Rotary Wing Instrument Flight Examiner Course (RWIFEC) students:

Question: If someone gives you a heading to fly, does that make your job easier?

The answer is a resounding "YES."

Question: So, if I am in the left seat and you are in the right seat and I say, "Fly heading zero-six-five, it will hold you on course." Does my giving you that heading make your job easier?

Again, the answer is always "yes."

How did I come up with the correct heading to fly? It's really very simple. What I did is exactly what has been in Field Manual (FM) 1-240, *Instrument Flying and Navigation for Army Aviators*, for all these years but, unfortunately, few of us know how to use. It's called "bracketing," and it works beautifully. Not only does bracketing work, but the moment you fully understand it, instrument flying becomes truly easy.

I know this because it has happened to me, and it happens to every student from initial entry rotary wing (IERW) to RWIFEC that I teach. It is amazing that something so simple can make such a big difference in instrument flight rules (IFR) flight, but it does. In every class I hear this same statement, "Why didn't someone teach me this 10 years ago?"

Prior to continuing I must ask another question: Is being off course a good thing or a bad thing? Everyone, without fail, says it is a bad thing. So, the first problem with track following is the inherent fear that being off course is a "bad" thing. This fear creates the majority of track following problems simply because pilots tend to stare at the course deviation bar and quit cross-checking the flight instruments. It's tough to control the aircraft looking at navigation instruments! I can tell you that being off course is not a bad thing; indeed, it is a good thing and an inherent part of good track following.

A simple chess game

My best analogy of bracketing is nothing more than a simple chess game, with one difference: I allow my students to make only six moves. In other words, if done properly, the student will establish and maintain a course with six heading changes or less. I have had IERW students do instrument landing system (ILS) approaches on check rides with as few as two heading changes.

Here's how it works. Just as in chess, there is you and one live opponent. In the track following game, there is you and your opponent, the needle. Keep in mind that if

you know what heading to fly, this business is MUCH easier. With bracketing, you always know what heading to fly.

To start any bracket, the first heading to fly is the course itself. You can't go wrong turning onto a course and rolling out on the course heading. How simple is that? Now, just as in a chess game, it is your opponent's move. Once he (the needle) moves, it then becomes your move, and so on until he is checkmated and has no more moves. Here is an example of the simplicity of this:

Our course is 120 degrees, so we turn on the course and roll out on 120 and relax. Now, using the standard 20-degree bracket method, I already know my next heading will be either 100 degrees or 140 degrees. (We all agree that knowing the next heading sure makes our job easier!) For example, I am flying 120 and the needle is centered. If the needle's first move is to the right, I already know I am moving to 140; conversely, if the needle's first move is to the left, I know my move will be to 100. So, the needle starts to move to the right, and I allow that because it is a natural part of the bracketing process—hence, being off course really is a good thing because it must happen in order for you to work a good bracket.

Now that the needle is moving right of 120, I will now turn to heading 140, which I already knew was the heading I needed to fly if the needle moved that direction. Now I wait. It is the needle's turn to make a move. While waiting I am contemplating my next move, and I know it will be a 10-degree one. If the needle moves to the right again, I will go to 150. If it moves back to centerline, I will go to 130. I will continue this process until I have worked my bracket down to a 5-degree bracket for precision work or a 10-degree bracket for non-precision work.

In the end it should take six heading changes or less to find what you are looking for, a heading that holds you on course. If you work a good bracket you will know what heading corrects you right, what heading corrects you left, and what heading holds you. If you inadvertently turn and find yourself off the course line, you simply turn to the heading that corrects the direction you wish to go. Brackets seldom take all six heading changes.

Bracketing is without a doubt the technique that removed all my fear of instrument flying. It released me from chasing needles constantly and allows me to sit back and fly simple basic instruments.

I suggest reading FM 1-240 regarding track following using the bracketing method, then try applying it first on a long, en route leg. Once you have that working, attempt bracketing on a few non-precision approaches and finally on the ILS. Use 20 degrees for your first correction on an ILS unless you are very close to the outer marker. It works like a charm. You also can start with an initial heading change of 10, 20, or 30 degrees, depending on where you are and what you think the winds might be doing.

Lastly, bracketing is without a doubt the technique that removed all my fear of instrument flying. It released me from chasing needles constantly and allows me to sit back and fly simple basic instruments, which most of us could do in the first few days of our instrument flight training with little trouble. The one drawback to this is your natural tendency to quit bracketing and start chasing the needle. The moment you do this is the moment instrument flying becomes work again.

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FDR System Overview

Historically, human performance has been a factor in 80 percent of all aviation accidents, both military and civilian. The human factor in accidents is one thing flight data recorders (FDRs) have the potential to reduce. The FDR is an asset that provides valuable assistance in accident investigation. But more importantly, it provides commanders a training resource to ensure "command presence" on all flights and a maintenance tool to reduce maintenance costs.

All too often when an aircraft accident or mishap is reported, it may not be understood immediately why the U.S. Army Safety Center (USASC) asks the unit flight safety technician if there was a recording device(s) installed on the aircraft. We are referring to cockpit voice recorders, FDRs, video data recordings, and any other data-producing device that might aid in the accident data collection and discovery process.

USASC is the sole authority for analyzing the safety portion of the data involving Army accidents, as well as the disposition of data extracted from installed onboard recording devices. Therefore, recording devices must be secured, protected, and turned over to the accident investigation board in accordance with Army Regulation (AR) 385-40. In turn, USASC will take this data, conduct analysis, and might actually animate flight data to recreate the flight to relate the mishap profile in support of the accident investigation.

This article is primarily written to assist the commander, flight safety technician, operations, and maintenance personnel by familiarizing them with the equipment and helping them develop procedures for handling transfer and security of data recorders. Army aircraft today may be equipped with a variety of data recording devices that range from solid-state to older tape-type flight data or cockpit voice tape-style recorders, to include video recorders. They are the:

- Maintenance data recorder (MDR).
- Voice and Data Recorder (VADR®).
- Cockpit voice recorder (CVR) (from various manufacturers).
- FDR (from various manufacturers).
- Programmable digital transfer module (DTM) or data transfer cartridge (DTC).
- Video subsystems of various formats.
- Smart Onboard Data Interface Module (SMODIM®), which normally is installed in support of Combat Training Center rotations.

Many Army aircraft might have engine-trend monitoring systems like the electronic

control unit (ECU) or the digital electronic control unit (DECU). Some could even be instrumented with non-standard recording devices and equipment in support of special programs. These systems can provide valuable data for accident investigations, as well as maintenance and operational trends in support of Flight Operations and Quality Assurance (FOQA) programs. The following is a brief overview by platform:

AH-64

The AH-64A aircraft normally are equipped with video subsystems. The problem is that the system might or might not be turned on and operating at the time of the mishap. Generally unit tactics, techniques and procedures, and SOPs govern operation. The aircraft might have also been modified with a SMODIM. If your aircraft are so equipped, USASC is prepared to assist you in retrieving the data.

The AH-64D Longbow has a video subsystem, MDR, and, in some cases, a SMODIM. The MDR is a crashworthy system that might also have cockpit voice capability, so treat the MDR just like an FDR or CVR. Data from the MDR can be downloaded using the Longbow Integrated Maintenance Support System (LIMSS) via a 1553 Interface cable to a personal computer (PC) host system. When the unit requests assistance from USASC to process safety data from the MDR, the maintainer must execute a full "safety download" to capture the voice file. MDR data and voice files can be sent over a secure DoD e-mail system to USASC when needed.

The bottom line: If the Longbow has been involved in a mishap, USASC will direct that the MDR be secured.

OH-58D

The Kiowa Warrior has two basic digital source collector (DSC) devices along with an airborne video tape recorder, the programmable DTC for the "I" model, and the programmable DTM for the "R" model. In addition, the ECU on the 250-C30R/3 engine for the "R" model aircraft can be downloaded at the request of the commander by a Rolls-Royce field representative. This download can provide limited engine parameters such as turbine gas temperature (TGT), N_G, N_P, torque, etc. The DTC has a limitation in that it relies on battery power to hold memory. If the batteries in the DTC are weak or aircraft battery power was cycled, maintenance data recorded on the DTC can be lost. The DTM has a non-volatile memory system that effectively holds data.

Unfortunately, units do not have the ability to download the flight data from a DTC or DTM; they can only program mission data via the Aviation Mission Planning System (AMPS). Presently, to download the DTC or DTM, the cartridge must be sent or escorted to USASC. The project manager for AMPS is working to make download capability available to units. When that has been accomplished, units will be able to e-mail cartridge binary data over a secure DoD e-mail system when needed to analyze a flight data set. New upgrades in the aircraft software will provide the unit additional flexibility in ways to handle flight data from the aircraft.

UH-60 and CH-47

Currently, there is nothing installed on these aircraft to provide a standardized source for digital data collection except for specialized aircraft that use VADR®. However, some aircraft have been outfitted with the Health Usage Monitoring System (HUMS) that is currently involved in field demonstrations and special projects. USASC coordinates data download from the Army aircraft system project manager when needed. The aircraft might have also been configured with a SMODIM. If you

have questions regarding the UH-60 or CH-47 aircraft, contact USASC for assistance.

Fixed-wing

The fixed-wing fleet has a varied list of data collection recording devices and capability because most are a military version of a commercial variant and are similarly configured. As a result, many of our fixed-wing aircraft have the older, tape-style CVR or FDR systems. Recently the Army has started modifying fixed-wing aircraft with digital CVRs or FDRs. Units requesting download and analysis of data should contact USASC for assistance.

Other collection sources

USASC uses other data collection sources to capture the full impact of maintenance, training, and human performance problems. Sometimes eyewitnesses, video recordings from other aircraft, radar summary, and Air Traffic Control tapes are the only sources of data. In any case, think outside the box in search of other data collection sources.

Because Army aircraft are equipped with a variety of recording devices, the flight safety technician needs to understand what they have on the aircraft and how to use it. If your unit experiences a mishap or an event that requires analysis in support of maintenance diagnostics or safety download, contact USASC's 24-hour hotline in the Operations Division at DSN 558-2660/3410 or (334) 255-2660/3410 to assist you in the disposition of and instructions for recording devices. ♦

Editor's note: An example of a policy letter that can be incorporated into your unit's pre-accident plan and unit reading file is located at ***http://safety.army.mil/pages/tools/fdr.doc****.*

—FDR Analysis Section, USASC, DSN 558-2884 or 2259 (334-255-2884 or 2259)

High Temperatures and High Stress

Dr. (MAJ) Dave Romine, U.S. Army Aeromedical Center, and Dr. (CPT) Kris Kratz, U.S. Army School of Aviation Medicine

Summertime and the livin' is easy. Right? Hardly. For most of us, summer schedules tend to be the manic extreme of cramming as much as possible into the period between Memorial and Labor Days. All kinds of activities—from family reunions to the phenomenon I call "youth league soccer and baseball slavery"; overdue visits to family members who, after a day or two, remind us why we live at least a 2-days' drive from them; and sunburn and animal bites—help to keep us from any true summer rest and relaxation. Throw into the mix a PCS move (this period being most likely for military family relocation) and two or three large wads of cash dropped on a vacation to some miserably hot and crowded theme park with rodent-costumed people dancing around in what was formerly uninhabitable swampland, and what you have is "summertime and the livin' is crazy."

For the aviator and aircrew member, increased stress can impair their ability to perform in the aircraft with varying consequences. We always are emphasizing the need for physical preparedness (crew rest, overall fitness, etc.) and only are beginning to take a preventive approach to good emotional health. Though we often talk about stress and its effect on us, we often fail to recognize that the presence of most stressors in our life is frequently voluntary. In other words, if we are stressed out, then it's most likely the result of our not saying "no" to something that

wasn't necessary. Remember, a certain amount of stress always is impacting us; some of it is related to good events (a new spouse, baby, promotion, etc.) and some bad events (a death in the family, injury, non-select for promotion, etc.). And, each person has a certain threshold that, once reached, will manifest itself by adversely impacting our day-to-day ability to function.

Signs that we have too much stress in our lives:

■ Problems with relationships: family, work, or socially.

■ Missing routine items, such as meetings or items on checklists.

■ Feeling resentful of your responsibilities or other people.

■ Not enjoying things that used to be fun.

■ Changes in motivation.

■ Problems with attention, memory, or reaction time.

■ Anxiety, depression, or unexplained fatigue.

■ Laughing or crying for no reason.

■ Back pain, headaches, or other body aches.

■ Other physical changes such as high blood pressure, shortness of breath, weight changes, upset stomach, or constipation and/or diarrhea.

Tips on avoiding undue stress:

■ Develop a sense of humor—seriously! Learn to laugh at yourself. Keeping standards high doesn't mean you have to be hard on yourself or those close to you.

■ Learn to recognize when you're feeling stressed.

■ Make choices to change the things you can control, and choose to stop worrying about things you can't control.

■ Exercise regularly, drink less caffeine, and stay properly hydrated.

■ Use alcohol only in moderation to enhance the good times, not to mask the tough ones.

■ Cultivate healthy, peaceful relationships.

■ Learn to relax, particularly diaphragmatic breathing and progressive muscle relaxation.

■ Pray, meditate, and take time for faith and stillness.

Drug and alcohol abuse are NOT ways to deal with stress. Drugs and alcohol only add new problems, including addiction and relationship issues. Also, don't ignore stress. It won't go away on its own!

If you're feeling a little overwhelmed, talk to someone—your spouse, chaplain, or even a close friend—about it. Talk to your flight surgeon early, let him know what's going on, and ask for his help. Go directed to an aeromedical psychologist. They are doctoral-level aviation crewmembers specially trained to help the aviator keep his or her emotional health in top form. And don't wait for stress to build to the point of distraction, causing you to miss a mission-critical detail that could hurt you or others. Instead, take a "performance enhancing" perspective. Early intervention ensures that your abilities (attention, memory, reaction time, and crew coordination) in the cockpit do not begin to degrade.

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And, about that summer (or anytime) schedule: Think about the choices we make for filling up our days and nights. The cumulative social and peer pressures that push and pull at us should be viewed judiciously. Guard yourself from unnecessary obligations and learn to focus on what's truly needful. Avoid the distractions of the day, and always make safety your goal. ♦

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Murphy's Law—

Lightning Strikes Two Ways

LTC John D. Murphy
HQDA, DCS, G-2

How likely is your aircraft to be damaged by lightning? Consider the odds... Since 1 October 1999, we've had 13 lightning strikes to Army aircraft. Eleven of those were Class C accidents and two were Class D accidents. Are there any precautions or techniques we can use to increase the miss distance? The answer is yes...and no.

"A bright flash of light and a loud boom similar to a cannon going off" is how an aircrew described a discharge they encountered while descending to land. Flying at 10,000 feet, the aircraft entered instrument meteorological conditions (IMC) and encountered very light, steady turbulence seconds before the strike. Immediately after the discharge, the crew noted light rain and Saint Elmo's fire (luminous, low-intensity electrical discharge). The crew described the Saint Elmo's fire as "green waves dancing on the windscreen," which continued for 2 to 3 minutes. After landing, maintenance discovered over $50,000 in damage including a small hole in the radome, aircraft skin delamination, and over 100 spot welds along the underside of the fuselage. Weather analysis revealed the outside air temperature (OAT) at 10,000 feet was about 1°C.

Did this crew do something wrong?

The answer is no, since the crew was well over 20 miles from thunderstorms as confirmed by airborne and ground-based radars. Radar showed only light precipitation in the area where they encountered the strike, not the type of weather normally requiring avoidance. This example is typical of mishaps reported as lightning strikes. Most don't occur while flying near a thunderstorm, but instead are associated with flight in precipitation near the freezing level.

Two types of lightning strikes

An article by D.W. Clifford of McDonnell Aircraft Company entitled "Another Look at Aircraft-Triggered Lightning" describes the experiences of many military and commercial pilots. Clifford states the strikes usually fit into one of two types. The most common occurs near the freezing level in precipitation not associated with thunderstorms, and can be preceded by static noise on aircraft radios and Saint Elmo's fire around the aircraft's extremities. When the discharge occurs, it's accompanied by a loud bang and usually does little or no apparent damage. Typically, a small $5,000 hole is burned through the radome and minor delamination occurs.

The other type of discharge occurs abruptly in or near a thunderstorm and usually causes more severe damage. This type is what most of us picture as a true lightning strike, where the aviator was simply in the way of a bolt of lightning. Fortunately, we experience very few of these in the Army because we routinely give thunderstorms a wide berth.

But what about the more common type of electrical discharge, often referred to as static discharge ("triboelectric charging," for you electrical engineers). It is the one occurring in areas we normally think of as safe. Clifford explains aircraft static charge accumulates through a process that is similar to the static electricity build-up when you scuff your feet on the carpet. For aircraft, the amount of charge transferred is related to the type and amount of water particles present, aircraft frontal area, and aircraft speed. A large aircraft flying at cruise speed through heavy precipitation will usually build up a charge quicker than a

small, slower aircraft flying at approach speeds through light rain. Flying near the freezing level adds to the static charge build-up. The most intense electrical charging mechanisms exist in this region due to its mixture of ice crystals and supercooled water droplets. Furthermore, as supercooled droplets become more highly charged at the freezing level, they could break into even more numerous smaller droplets, thus increasing the electric charge buildup.

If all this electrical potential is at the freezing level in innocent-looking rain clouds, why is there no natural lightning? Good question! Here's where we must deal with some theory. First, for lightning to occur, charged areas need to separate. In rain showers, large charged regions don't form until your aircraft comes flying through. Not only is your aircraft accumulating a large negative charge from impacting cloud droplets and precipitation, the turbulence created in your wake might intensify the charge separation process. Although Clifford's explanation is complex, it essentially says the aircraft triggers the discharge. Whether you want to call this a lightning strike or a static discharge really doesn't matter—results are often the same.

So where does Saint Elmo's fire fit into the process? Saint Elmo's fire also is called corona and occurs when charge builds up enough to exceed the breakdown strength of the air around the sharpest points of your aircraft. Air breakdown strength is its resistance to electrical arcing and decreases with altitude. The corona will typically form around the aircraft nose and, besides being visible to the crew, could cause radio static.

Does the presence of Saint Elmo's fire mean you'd better get ready for a strike? Well, not necessarily. Although you might be on the verge of a rapid discharge, electrical exchange to the air by the corona reduces the charge on the aircraft. As long as the corona releases charge from the aircraft at least as fast as it builds up, you're okay. However, static charge build-up can exceed the corona's ability to "vent" the charge. The aircraft then becomes a region of charge build-up, and a discharge similar to lightning occurs.

This discussion isn't meant to imply we're only susceptible to aircraft-triggered static discharges. Natural lightning strikes can and do occur. The USAF, NASA, and FAA have conducted considerable aircraft lightning strike research by intentionally flying highly instrumented CV-580 and F-106B aircraft in the vicinity of thunderstorms. Their results show conditions likely to cause lightning strikes differ from those we generally encounter during a static discharge. These tests demonstrated the probability of lightning strikes in thunderstorms increased with altitude, usually well above the altitudes of most Army aviators. At 36,000 to 40,000 feet and at temperatures below –40°C, they averaged two strikes per minute inside thunderstorms. At 18,000 feet, the frequency was one strike every 20 minutes. Most of the strikes at the lower altitudes actually were triggered by the aircraft themselves. Test results, though, were probably influenced by how the data was collected. NASA obtained data by intentionally penetrating thunderstorms—a maneuver most aviators shy away from. Lightning strikes in the vicinity of thunderstorms don't pose as great a hazard to Army aircraft. This isn't because thunderstorms aren't potentially dangerous, but because they're usually easy to avoid by giving them a wide berth using flight planning, radar, and good old common sense. ♦

Editor's note: Remember, lightning is not the only reason to avoid thunderstorms: heavy precipitation, low visibility and ceilings, hail, turbulence, icing, violent wind speed, and direction shifts, to mention a few, also can cause major problems. Though the risk of lightning strikes to Army aviators might be low, other risks associated with thunderstorms make flying near the storms inherently dangerous. The wise aviator is the aviator who steers clear of thunderstorms and gives them a wide berth.

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WAR Stories

Risk management lessons learned

You Don't Know as Much as You Think

"I made it just by the skin of my teeth!" How many times have you heard an Army aviator say that? In a land far, far away and a time long, long ago, I was a CW2 and pilot-in-command (PC) of a UH-1. I thought I knew everything there was to know about flying Army helicopters, and I even had nearly 500 hours of flight time. I could tell war stories with the best of them and had a really strong knowledge of emergency procedures, range operations, and airfield operations. I was proficient in night, instrument, and formation flying, or so I thought.

Late one afternoon, five crews and my copilot (a brand-new WO1) and I reported to flight operations for a day-out, night-return training mission with formation flying incorporated as part of the training. We took off in good weather, with reports calling for some late-evening clouds and visibility of no less than 3 miles outside the clouds. We did formation changes, lead changes, and approaches to confined areas. Some time later, it was well past dark so we elected to put our best lead pilot up front in case we encountered low visibility.

After we had climbed to 3,000 feet we decided that everyone had had enough training for one day, so we turned for home. Well, the things that are supposed to stay the same didn't. The weather came in and the next thing I knew, we had just initiated instrument flight rules (IFR) break-up, with all five crews IFR!

The lead called approach control and informed them of our situation. Approach control, in turn, called each of us, gave us squawk codes, and began sequencing us for an approach. Sometime between getting my code and the time approach control came back to me with my clearance, I had not been performing a proper cross-check and zeroed the airspeed. The aircraft just stopped flying, and by the time I realized what I had done we were in some very unusual attitudes with a bunch of warning lights going off!

I remember attempting to make a mayday call, which was totally unintelligible because my voice had gone up so many octaves that it sounded like a 1955 Chevy squealing tires. By the grace of God, I managed to regain control of the aircraft and my voice. I called approach control and asked for the nondirectional radio beacon (NDB) approach back to the airfield. They asked me if I had attempted a mayday call because they couldn't understand who called or what had been said. I told them I had called, but that it was a mistake. I was too embarrassed to tell the truth.

Approach control approved the NDB request and vectored me to a course that kept me from doing the entire approach. I asked my copilot to tune and identify

the NDB and do a before-landing check. "Tuned and identified and land check completed," he said.

As we crossed the beacon, approach control turned us over to the tower for final approach. I continued to fly the heading that was depicted on the approach plate, but the #1 needle was pointing in the wrong direction. Now at this point and after everything else that had occurred, you can imagine my concern.

Just as I was about to call for a missed approach, we broke out of the overcast and I saw the airfield off to my left front. You can probably guess what happened. My copilot dialed in the wrong frequency, and I didn't check after he confirmed tuned and identified.

Remember that if you fly Army aircraft, you don't know as much as you think. Always reconfirm anything you or your copilot do, and never stop flying the aircraft until you are sitting in the club with your beverage of choice and an audience for your war stories. I'm not going to sign my name to this—I'm very old, still on active duty, and there are probably some guys left out there that flew with me back then. I just can't handle all the obscene phone calls! ♦

Be safe!

New Aviation Life Support Equipment Course

Dan Reed
Directorate of
Training, Doctrine, and
Simulation

Beginning in October 2003, the U.S. Army Aviation Center will enhance the aviation life support equipment (ALSE) course by adding a 6-week resident course to the existing 1-week distributed learning (DL) course.

The ALSE course is designed in two phases. The first phase is the online DL phase of 38.5 hours of instruction. The second phase includes 6 weeks of in-residence training at the ALSE School, Fort Rucker, AL. The course has been designed to include the new Air Warrior equipment.

Registration for access to the online DL phase began 23 June 2003. Soldiers must pass the two online Phase One DL examinations and have confirmation of test scores 2 weeks prior to arriving at Fort Rucker for the Phase Two resident portion in October 2003. Unit training divisions must start registering their soldiers *now* for the Phase One DL course and follow on with the Phase Two resident course in the Army Training Requirement Reporting System (ATRRS).

"This is another first for us in the distance learning arena in aviation enlisted training at Fort Rucker," said CPT Ken Girardi, Chief of Enlisted Training. "We are giving our soldiers a Web-based course of instruction followed by a resident course. In meeting the directive set by the Commanding General of TRADOC for FY04, we are importing a DL concept into our training strategy that ultimately provides our soldiers more time at home station and less time in the schoolhouse. It's a win-win situation for both the soldiers and commanders in the field." ♦

—Dan Reed is an Instructional Systems Specialist in the Training Division, DOTDS, Fort Rucker, AL, DSN 558-9654 (334-255-9654), e-mail: reedd@rucker.army.mil.

Above the Best

CW5 William Barker
Aviation Warrant Officer Proponency

Simply mentioning the fact that you are a military pilot often makes you the center of attention, even in the company of other soldiers or professional people. It is a heady feeling that strokes the ego, leaving you rightly proud of your accomplishments and proud of knowing you have joined an elite group—the long line of Army aviators. You are one who can proudly wear the Silver Wings, one who can truly identify with the timeworn phrase "Above the Best."

You could be doing a thousand other things with your life. Instead you have been chosen to do something extraordinary, something that demands intelligence, meticulous planning, and continuous, career-long, thoughtful effort in order to count yourself alive and successful at the end of the day. It is the stuff of legend, something highly desired and greatly treasured, and it is naturally fun and exciting! No honest aviator would deny that. We probably wouldn't tolerate many of the hardships if it were otherwise.

That exhilaration comes at a price. Sadly, not all of us are willing to make that sacrifice for this great privilege. We have had some frightful incidents and accidents in the past because of that unwillingness. It is time to look at our individual attitudes, professionalism, and the integrity of our actions.

Perception

You've heard it your entire career...you are a soldier first and always. What you do as an aviator is subordinate to that singular, distinguishable fact. It's that simple and it's that profound. This can't be overemphasized! If this is not your perception, then you need to seriously consider leaving the Army. There must be an unwavering commitment to this principle. Anything less is unacceptable and is grounds for dismissal!

Attitude

The great standardization instructor pilots (SPs) I have known and worked with placed attitude preeminent on their scale of required aviator "skills." Among the many attributes and skills needed to be a proficient aviator, most can be strengthened or enhanced through study, practice, and guidance—with one notable exception, attitude. It is the age-old story; I can teach you to fly an instrument landing system (ILS) or to execute a visual meteorological conditions (VMC) approach, but I can't fix your attitude. Only you can do that! It's a matter of the heart, and only you can effect authentic and lasting change. If you have chosen to be a rogue aviator, the type who holds rules and guidelines in disdain, there is little hope of forcing you into a different mindset. Worse still, you simply can't be trusted with millions of dollars worth of equipment, the dependency of others on your mission performance, and most importantly, the priceless lives of your fellow soldiers.

Integrity

Can you be counted on—counted on to be realistic about your own or the crew's shortcomings, to maintain the knowledge necessary to be a professional aviator, and to be dedicated to the Army mission, whatever that might be on a particular day? Will you do the right thing when no one is watching? Regardless of the strength or weakness of the "command climate," a professional soldier and aviator will not violate the implied trust of those he serves. Vigilance must come from within; it should not need to be forced from without.

Duty and Honor

Some have snickered at the statement of the seven Army Values, yet they form the glue that bonds soldiers together in peace and, most especially, war. These values are intangible elements, but they manifest themselves in very tangible consequences, good and bad, gratifying and tragic.

It is imperative the Army Aviation community solve its own problems without outside meddling from those who won't likely understand our unique requirements. Past issues of *Flightfax* have made us aware of the consequences of disobedience and undisciplined flight. I'm encouraging you to aspire to greatness, to live on the other side of the fence from the rogue aviator, the one who wreaks havoc and destroys lives. Perform your flight and your mission with honor and distinction.

Flying is fun and garners much personal attention, but it must be embraced as a sacred trust and when that trust is violated, disciplinary action must be swift and unwavering. The sheer joy of flight properly executed carries no guilt and is exhilaration undefiled. In the daily performance of this privileged assignment, we must remain duty-bound and committed to integrity of action. ♦

—CW5 Barker currently serves as Chief of the Aviation Branch Warrant Officer Proponency Office, Fort Rucker, AL, DSN 558-1419 (334-255-1419), e-mail: william.barker@rucker.army.mil.

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class A:** While in cruise flight at approximately 400 feet above ground level (AGL) and performing a route recon, the pilot-in-command (PC) executed a right turn at an altitude between 300 to 400 feet AGL and 20 knots. The aircraft entered a down-wind condition, and the rotor RPM began to decay. The PC attempted to regain rotor RPM by reducing power, but the rotor RPM had not recovered by 200 feet AGL. The PC executed a power-on autorotation to sloping terrain and the aircraft rolled right upon touchdown. The PC compensated with left cyclic, causing the main rotor blades to strike the upslope terrain. The aircraft rolled inverted, spun 180 degrees, and came to rest on the rotor hub. The crew egressed without injury, but the aircraft was totally destroyed.

■ **Class A:** While conducting a night recon and surveillance mission using night vision systems (NVS), a flight of two aircraft departed a named area of interest (NAI) en route to another NAI in a loose, staggered right formation. As the flight maneuvered between two hilltops, Chalk 1 struck a series of four mining cables. Both pilots were killed by the impacts and the aircraft was completely destroyed by a post-crash fire.

■ **Class D:** During preflight phase with engines running prior to taxi, the aircraft turned 290 degrees to the left while on the ramp in parking. This movement caused the aircraft to contact a Tri-Max fire extinguisher with the right underside of the stabilator. The aircraft stopped turning when it contacted the fire extinguisher. The pilot was late with the appropriate corrective flight control inputs to stop the turn.

CH-47

F Model

■ **Class E:** During shutdown, the #1 hydraulic pump failed and subsequently was replaced. The problem was determined to be due to fair wear and tear (FWT).

MH-60

L Model

■ **Class E:** During run-up, the #1 engine flamed out while in cross-feed. Maintenance personnel attempted to run the #2 engine indirect, and it subsequently flamed out. Maintenance personnel determined the packing between the #2 main fuel hose and the #2 main fuel tank breakaway valve had deteriorated and allowed a significant enough air leak to flame out whichever engine was drawing fuel from the #2 main fuel tank.

OH-58

C Model

■ **Class C:** Aircraft suffered a reported turbine outlet temperature (TOT) spike to 990ºC during engine start-up. No other details were provided.

DR Model

■ **Class C:** During termination with power phase of an autorotation, the aircraft experienced engine (141 percent/2 seconds) and transmission (119 percent/3 seconds) overtorque conditions. No other details were provided.

■ **Class E:** While conducting an over-water formation, the aircrew noticed a slight binding and resistance in the flight controls or hydraulic system. The crew made a precautionary landing, and the aircraft was inspected in accordance with the appropriate maintenance technical manual (TM). No mechanical damage was found, and the aircraft was released for flight.

UH-60

A Model

■ **Class C:** The aircraft's tail de-ice cable bracket fractured during flight, striking the tail rotor and stabilator on the right leading edge. No other details were provided.

■ **Class E:** During daytime cruise flight the #1 ENG CHIP and MASTER CAUTION lights illuminated. Engine oil temperature and pressure remained within normal limits, and the flight was terminated without further incident. Maintenance inspection revealed the #1 engine chip detector was within tolerance, and the aircraft was released for flight.

O-2A

Cessna Skymaster

■ **Class E:** During takeoff roll at night the pilot observed fuel flow drop to zero, and the #1 engine lost power. The pilot aborted takeoff and secured the engine by moving the mixture lever to CUTOFF and closing the front engine fuel valve. The aircraft was taxied to parking and secured. Maintenance personnel discovered a fractured fuel line fitting at the fuel injector and installed a replacement part. The aircraft was functional flight-checked and returned to service.

Editor's note: **Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Iraqi Freedom. We will publish those details in future *Flightfax* articles.**

Routine Mission? I Don't Think So!

A crewmember in Afghanistan was working on his aircraft when he felt something touch the top of his boot. He looked down and froze when he saw this snake on his foot—turns out it was a 6-foot cobra. That'll get your attention! The snake was seeking refuge in the fuel vent area above the right forward landing gear.

LESSON LEARNED:

Never get too comfortable on a "routine mission." Something could be waiting out there to bite you!

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

SEPTEMBER 2003 ✦ VOL 31 ✦ NO 9

The ever-changing face of Combat Engagements

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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U.S. ARMY SAFETY CENTER

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Joseph A. Smith
BG, USA
Commanding

DASAF's Corner

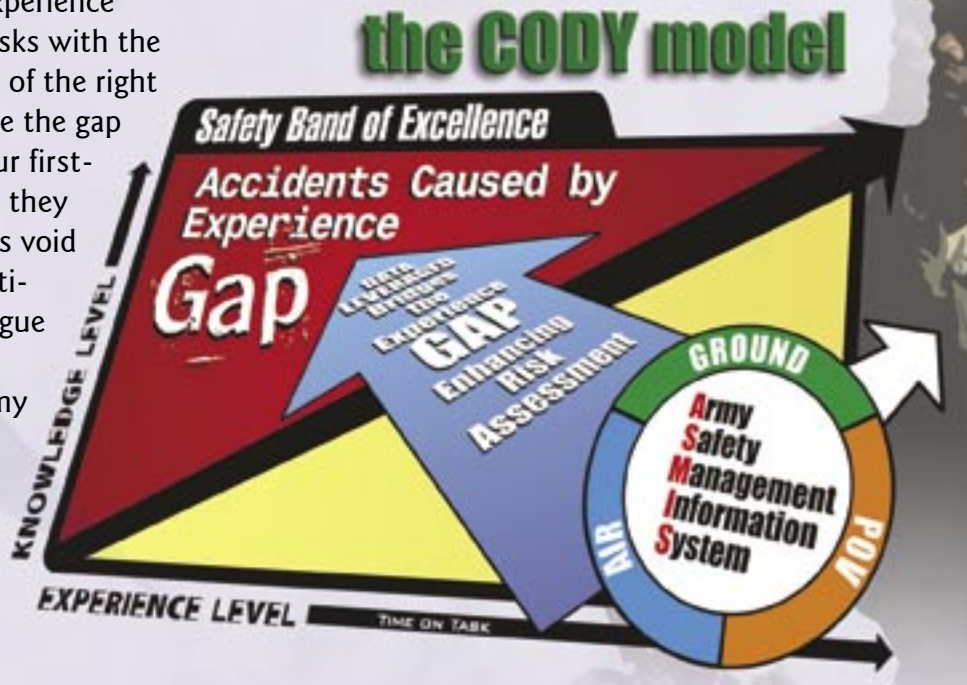
FROM THE DIRECTOR OF ARMY SAFETY

Bridging the Gap Between Lack of Experience and Safety Excellence

As we approach the end of this fiscal year, the potential exists for the Army to experience its highest number of accident fatalities since 1994. The Secretary of Defense has laid out a clear challenge for us: **reduce the number of mishaps and accident rates by at least 50 percent in the next two years**. The key to achieving this goal lies in bridging the gap between lack of experience and safety excellence.

Recent deployments to Afghanistan and Iraq have taught me that accident fatalities are not normally the result of an inability to identify hazards. Risk is inherent in combat and realistic training, and our leadership generally identifies the appropriate hazards. However, we do not do as well identifying and implementing the right control measures to mitigate the risk of those hazards.

The cause stems not from negligence or a lack of effort, but rather from a lack of experience and knowledge. LTG Dick Cody, our Deputy Chief of Staff, G-3, asserts that our small-unit leaders and first-line supervisors simply lack the experience necessary to match the mission risks with the identification and implementation of the right control measures. We must bridge the gap between the experience level of our first-line leadership and the knowledge they need to properly mitigate risk. This void can be effectively filled by (1) multi-level leader involvement and dialogue and through (2) knowledge and information-sharing using the Army Safety Management Information System (ASMIS): a soon-to-be fielded web-based aviation, ground, and POV centralized risk-assessment program.



THE WAY AHEAD

1

Risk Management "3 Deep" Leadership:

For every mission, on or off duty, there needs to be three levels of leader involvement. Using his knowledge of the individual soldier and guidance from higher levels, the first-line leader interacts face-to-face with each subordinate. The second-line leader supervises and spot checks, providing an independent set of eyes and the higher level of experience. The top-line leader uses his wealth of experience to provide guidance and supervises the risk-mitigation process to ensure the right control measures have been highlighted and implemented. This process of dialogue between leader levels gives less-experienced leaders knowledge in place of experience to protect their soldiers and move toward a safety band of excellence.

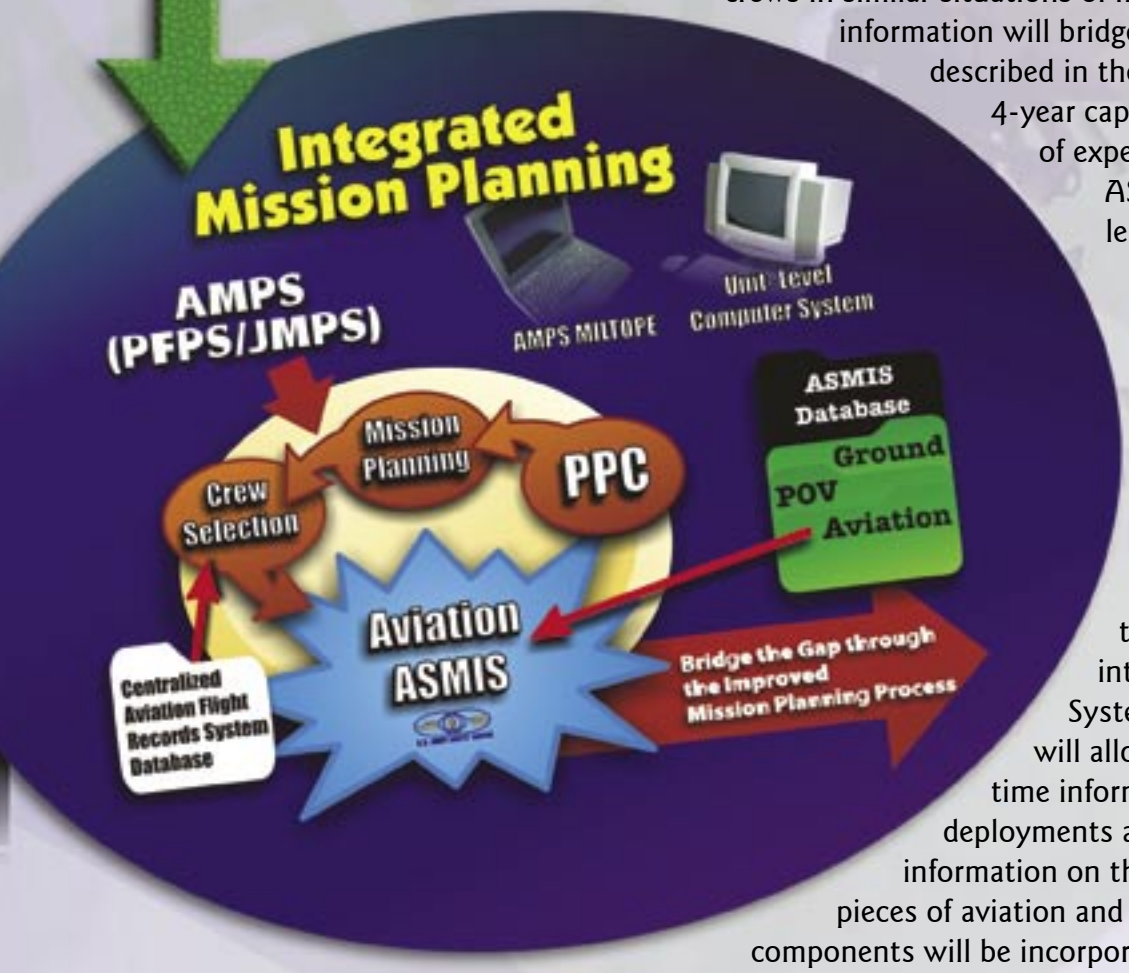
2

Information-Sharing Through Technology:

A second means of bridging the experience gap for first-time leaders is through information sharing that leverages technology. RMIS is our current web-based hazards, risks, and controls database that provides near real-time accident data. As we are transitioning to the next level, the Army Safety Center is working with Aviation Proponency in developing an automated risk assessment program that incorporates the data found in the RMIS database as well as other "stovepipe" systems to further assist leaders in identifying and implementing effective control

measures. ASMIS will be an on-line, centralized risk-assessment program for air, ground, and POVs that will prompt mission leaders to input their demographics, mission type, and experience level. ASMIS will use the Army Safety Center databases to give our soldiers the degree of risk associated with the mission, the hazards, effective control measures, and examples of recent accidents that fit the mission profile.

Let us use the example of an Attack Company Commander who has 4 years time in grade. He will use the Portable Flight Planning System (PFPS) to plan his mission. By entering the knowns—mission, crew, G-2 intel from higher HQ, and Performance Planning Criteria—the commander will be able to have all of the integral pieces of the risk decision process at his disposal provided by the PFPS software. The commander will be able to see crew configuration of time in aircraft, currency of flight, currency of NVS and be able to make an astute decision based upon the crew's history predicated upon the historical data of ASMIS. The user will also be able to see through ASMIS the historical accident data of mistakes made by previous crews in similar situations of mission profile. All of this information will bridge the "knowledge gap" as described in the CODY MODEL and give that 4-year captain the leverage of 20 years of experience.



ASMIS will also provide senior leaders with the ability to identify and mitigate risks for upcoming deployments and combined arms exercises. This knowledge will allow them to develop the most effective home-station and environmental training to mitigate their unit's risk before departure. In the long-term, ASMIS can be integrated into all Army Mission Planning Systems. Wireless technology will allow leaders to obtain real-time information even on long deployments and field exercises. Eventually information on the failure rate of individual pieces of aviation and ground equipment and sub-components will be incorporated into the aviation and ground centralized risk assessment modules' database.

Using the hazards, risks, and controls information provided by the ground, aviation, or POV modules of ASMIS and supported by 3-deep dialogue between soldiers and their experienced leadership, our less-experienced leaders will have the knowledge to properly manage risk.

Keep your leader lights "on!"

BG Joseph A. Smith

The ever-changing face of Combat Engagements

Army Aviation employment techniques have seen vast changes since the Vietnam War. The development of integrated air defenses and the Man-Portable Air Defense System (MANPADS) necessitated shifts in tactics, techniques, and procedures (TTPs), resulting in executing hovering engagements from nap-of-the-earth (NOE) altitudes. Target arrays changed considerably, and attack aviation transitioned from a close combat role to one of anti-armor in a European environment over open, rolling terrain.

Resultant TTPs focused on maneuver by stealth to concealed battle positions, limiting exposure during engagement with precision weapons that provided range overmatch. Teams would then disappear into the shadows to prepare for the next engagement. Aviators developed the skill of firing rockets from a hover, which presented new dynamics and coordination challenges. New aircraft were equipped with basic fire control computers that provided a fire control reticle for rocket

engagements. Aviators began to maneuver the aircraft to a computer-generated "release point," as opposed to an out-the-window (via grease mark) aim point.

In the War on Terror, combat maneuver, maneuvering engagement TTPs, and the conduct of close combat with ground troops have appeared as critical mission requirements to support successful engagement of a distributed enemy in complex terrain. This mission requirement will remain valid for the foreseeable future. These TTPs do not replace NOE flight or hovering engagement, but must be taught in addition to those established concepts.

The foundation for combat maneuver and maneuvering engagement

Successful maneuvering engagement cannot be accomplished without a sound foundational understanding of the associated high-energy characteristics of a given platform. Aviators must maintain keen situational awareness of aircraft orientation, closure rate, and enemy disposition while adhering to aircraft envelope and platform limitations. Failure to manage any one of these facets can result in crew injury, aircraft damage, aircraft incident, and/or mission failure.

Just as NOE flight tasks and hovering engagements require key critical skills, high-energy maneuver must be built on essential knowledge and skills that have to be understood, applied, and correlated. The successful development of high-energy maneuver skills is predicated on instinctive understanding of the aerodynamics and characteristics that accompany the maneuvers associated with high-energy weapons platform employment. These aerodynamics and characteristics include transient torque, total lift area loss due to blade coning (i.e., mushing), conservation of angular momentum, high angle turn factors, g-loading, and associated total aerodynamic force effects. While these descriptions require more room than allotted in this article, aviators should give the "maneuvering flight rules of thumb" ample consideration during mission planning and execution.

Maneuvering flight rules of thumb

1. Never move the cyclic faster than you can maintain trim, rotor, and torque. If you enter a maneuver and the trim, rotor, or torque reacts more quickly than you anticipated, then you have exceeded your own limitations. If you continue on this path, you most likely will exceed an aircraft limitation. Slow down and perform the maneuver with less intensity until you can control all aspects of the machine.

2. Anticipate changes in aircraft performance due to loading or environmental condition. The normal collective increase to check rotor at sea level/standard will not be sufficient at 4,000 feet and 95°F.

3. Anticipate the following characteristics (for American conventional and non-tandem rotor helicopters) during maneuvering flight and adjust or lead with collective, as necessary, to maintain trim and torque:

- During aggressive left turns, torque increases.
- During aggressive right turns, torque decreases.
- During aggressive application of aft cyclic, torque decreases and rotor climbs.
- During aggressive application of forward cyclic (especially immediately following aft cyclic application), torque increases.

4. Always leave yourself a way out. Regardless of the threat, the ground will always win a meeting engagement.

5. Know the wind direction and approximate speed.

6. Most engine malfunctions occur during power changes.

7. If you haven't performed combat maneuvers in a while, start slowly. Much like night vision device (NVD) flying, your cross-check slows and it will take some time to develop proficiency at tasks that have not been performed for extended periods of time.

8. Crew coordination is critical. Everyone needs to be fully aware of what is going on, and each crewmember has a specific duty.

9. In steep turns the nose will drop. If this drop is not compensated for, a sink rate will develop. In most cases you must trade energy (airspeed) to maintain altitude, as you will not have the required additional power (e.g., to maintain airspeed in a 2-g and 60-degree turn, you will have to increase rotor thrust and engine power by 100 percent). Failure to anticipate this at low altitude will endanger yourself, your crew, and your passengers. The rate of pitch change and sink rate will be proportional to gross weight, density altitude (DA), and angle of bank.

10. Many maneuvering flight overtorques occur as the aircraft unloads g's. This is due to insufficient collective reduction following an increase to maintain consistent torque and rotor speed as g-loading increases (i.e., dive recovery or recovery from a high-g turn to the right).

Critical combat maneuver do's and dont's

1. Employ combat maneuver as a function of mission requirement, not recreational activity. Every aviator that employs these techniques at the wrong place and time endangers our ability to continue this critical training.

2. Train only those maneuvers that have a combat application. These platforms are made to engage and destroy the enemy and are not purchased to enable you to impress friends, relatives, or passengers. Again, one incident will endanger your fellow aviators by denying them training.

3. Taking unnecessary risks when carrying a load of combat-equipped infantry soldiers can be equated to a commercial airline pilot showing off when carrying athletes to the Olympics. There is no excuse. Do what the mission requires.

High, heavy, and hot environments

A thorough understanding of the three components of energy (altitude, airspeed, and engine power) and its tradeoffs must be ingrained. All of these factors must be nested in an overarching understanding of the effects of aircraft weight, temperature, and altitude. Weight, temperature, and altitude substantially affect helicopter performance. While this seems a bold statement of the obvious, crews that habitually fly lightly loaded platforms in a cool, low altitude environment repeatedly are surprised when deployed to a high, hot theatre of operations. Aircraft must be flown differently as power margins shrink due to DA and aircraft loading. The following rules of thumb for high, heavy, and hot environments have served many aviators well.

High, heavy, and hot rules of thumb

1. Always land or take off INTO THE WIND. It sounds incredibly basic, but we don't always do it.

2. If at all possible, maintain effective translational lift (ETL) until within ground effect.

3. When out-of-ground effect (OGE) power is close to maximum power available, there is a very limited ability to arrest descent when hovering or flying at speeds well below ETL. For example, in an AH-64A, if your OGE hover power is 92 percent and your maximum torque available is 98 percent, you have roughly enough power margin to establish a 300 foot per minute (fpm) vertical climb while at a hover. This means that if you allow a sink rate of more than 300 fpm to develop, you will not be able to recover without building airspeed to above ETL and trading energy. This will take a lot of altitude to accomplish.

4. If you must approach to an OGE hover, be keenly aware not to allow a sink rate to develop (see rule 3). Execute the deceleration slowly. A large flare is conducive to a sink rate you might not be able to arrest.

5. When margins are close, avoid left turns until above ETL. Substantial left pedal inputs could very well overtorque or droop the rotor when operating near the limits.

6. When operating near the margins, do not forget the option to jettison the stores or load. This should be an integral part of the brief.

7. High DAs, hot ambient temperatures, or a heavy helicopter will require more altitude to recover from dive pull-outs or breaking turns and less engine or rotor capability to recover with.

8. Know your aircraft's limits and power margins before you leave the ground. Performance planning is not conducted to check a block. When computed correctly, it provides critical information to enable mission accomplishment and sound cockpit decision-making.

9. When conducting multiple aircraft operations, do not conduct the takeoff in trail formation. The downwash created by the aircraft to your front might exceed your power margin during takeoff. When possible, takeoff individually and conduct an inflight link-up.

10. While nearly all aviators have been through academics on retreating blade stall and frequently describe it during annual evaluations, most rarely experience it. During missions with a heavy aircraft in a high, hot environment, the onset of retreating blade stall occurs sooner (a good hint is when you notice a reduced velocity not to exceed [VNE] during performance planning card [PPC] computation). Review and know the causes, the onset characteristics for your aircraft, and recovery methods before any deployment to a high, hot environment. Good information can be found in Field Manual (FM) 1-203, *Fundamentals of Flight*, on pages 6-39 through 6-43.

Perceptions

Overarching vigilance must remain high in identifying the high-risk aviator. Aviators that perform unauthorized maneuvers with no combat application must be held accountable. This vigilance, however, must be focused. There have been numerous crews that have returned from a flight that involved authorized training, performed within the constraints of the aircrew training manual (ATM) and operator's manual, only to be told to report to the company or battalion commander to answer reports of inappropriate use of Army aircraft. An education process must take place to inform those in our branch and in our Army of what training must be integrated in order to ensure mission success in today's demanding environments.

The path ahead

U.S. Army Aviation Center (USAAVNC) leadership has directed development of the path to provide the substance, framework, and requisite training for maneuvering flight engagement and associated considerations for operations with heavy aircraft in high, hot environments. The time has come where training is pushed to the mainstream and not conducted in isolation by instructors who honestly endeavor to accomplish what their conscience decrees as the right thing. The key objective is to provide the line aviator with the skills and knowledge to accomplish the mission aggressively, effectively, and safely in a rapidly changing environment.

This initiative includes adjustments to USAAVNC Plans of Instruction (POIs), additional instruction during aircraft transition, the development of ATM tasks, train-the-trainer visits by the Directorate of Evaluation and Standards (DES), and the generation of a "maneuvering flight handbook" similar to a pilot's pocket tactical standing operating procedure (TACSOP). In the meantime, know the capabilities of your platform, operate within established limitations, listen to your instructors, apply common sense, and anticipate aircraft response. Take these steps to subject the enemy to violence and maneuver, and GO GET SOME. ♦

—POCs: This information was jointly prepared by the following individuals—
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Attack Aviation in Restricted Terrain

"**Know yourself, know the enemy, but always analyze and apply the effects of terrain**." These are seemingly simple-enough terms for the professional warrior. However, knowledge of the terrain and the effects it can have on military operations is a skill that increasingly is becoming clouded by modernization. This article invokes some thoughts on the proper use of attack aviation in restricted terrain, using the Korean peninsula as a template.

While Field Manual (FM) 1-112, *Attack Aviation Helicopter Battalion*, includes mission, enemy, terrain, troops, and time available (METT-T) in all of its tactics, techniques, and procedures (TTPs), it primarily focuses on open terrain with little relief. Korea, which is punctuated with rough mountains, large streams, and rugged narrow passes with about only 20 percent of the peninsula suitable for cultivation, quickly brings renewed emphasis for understanding METT-T. The Korean Peninsula comprises numerous ridgelines and hills that offer excellent cover from direct fire and ground observation. Restricted terrain affords attack aviation little chance for success unless it is controlled and employed properly. The proper use of command relationships, attack reconnaissance, and battlefield synergism can mean the difference between mission accomplishment and mission failure.

In Korea, the 2d Infantry Division has one aviation brigade with one assigned AH-64 attack helicopter battalion. The operational control (OPCON) of this extremely lethal asset usually is accompanied by the same unintended restrictions: "Don't piecemeal Apaches" and "husband the resource." Unfortunately ground commanders, as well as attack helicopter commanders, adhere to these restrictions a bit too literally. A division commander would operationally control an attack battalion to a ground maneuver brigade only after careful consideration and analysis. The division commander might need to improve the correlation of forces (COFMs) ratio, but realizes the ground commander who owns the terrain is the most suitable agent to coordinate the attack of ground and air assets. He may visualize that the ground commander needs the unique capabilities of the AH-64—unrestricted maneuver and night visionics with magnification—to conduct reconnaissance or a pre-emptive strike to desynchronize the enemy. The division commander could even operationally control them to the ground commander in a "911" situation where ground forces are taking heavy casualties due to an unsuccessful breaching operation. Korean terrain offers the division commander many possibilities for the OPCON of attack assets.

Korea's many defiles make the AH-64's unique capabilities a primary asset to ensure force protection in the close fight. However, the ground force commander seldom will be able to employ a complete Apache battalion en mass in this type of terrain. He might employ AH-64s in small lead-wingman teams, or he could use the entire battalion in the one-third rule. Apache lead-wingman teams flying some 3 to 5 kilometers ahead of ground scouts can be employed at night to find the enemy and alert ground forces

to ambushes, disposition, etc. This still would leave the ground commander sufficient combat power in the attack battalion to execute typical missions such as destroy the counterattack force or reserve.

Unfortunately, this type of employment poses a quandary. Doctrinally, an attack battalion can be operationally controlled to no lower than a ground maneuver brigade. However, tactics dictate that the ground commander in contact is the best agent to control or integrate Apache fires into the fight (to preclude fratricide) and to take measures to synchronize direct and indirect fires. The maneuver brigade commander should control the asset for planning but, during employment and execution, the AH-64s must talk and work specifically with the ground force commander, regardless of the size of that force. Moreover, the brigade commander must ensure that the attack and ground force commanders are executing within his intent. This concept is not new and has been employed successfully by special operations aviation on numerous real-world missions to facilitate command and control, increase lethality, and prevent fratricide.

In deep operations, commanders caution against "trolling for tanks" and appropriately allow Apaches very little flexibility to maneuver beyond the assigned engagement area and designated routes. If the attack battalion is told to attack the reserve in Engagement Area (EA) Stuart in support of the maneuver brigade, then we expect the reserve to be on the move long enough for us to detect, identify, and track the enemy formation. Unfortunately, Korean terrain negates this detection usually by providing the enemy reserve a covered and concealed route to the engagement area. The enemy reserve might have to move, in a typical scenario, only 2,500 meters, hardly enough distance to detect, identify, and track. A more viable mission is to orient the attack helicopters on the enemy force. A moving enemy reserve normally would not have time to make defensive preparations or to have a robust air defense artillery (ADA) threat, allowing AH-64s to discover the formation even in daylight from standoff range. This type of mission allows attack aviation to fully negate and exploit the advantages that restricted terrain provides to the enemy.

Battlefield synergism might not necessarily mean simultaneous synchronization. A National Training Center (NTC)-like environment forces the ground commander to synchronize his total combat power in one or two engagement areas—simultaneous engagements to destroy the enemy en mass. However, simultaneous synchronization in restricted terrain is extremely difficult to control and very vulnerable to fratricide. A far better plan is to destroy the enemy reserve as a pre-emptive measure, since the reserve probably is not dug in and would not have to move any appreciable distance to enter the intended engagement area. In essence, the AH-64s would find and destroy the reserve as the enemy's main body crossed the line of departure (LD) and was engaged by direct-fire weapons systems. The synergistic effect of this operation is that the enemy would have to deal simultaneously with a close fight and operations in his rear.

Adjusting command relationships, modulating attack reconnaissance, and sequencing synchronization might not be suitable for desert operations or doctrinally correct by our manuals, but they are extremely effective in desynchronizing the enemy in restricted terrain. The old adage that the only good tactic is the one that works is reinforced quickly by the restricted terrain on the Korean peninsula, where METT-T analysis can mean the difference between victory and defeat. ♦

—Reprinted with permission from the Center for Army Lessons Learned (CALL) Web site, http://call.army.mil/call.htm. Major Bob Werthman wrote this article while he was stationed at 2ID, Korea.

Things That Go Bump in the Flight

Ian MacPherson
Royal New Zealand Air Force

Joining the Royal New Zealand Air Force in 1988 was the realization of a dream for me. I had earned my private pilot's license a few years earlier, and I found the discipline, high standards, and relentless emergency training somewhat of a shock. Looking back, I believe this training saved my life and the lives of all those on board a UH-1 when its tail rotor failed and I was pilot.

With only 301.4 hours in the Huey, I was a junior bograt and seldom authorized as captain. Generally, the tasks the squadron flew required the better-qualified pilots to occupy the right seat. However, to get experience, we occasionally were sent out on day navigation exercises, as was the case on this particular day.

As Number Two in the formation, we were positioning downwind left-hand for Runway 03 at the local airfield. The rejoin was briefed to be a run-in, low-level on Runway 03, followed by a 1-second, 270-degree right break to terminate outside the Number 4 hangar. All was going as planned except for Number One's VHF radio, which had failed just minutes before. In their place, my crew was doing all the joining calls for the formation.

In mid-downwind and only 1½ miles from the airfield, we felt and heard a high frequency vibration throughout the airframe. It's funny how often you hear, feel, or smell something in the cockpit but, after consultation with the crew, the problem appears to have been a figment of your imagination. In the hope that this was perhaps one of those times, I sheepishly asked the question, "Can you guys hear or feel that?" Over the intercom my crewmembers replied, "Sure can." There was little doubt in our minds that, with the airfield so close, we should turn left, leave the formation, and land as soon as possible.

Once clear of the other aircraft and with the whole airfield in our sights, we had about a minute to address the issue; strangely, though, the vibration had gone away. All the flight controls were responding normally, and all the instruments were normal. Since the noise had gone and everything appeared to be okay, I felt no cause for alarm. My copilot had his hands full operating two radios, and I don't think he particularly was worried either. Why should he? After all, the noise was gone.

As we crossed the perimeter fence, the Number Four hangar came into sight. I felt a slight sense of relief: Home was now only 300 yards away. However, we were far from out of the woods. As the Huey approached translational, I introduced collective to arrest the rate of descent. When I did, the aircraft made a sudden and violent yaw to the right. I never had seen or experienced anything like this in all the training I had received.

One thing did seem obvious—pulling up the collective had caused this immediate problem, so the sensible act was to put it back down. I did this and, fortunately, the rotation stopped at about 110 degrees. Then the nose came left again to settle at 60 to 70 degrees out to the right. It came as no great surprise that the vibration was back and with far more vengeance than before. Some height and speed were lost, but we still were crossing the ground at approximately 20 knots and descending at about 40 feet.

Acting on instinct, I tried to introduce power and increase airspeed. The aircraft responded, but continued flying at an alarming attitude: The left skid was very low, and the nose was wavering between 70 and 90 degrees to the right. Despite reducing the rate of descent (thereby delaying impact with the ground), efforts to climb proved fruitless as the aircraft

threatened to rotate through 90 degrees every time power was increased beyond a critical point. My copilot and crewman automatically performed the critical actions of a mayday call and secured the passengers in their crash positions.

The point of impact was quite obvious at about 100 yards away. As the aircraft approached 10 feet, still crossing the ground at about 20 knots, I had no choice but to treat this as a low-power tail rotor emergency. For a helicopter like the Huey, which has a counter-clockwise rotating main rotor, a low-power tail rotor emergency means the tail rotor is not producing the thrust required for a given power setting and, as power is introduced and/or airspeed is reduced, the nose rotates to the right. The only corrective measure is to close the throttle, which eliminates torque; the nose then rotates left for a matter of seconds, during which time the aircraft should be run on while the skids are aligned with the direction of travel.

As the Huey approached translational, I introduced collective to arrest the rate of descent. When I did, the aircraft made a sudden and violent yaw to the right. I never had seen or experienced anything like this in all the training I had received.

During training we would never practice such an extreme low-power scenario. I had not seen this maneuver performed with the nose beyond 20 to 30 degrees to the right. I briefed the crew of my intention to close the throttle to flight idle and proceeded to do so. The aircraft yawed to the left but didn't quite reach the direction of travel. Suddenly the rotation reversed, and the nose was rotating to the right again. Now we really were committed—rotor rpm was reducing rapidly, and the rotation was accelerating through 90 degrees to the right.

Instinct took over again and I attempted to reduce ground speed to zero, for the aircraft surely would turn over if we hit with any sideways movement. The left toe kissed the ground but didn't grab it, allowing 15 more feet of flight before contacting it again, only this time harder. As the skid tore into the soft topsoil, the remaining sideways movement caused the aircraft to rear up on its left skid, all the time rotating to the right. The last of the energy was dispelled as the left heel also penetrated the topsoil. The aircraft, now completely out of control, threatened to roll over.

Fortunately, the dynamic rollover effect stopped before the center of gravity exceeded the limit of the left skid. The aircraft ungracefully fell back down and for the first time contacted the ground with both skids. It was now facing 180 degrees opposite of the approach heading.
The crewman quickly exited the aircraft to check for the cause of this hair-raising ride. The copilot and I looked anxiously at each other while we secured the engine and turned the electronics off. The main rotor still was winding down when the crewman returned and said the tail rotor was not turning at all. He could see the failed tail rotor drive hanger bearing. This was the first time during this 50-second ordeal that any of us could think clearly enough to acknowledge the fault and its seriousness.

I flew the Huey for 5½ more years and eventually qualified as both a fixed- and rotary-wing instructor. I now have a total of 2,500 flying hours, of which 1,800 are on helicopters. I never have forgotten the time my tail rotor failed, and I doubt I ever will. Surprisingly, I don't think I would do anything different if it happened again. Perhaps I wouldn't have flown a normal approach but, again, the noise was gone and there were no signs of a serious problem. After all, how often do you hear a noise that turns out to be nothing?

I attribute our instinctive handling of this problem to the excellent instruction I received during my training. To put it in simple terms, when you fly helicopters there are some things that have to be instinctive. The initial actions required when you lose yaw control or tail rotor effectiveness is an example of one of these times. You've been trained by the best. Use that training to keep you and your crew safe! ♦

—This article was written by Royal New Zealand Air Force (RNZAF) squadron leader, Ian MacPherson. You can read this true account and many others in Greg Whyte's book entitled, "Fatal Traps for Helicopter Pilots" recently published in August 2003 in New Zealand. You can preview and order the book at http://www.fataltraps.com. For more info, contact Greg Whyte, P.O. Box 75, Waikato Mail Centre, Hamilton 2015 New Zealand, Fax: +64-7-850-6053 or e-mail: greg@fataltraps.com.

A Warm Tent and a Cup Full of Soup

LTC Joseph McKeon
U.S. Army Safety Center

As I write this article, it's July and I'm in southeastern Alabama—hot, hot, hot! But given the literary flash-to-bang time between writing an article and getting it into the bathroom stall where it can be read by soldiers, it's already time to think about winter. It's also the 50th anniversary of the declared cease-fire in Korea, which was a welcome relief to all those dog-faced Joe's who suffered through brutal Korean winters.

Looking back at World War II and Korea, the numbers of soldiers incapacitated due to cold weather injuries was staggering. LTC (Dr.) Kenneth Orr reported in 1954 that the number of hospitalization days due to cold injuries in those two conflicts was more than 3 million! Imagine our entire Army being hospitalized for more than a week. This stands as a stark reminder of how poorly trained and equipped soldiers rapidly can become compromised, especially in the absence of meticulous supervision by caring leaders.

As a soldier today, you are neither poorly trained nor poorly equipped, nor are you lacking caring leaders. So why bother writing about cold injuries? Because they continue to happen, even though they are preventable. The equipment issued to you, when used and maintained properly, will allow you to fight and win in even the most austere environment.

I know this because when I was building my little shelter in the snow near Fairbanks, AK, it was 20 degrees below zero and my gear protected me. And then there was the time I spent the night unexpectedly on a hilltop at the National Training Center (NTC), CA. I was with a light infantry battalion and had nothing but the BDUs I was wearing and my TA-50. Even though the temperature was "only" in the 40s, I endured the coldest night of my life. But this article isn't about "war stories;" rather, it's about protecting yourself and the soldiers you

work with.

As individuals and leaders, it is your responsibility to ensure your soldiers are trained and equipped properly. That means anticipating being colder and staying longer than originally planned. Those who grew up in cold environments have learned how to respect the weather and dress for it. Few residents of Fairbanks or Watertown, NY, would walk out to the mailbox in a T-shirt and shorts in February or drive to the store without a coat and gloves in the car. If the door accidentally locked behind you or the car broke down, you could freeze to death. So what was I thinking, ending up with my "hooah" medical team stuck on a hilltop at NTC with no "snivel gear?" The fact is, I WASN'T thinking, and I set us up for cold injuries. Life is too short to make all the mistakes yourself, so learn from others! Don't be the one who endures a night freezing in the back of a "Hook" or a "Hawk" because you didn't bring your cold weather gear, or didn't take your coat out to the Apache because it was "only a quick test flight."

When considering injury prevention, it often pays to target your efforts at the highest risk group. So what does the "typical" cold injury patient look like? He (I'm not using your usual sexist male pronoun, it's just that the typical cold injury victim is male) is young, usually about 20; is from a warm climate (he hasn't learned you don't walk to your mailbox in February in a T-shirt); has less than 18 months in the service (so it's his first winter field training exercise); and he's neglected his foot care. In the infantry, foot care is a leadership issue, and the rest of the Army needs to get with the program! In addition, he is likely to use alcohol, tobacco, and possibly medications. While flight personnel know better than to self-medicate, other soldiers in the unit might not. Look around your squad, platoon, company, battery, or troop and see if you have soldiers that fit the above description, because they are at risk. Identify them and pay special attention to them now, before you go to the field or deploy.

Now that we have an idea of who is most likely to get hurt, let's briefly discuss cold injuries and what we can do to prevent them. The human body is indeed "fearfully and wonderfully made." I'm sure you've noticed how some folks get very "red in the face" when they exercise. That's the body's cooling mechanism shunting blood to your skin so the blood can be cooled readily. But did you know the shunting process also works the opposite way? In cold environments, as much as 99 percent of surface blood flow can be shifted back inside you to keep your vital organs warm. Amazing, isn't it?

However, this protective mechanism that has been "engineered" into our bodies can be defeated by what we do. For instance, dehydration decreases the amount of blood that is circulating, thus hindering the body's heating mechanisms. That's why it's so important to ensure we stay hydrated. Pushing fluids can be forgotten in a cold environment. This is especially true if you have to get out of a warm tent when it's below zero, trudge through the snow, and "drop trou" to pass water, or if you've got to walk a quarter mile from the aircraft to latrine facilities.

In cold weather you might be tempted to drink less to reduce your need to leave your nice, warm tent. However, this can set you up for dehydration and even a heat injury—that's right, a heat injury! When you are performing hard physical work in a cold environment and wearing all your protective equipment, it's easy for you to start sweating and become overheated. You can end up exhausted and sweaty, and then cool off

rapidly in the cold. It's no wonder the typical cold injury victim is a young, first-term male soldier...who usually gets detailed to put up the GP Mediums!

In addition to the demographics listed above (young, first-term males), there are other significant risk factors. If you have a previous history of cold injuries you are obviously at risk, because you've already shown that you are susceptible. In addition, if you are not physically fit, you are more likely to be injured—thus the Army's emphasis on physical fitness.

Poor or inadequate nutrition also can take its toll quickly. When you're in a cold environment, your body has a greater metabolic demand because you're burning more calories trying to stay warm. If you need 3,000 calories per day in a controlled environment, you may need up to 4,500 calories in a cold environment just to maintain your body weight. Eating meals also will increase water consumption, which will be a hedge against dehydration.

Too little activity also can be a risk factor. While overheating is a risk when you are working hard, lack of activity can cause you to have cold injuries because of poor circulation in the extremities. Using those large muscle groups will ensure good circulation and heating, so get up and do 20 side-straddle hops (when not in contact with the enemy!).

Alcohol and tobacco, as well as caffeine, also can make it harder for you to stay warm. These substances all affect your body's ability to dilate (widen) and constrict the blood vessels, which can defeat your body's built-in heating and cooling mechanisms. Prescription and over-the-counter medications can adversely affect your body's heating and cooling as well, so it is important to let your doctor know if you will be exposed to cold weather. If you are a leader, you need to create a healthy work environment where soldiers are steered away from unwholesome behaviors such as tobacco use and excessive alcohol consumption.

Okay, let's wrap this up, so to speak, with some tips on prevention. Dress in layers and avoid tight-fitting clothing. This will improve your circulation and provide layers of air between layers of clothing to help insulate you. Change your socks frequently to ensure your feet stay dry. This is going to require that you actually take off your boots and socks and change the latter, maybe even the former. If you are a squad leader, you might have to closely observe your soldiers to ensure compliance.

Beware of the wind. Wind chill can cause skin to freeze at temperatures that would be much less dangerous in the absence of wind. This is especially important when you are working around helicopters or in open areas where trees or man-made features are not available for wind protection. Just the other day I heard a CH-47 set off car alarms in a parking lot at Fort Rucker. Now that bad boy can put out some wind! Ensure your soldiers and passengers do not linger in rotor wash in below-freezing temperatures. Protect your face and ears, because these areas often suffer frostbite due to exposure and decreased blood flow. Wear the appropriate gloves, especially when you're handling petroleum, oil, and lubricants (POL) products, and avoid touching cold metal or fuel. Change wet gloves and clothing immediately, especially if fuel is spilled. In addition to the fire hazard, evaporating fuel can speed the onset of cold injury. Eat often and drink warm, non-caffeinated beverages. Soup is super, and remember to wash your hands!

Use the buddy system. Seek medical attention for yourself and your buddy before symptoms become severe. As cold skin gets numb, subtle damage can progress and become a severe injury. Don't be like those thousands of soldiers that spent weeks convalescing during World War II and Korea. This Army needs every soldier every day, so take care of your body. After all, where else are you going to live? ♦

—LTC McKeon currently is assigned as the Command Surgeon for the U.S. Army Safety Center. He may be reached at DSN 558-2763, 334-255-2763, e-mail: joseph.mckeon@safetycenter.army.mil.

WAR Stories

Risk management lessons learned

Basic Instinct

CW3 Joseph E. Gould
ASOC 03-003

It had been almost 40 days since our last night vision goggle (NVG) flight. Mark and I had been battle-rostered together for almost the entire past year in a UH-60L assault battalion as our company's primary flight leads. It was definitely time to brush up on our skills, so we planned a night training flight and put the same effort into it as we would the real thing.

The next evening we flew the planned mission. We were both pleased with how the flight went and decided to head back to the airfield. On the way back, I asked Mark if he minded doing some emergency procedure training at the airfield when we returned. I put the extra training on the brief sheet because I knew we would have fuel left after flying our route, and I wanted to get as much training as possible out of the evening. Part of the reason we hadn't flown for almost 40 days was because the flying-hour budget had been spent. Mark said, "That sounds like a good idea to me." He asked me what I had in mind, and we agreed on roll-on landings.

After I finished my third roll-on landing, Mark started to rib me on my technique in the use of aerodynamic braking during the maneuver to help in bringing the aircraft to a stop. I was taught to use this method to prepare yourself for the fact that if you lose one engine, you might not be afforded the luxury of an airstrip on which to land the aircraft. Mark was the pilot in command (PC) and had almost twice the flight experience I had. I completely

respected his experience and his desire to teach me new or better ways to do things, whether it was in cockpit management or a roll-on landing. After taking his jokes for a while I said, "Alright, Hot Shot, show me how it's done."

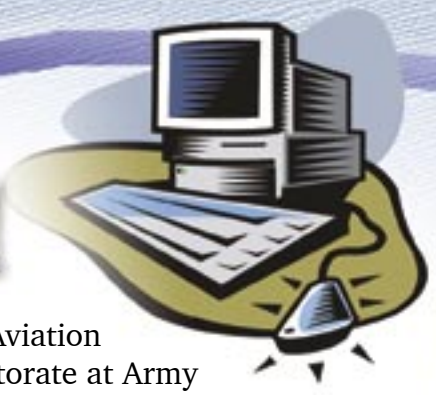
On downwind we were talking about his roll-on landing philosophy—you wouldn't have the power available to use any form of aerodynamic braking, and you should rely on the brakes to stop the aircraft instead. We turned base and tower gave us permission to perform the roll-on, with a mid-field hold restriction because of the amount of traffic in the pattern. I thought to myself, "Perfect, he's in a situation that I had always trained for and his technique didn't allow for." (I say he was in a situation because he was on the controls.) When we turned final, tower lifted the restriction and cleared us for the entire runway. "He's lucky," I thought to myself again. Mark had everything set up for the perfect roll-on landing.

Our tail wheel just came into contact with the runway when the tower came back with the mid-field hold restriction. All I felt was the cyclic come back hard, with no collective being applied. Flashing before my eyes was the –10 warning that talks about the stabilator being programmed down and 25 degrees pitch attitude, which can cause the stabilator trailing edge to contact the ground. Our crew chief announced we had sparks coming from the back of the aircraft. I knew what had happened. We went into parking and shut down.

The reason I am sharing this story is because, as aviators, we always are being warned about being overconfident in our own ability. In this instance, I was overconfident in the other pilot's ability, and maybe a little under confident in my own. I saw everything happening and knew what was wrong, but I did nothing because I believed too strongly in Mark's ability to control the aircraft. Yes, he was the PC, but together we were a crew. If I had allowed myself to act upon my instinct, I could have prevented this accident. ♦

—CW3 Joseph E. Gould wrote this story while attending the Aviation Safety Officer Course, ASOC 03-003, U.S. Army Aviation Center, Fort Rucker, AL. He is currently assigned as an aviation maintenance officer to the 2/409th Training Support Battalion, Knoxville, TN. CW3 Gould may be contacted by e-mailing joseph.gould@us.army.mil.

We Need Your Help!



The Army Safety Center, in conjunction with Aviation Proponency and Software Engineering Directorate at Army Armament, Munitions, and Chemical Command (AMCOM), are developing an automated risk management tool to be integrated into the redesigned aviation mission planning system (AMPS); i.e., PFPS and JMPS. We are currently soliciting ideas from the field. Your input is valuable for the development of a risk management tool that is useful and user-friendly. Basically, what we are asking: If you could design an automated risk management tool, what would you like to see? Any good risk assessment worksheets, hazards, and associated controls for particular missions, ideas, etc., are encouraged. Send all inputs to **AutoTool@safetycenter.army.mil**.

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class C:** The #1 engine generator caught fire during cruise flight. The aircraft landed hard in rough terrain. The onboard fire subsequently was extinguished.

■ **Class C:** While landing from a 10-foot hover, both crewmembers heard a loud "clunking" noise, followed by another series of noises. The noises immediately were followed by the MASTER CAUTION light and the FIRE APU (auxiliary power unit) warning light illuminating. While calling another aircraft in their flight to check for signs of fire, the crew smelled smoke. By this time the aircraft was on the ground, and the pilot in command (PC) executed the emergency procedure for APU FIRE and announced, "Get out." The crew egressed unassisted and without further incident. The APU was replaced, and the aircraft was released for flight.

■ **Class C:** Before takeoff, the crew completed a health indicator test (HIT) check. The crew felt rushed to meet the takeoff time and did not complete a before takeoff check. The #1 power lever was left in the IDLE position and, as the PC picked the aircraft up to a hover, the rotor drooped and the generators drooped offline. The PC landed the aircraft and determined the #1 power lever was left in the IDLE position. The crew did not think an overtorque condition had occurred and continued to fly the mission for another 2.5 hours. After landing, the electronic control unit (ECU) was removed for download. As a precautionary measure, the main transmission, #2 drive shaft, drive shaft coupling, nose gearbox, and tail rotor fork assembly will be replaced.

D Model

■ **Class B:** During a 30mm gun engagement, a round struck a buried weapons cache, resulting in an explosion under the aircraft. No other details were provided.

■ **Class B:** Prior to aircraft taxi and with the APU turned off, engine power turbine speed (N_p) and main rotor speed (N_r) were observed at 101 percent. The crew heard a loud banging noise and discovered the #2 engine N_p was in the yellow at 106 percent. The crew conducted an emergency shutdown of #2 engine and followed with a normal shutdown of the #1 engine. The engine was bore-scoped and sent for teardown analysis to determine if an internal failure occurred.

CH-47

D Model

■ **Class C:** Aircraft was Chalk 2 of a flight of two under night vision goggles (NVGs) conducting a formation landing in a known dust environment during an air gunnery range. The aircraft landed with forward airspeed on a down-slope and began to slide. The underside of the nose struck a ditch, causing damage to the underside of the aircraft. The crewmembers repositioned the aircraft, performed an inspection, and returned to the airfield without further incident.

OH-58

A Model

■ **Class B:** Aircraft crashed into a gravel pit following reported engine failure and autorotation. The main rotor blades and tail boom were damaged.

■ **Class C:** Aircraft experienced an overtorque condition (115 percent) during takeoff.

DI Model

■ **Class A:** While performing a multi-ship support mission, the takeoff crew browned out during takeoff but landed safely. During the second attempt at takeoff the aircraft browned out again and crashed, resulting in major damage to the skids, fuselage, mast-mounted sight, main rotor system, and tail boom. The crew suffered minor bruises. There were no reported malfunctions prior to the accident.

DR Model

■ **Class C:** During day training, the main rotor flexed down and two blades contacted the tail rotor drive shaft cover and global positioning system (GPS) antenna. The crew was not aware of the damage and continued with the training period, which included standard autorotations, low-level autorotations, 180-degree autorotations, full authority digital electronic control (FADEC) manual throttle operations, and hydraulic operations. The damage was discovered during the post-flight inspection.

UH-60

A Model

■ **Class C:** During terrain flight on a nap-of-the-earth (NOE) route, the main rotor blades struck a tree, damaging all four tip caps.

Editor's note: **Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Iraqi Freedom. We will publish those details in a future *Flightfax* article.**

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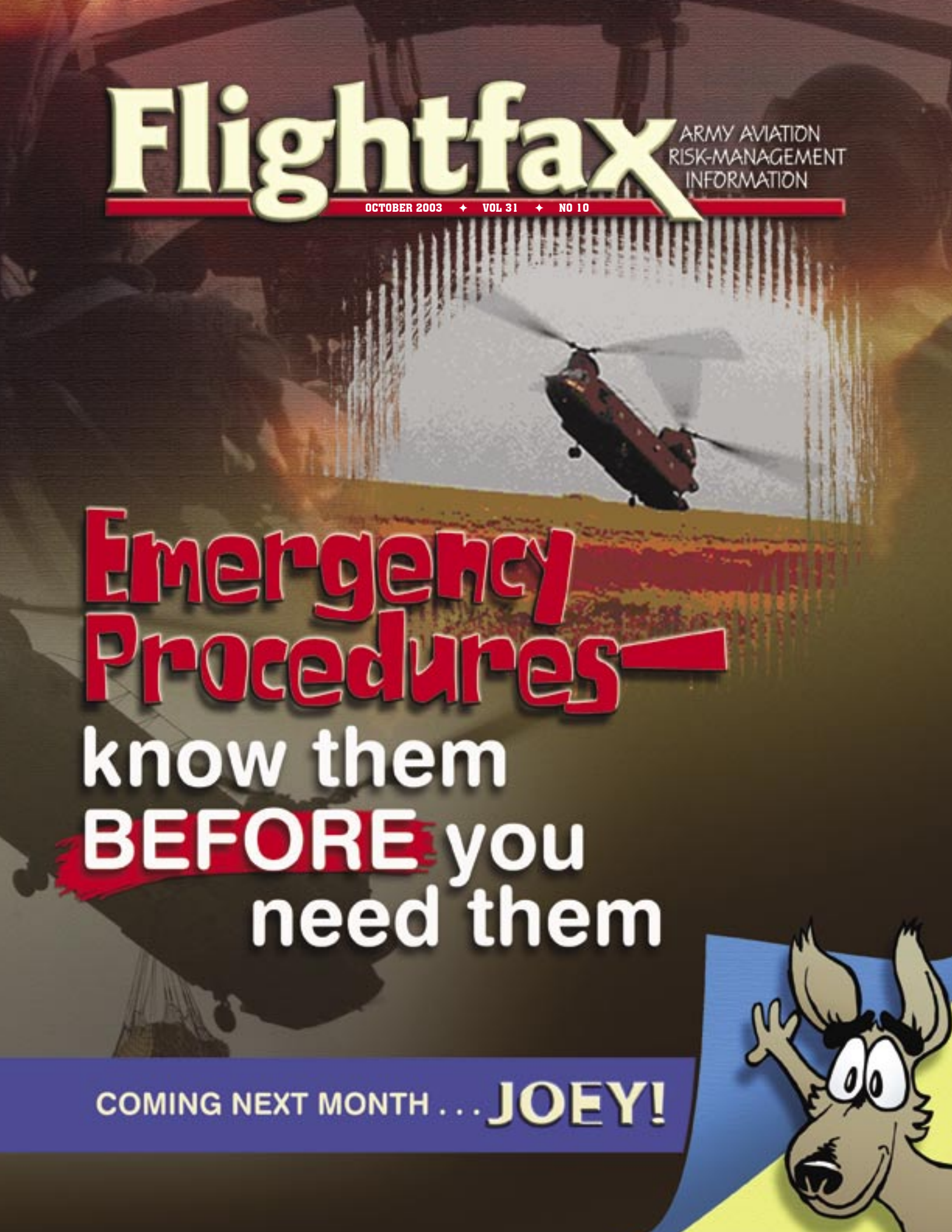
ARMY AVIATION RISK-MANAGEMENT INFORMATION

OCTOBER 2003 ✦ VOL 31 ✦ NO 10



Emergency Procedures—

know them BEFORE you need them

COMING NEXT MONTH . . . JOEY!

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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U.S. ARMY SAFETY CENTER

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JOSEPH A. SMITH
Brigadier General, U.S. Army
Commanding

DASAF's Corner

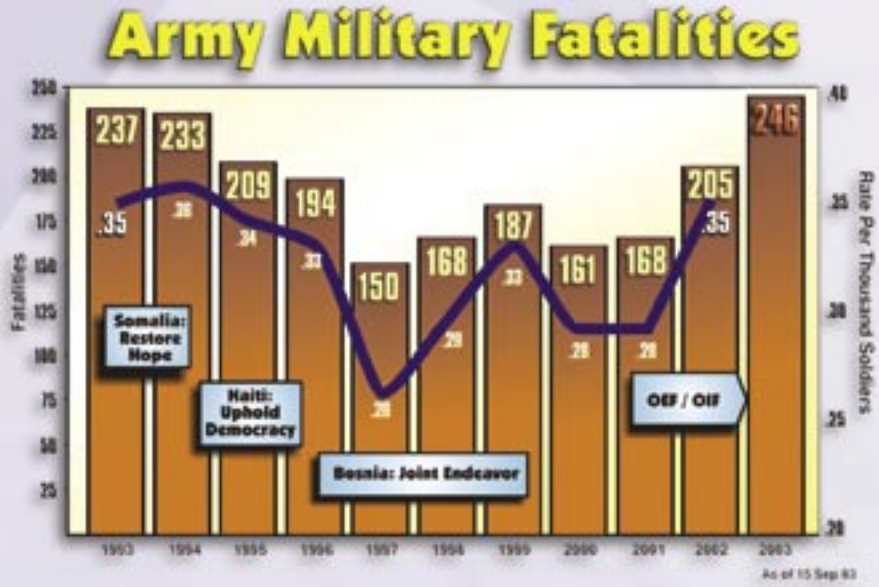
FROM THE DIRECTOR OF ARMY SAFETY

A Formula for Safety…

As the final reports arrive at the Army Safety Center for 2003, the Army has lost 246 soldiers to accidents this fiscal year. These are 246 notifications, 246 funerals, and 246 families who have lost a father, mother, son, or daughter. These soldiers were in our formations and a critical part of our combat readiness. Now, they're gone. We have two enemies in this Global War on Terrorism: the "bad guys" who carry weapons and preventable accidents that are not stopped by the "good guys."

In World War II, accidents accounted for 50 percent of our deaths; in Vietnam 54 percent; in Operations Desert Shield and Desert Storm 75 percent; in Operation Enduring Freedom 51 percent; and in Operation Iraqi Freedom 28 percent. To paraphrase a quote by Dr. Scott Geller: "If you keep doing things the same way, you will get the same results." This statement is as true for your unit as it is for the entire Army.

Let's look at accidental deaths over the last 10 years. In 1993 we were losing .35 per thousand soldiers. Last year we were at .35. For 2003, we are at .39…and climbing.



The Secretary of Defense (SECDEF) has mandated a 50-percent reduction in accidents over the next 2 years. This is on our watch, and we are going in the wrong direction!

"Out of the box" thinking is critical as our Army transforms to meet the Nation's security requirements. It is important that we shift our safety strategy from "art" to "science." General Peter Schoomaker, Chief of Staff, Army, coaches leaders to use the following formula to attack tough challenges (if you're not into math…hang in there, this ain't hard):

$$f(\text{degree of operational success}) = (\text{Doctrine} + \text{Organizations} + \text{Materiel}) \times (\text{Soldiers' Skill}) \times (\text{Leaders' Influence})^{(\text{training} \times \text{knowledge} \times \text{experience})}$$

Or, simplified in a safety context:

$$f(\textit{degree of organizational safety success}) = (D + O + M) \times S \times L^{(t \times k \times e)}$$

The Safety Center is developing a series of tools that will allow our Army organizations to increase

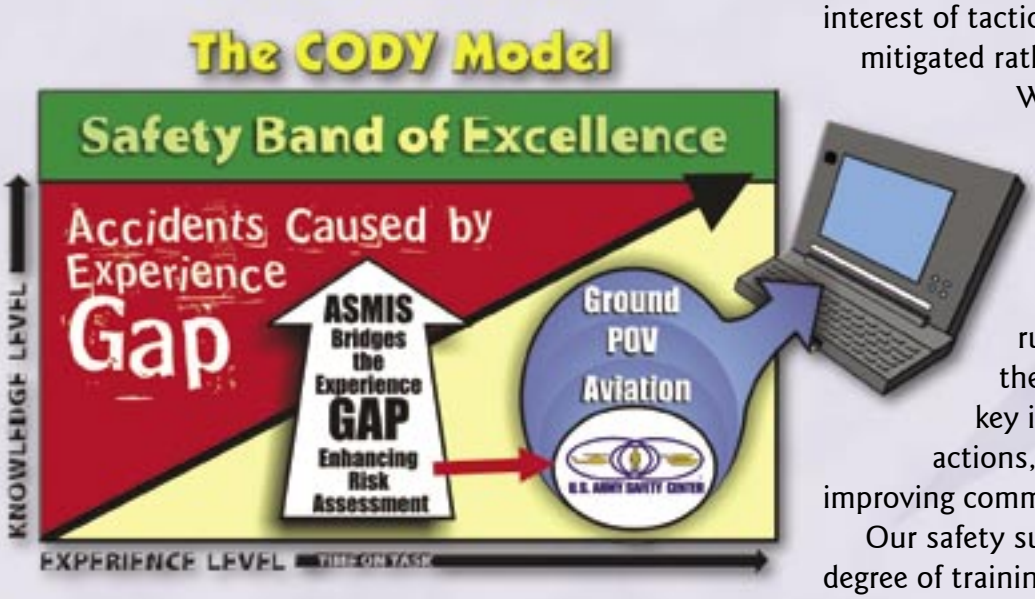
the value of each of their formula's coefficients. If we work this as a team, it will result in a dramatic decrease in accident fatalities.

(D)=Doctrine. It is the foundation that guides us to execute missions safely and effectively. Several manuals, including those focused on drivers' training, are out of date. We owe our leaders updated field and training manuals that reflect the changes in our Army's equipment and operational environment. The goal is for doctrine to push us to use our full capability while accepting reasonable risks. Get the job done, but don't kill yourself doing it.

(O)=Organizations. Soldiers, leaders, and equipment need to be brought together as a combat-ready team. We must protect our combat formations by enhancing combat readiness through solid risk management. Good organizations protect soldiers on and off duty to preserve combat power through instituting proper safety programs. A death is a death, regardless of where it happens. Accidents in privately owned vehicles (POVs) and Army combat vehicles (ACVs) accounted for over 60 percent of our total fatalities this year. To attack POV accidents, the Army's biggest killer, we are now conducting centralized accident investigations the same way we do aviation and on-duty ground accidents. These teams are investigating POV fatalities to ensure organizational programs are actively reducing off-duty risks.

Additionally, the Safety Center has just fielded the first ground Directorate of Evaluation and Standardization (DES) team in an effort to help commanders evaluate their drivers' training and operation programs. Instead of being post-accident focused, we are aggressively working to identify and flag the warning signs to prevent accidents *BEFORE* they occur. As part of that vision, the Safety Center remains poised to conduct voluntary assessments for commanders who have specific safety concerns within their organizations.

(M)=Materiel. The goal is to "engineer out" hazards in the equipment our soldiers use to train and fight, so leaders don't have to "train them out." The Safety Center has a responsibility to assist the acquisition process and is placing renewed emphasis toward this common goal. I recently visited an installation regarding some safety concerns with the Stryker. Drivers and TCs were comfortable with the idea that "*mobility=survivability*," or rapidly moving on the battlefield as a form of protection. From their perspective, adding 8,000 pounds of reactive armor made the Stryker top-heavy and more difficult to maneuver. However, the reactive armor is needed for urban operations; so in this case, we must "train out" the hazard. The acquisition process is very effective at engineering out hazards, but in the interest of tactical operations, some risk is mitigated rather than eliminated.



While doctrine, organization, and materiel all have a role in the safety equation, it is the actions of our soldiers and their leaders that reduce risks where the rubber meets the road. Hence, the Safety Center has focused its key initiatives at influencing soldier actions, empowering leaders, and improving communication between the two.

Our safety success is influenced by the degree of training, knowledge, and experience

of soldiers and leaders. As you can see in the Cody Model, we cannot influence experience levels—experience equals time at the tasks. We can, however, fill in the "experience gap" by providing soldiers and leaders the knowledge they need to reduce risk. We will field the beta version of the Army Safety Management Information System (ASMIS) this month to provide a user-friendly, automated way to assess risks for aviation, ground, and POV missions. Furthermore, ASMIS will suggest control measures to reduce risk and educate soldiers by providing them examples of past accidents during similar missions. The knowledge provided by ASMIS educates the leader on his soldiers' risks and inspires dialogue between each level of leadership. The goal is to ensure effective control measures are used.

In addition to the variables in the Army Chief of Staff's formula, we find the Degree of Dialogue (d) between senior leaders, first-line leaders, and soldiers to be a key ingredient in the safety formula. This dialogue should be "3 levels deep" and can be done through a combination of guidance, coaching, and supervision early in the risk mitigation process. We suggest that dialogue be added as an exponential factor in the effectiveness of Leader Influence (L):

$$F = (D + O + M) \times S \times L^{(t \times k \times e \times d)}$$

For those who hate math, stay with me for a moment. If there is no dialogue between senior leaders and their soldiers (d=0), then the value of leader influence, regardless of the leader's training and experience, equals one (L=1). Because of the geometric relationship between leader influence and safety success, the formula demonstrates that leaders have ***NO*** effect on safety unless they talk to their soldiers during the mission planning process. Historically, this has proven to be true in all facets of soldiers' lives, both on and off duty. "***YA GOT TO COMMUNICATE!***"

(T)=Training. Safety and operational training are extremely important to the effectiveness of the organization's safety success. Simply avoiding risks is not safe. Challenging training with tactically and technically proficient leaders present increases the value of T, exponentially increasing the long-term safety success of the organization. In the long term, risk aversion is not effective risk mitigation.

At the Safety Center, we refuse to be stagnant. We are aggressively making use of proven processes, industry's best practices, and technological advances to help you succeed in reducing fatalities. But, as the formula emphasizes, ***YOU are the key element in reducing accidents***. Achieving the SECDEF's mandate of reducing accidents by 50 percent over the next 2 years is not only possible, it's necessary to winning the Global War on Terrorism. ★

Keep your leader lights on!

Emergency Procedures—know them BEFORE you need them

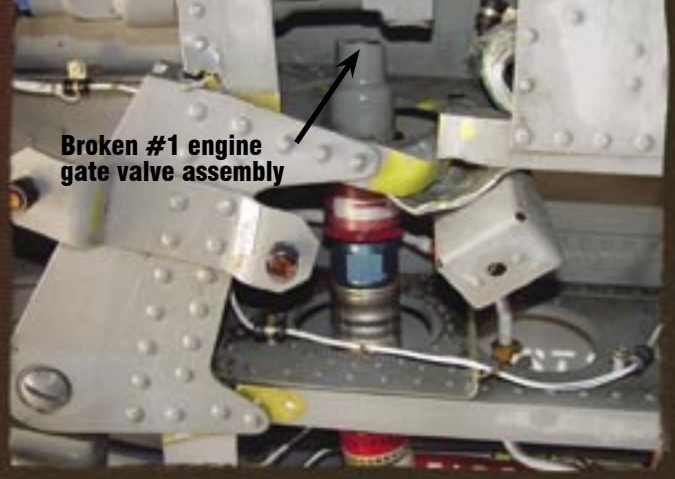
"Icarus, my son, I charge you to keep at a moderate height, for if you fly too low the damp will clog your wings, and if too high the heat will melt them. Keep near me and you will be safe. Beware, dear son of my heart, lest in thy new-found power thou seekest even the gates of Olympus...These wings may bring thy freedom, but may also come thy death."

—Daedalus to Icarus, after teaching his son to use his new wings of wax and feathers

We all know how the story ends. Icarus flew too close to the sun and the wax holding his wings together melted from the heat, causing him to fall to his death and drown in the sea. His father, Daedalus, might have been a famous architect, inventor, and master craftsman, but he forgot one thing—the importance of emergency procedures for his new invention, and maybe even a little crew coordination. Both are essential to successfully handle an in-flight or on-the-ground emergency, and it's important to fully understand your emergency procedures (to include those WARNINGS, CAUTIONS, and NOTES) *BEFORE you need them*!

Fortunately, we have published aircraft emergency procedures for almost any emergency. Have an emergency? "Piece of cake," you say. "Just break out the checklist and use the call-out and response method, right?" Well, it's not always that simple, and you may not have time before your wax melts to get to that checklist. Let's take a closer look at

The ultimate cause of this accident was determined to be human error as a result of several factors, including training, unit standards, crew coordination, and risk management. The application of the incorrect emergency procedure contributed to the severity of damage to the aircraft.



another story and see if there is a moral to this one as well.

Once upon a time, a CH-47 crew was performing a Fast Rope Insertion/Extraction System (FRIES) mission with 17 Army and U.S. Navy Special Operations Forces (SOF) ropers on board. During the deceleration for the fast rope task, the aft ramp of the aircraft struck the ground hard enough to force the ramp up into the hydraulic struts. The impact caused bending of a sheet metal airframe structural former on the left side of the aircraft.

This bending caused the #1 engine gate valve and mounting bracket to break, spraying fuel in the cabin and on the passengers near the aft ramp. It also created a large fuel vapor cloud due to the rotor wash over the aft ramp. The break in the fuel line fitting immediately starved the #1 engine of fuel, causing it to spool down. The aircraft rebounded slightly and, knowing they now had an emergency situation, the crew leveled the aircraft at about 20 feet above ground level (AGL). The #2 engine immediately began to spool up to meet the now single-engine power demand. The flight engineer (FE) told the pilot (PI) there was a fuel leak and to shut down the #2 engine.

Without hesitation, the PI not on the controls immediately shut down the #2 engine by pulling the #2 engine control lever (ECL) to the STOP position. But he didn't stop there: he then pulled the #2 engine FIRE PULL handle. Oops! This action essentially created a dual engine-out condition, and the rotor RPM began to decay very rapidly. The pilot in command (PC) continued to level the aircraft and applied cushioning collective pitch as the aircraft settled in a forward motion to the ground.

Due to the extremely low rotor RPM, which inhibited the interposer droop stops from engaging in time to prevent rotor droop and subsequent contact of the blades with the fuselage, the synchronizing driveshaft and tunnel cover area received extensive damage. (The interposer blocks are centrifugal force-generated stops that begin to engage at 88.5 percent rotor RPM and are fully engaged at 66.5 percent rotor RPM. They could not position in time due to the rapidly decaying rotor RPM as a result of the induced dual engine-out condition.)

Incorrect emergency procedure

Let's analyze this accident in a little more detail. After the #1 engine quit as a result of fuel starvation from the ruptured valve, the #2 engine began to spool up to meet the single-engine power demand. The operating engine did exactly what it was designed to do. This resulted in an increase in engine noise in the aft section of the aircraft, and the FE mistakenly told the pilot that the #2 engine had a fuel leak and to shut it down. Easy to do when fuel is being sprayed all over the back ramp with hot exhaust plumes just off the back! The PI, hearing the excitement in the FE's voice, immediately shut down the #2 engine without positively confirming the #2 engine was, in fact, the one that failed. He didn't cross-check cockpit indications such as torque, gas turbine speed (N1), power turbine inlet temperature (PTIT), engine oil pressure, etc. Technical Manual (TM) 55-1520-240-10 contains the following caution about emergency

CAUTION

When in-flight shutdown of a malfunctioning engine is anticipated, positive identification of the malfunctioning engine must be accomplished to avoid shutting down the wrong engine.

engine shutdown.

Misdiagnosing the emergency after the impact and subsequent shutdown of the good engine were the primary causes of the extensive damage, since the rapid rotor decay prevented the interposer blocks from positively engaging and preventing the rotor droop. This is a classic example of a minor accident that suddenly turned into a more serious situation as the result of an improperly executed emergency procedure. Had the crew correctly diagnosed the emergency, a single-engine landing and shutdown most likely would have allowed the interposer blocks to engage properly, and also would have prevented the resulting structural damage to the top of the fuselage.

In this case, misdiagnosing the emergency was the difference between a minor accident and a Class A accident. No one was seriously injured in this accident but, like Icarus, the results could have been tragic. The fuel leak created a large vapor cloud that easily could have ignited from sparks or hot exhaust. Once on the ground, the crew did an excellent job of evacuating the aircraft.

Anyone who has even a few hours of flight time knows that an actual aircraft emergency definitely will test your wings. It's important to know your emergency procedures BEFORE actual emergencies occur.

What about those emergencies that don't have a listed emergency procedure? Those are the times where pilot judgment and experience come into play. The single-most important consideration is aircraft control, and all procedures are subordinate to this requirement.

Knowing your emergency procedures

Emergency procedures should be discussed as a part of every pre-mission planning event. For instance, if there is a possibility of encountering marginal weather during the mission, it might be prudent to discuss briefly what procedures you will execute in the event you encounter inadvertent instrument meteorological conditions (IIMC). Don't wait until you suddenly find yourself in the clouds to discuss IIMC recovery procedures.

What will you do when you unexpectedly experience an engine failure with a sling load or execute an approach in known brownout or whiteout conditions? It is critical that everyone understands their responsibilities once the dust or snow cloud engulfs the aircraft. When will you execute a go-around? Be sure to discuss how you expect your fellow crewmembers to communicate during an actual emergency. Don't wait until the actual emergency—it might be too late!

Passengers are critical to your emergency procedures as well. Don't forget to brief your passengers on the use of emergency equipment such as fire extinguishers or how to use survival equipment.

The moral of this story is simple. You must instinctively know your emergency procedures and understand the rationale behind the underlined steps, as well as the details of NOTES, CAUTIONS, and WARNINGS associated with emergency procedures.

During an actual emergency, you might not have time for the checklist. Only *you* can know your emergency procedures. Do you study them only when you have a check ride? Have you really committed them to memory? Commanders should make sure their unit standardization program includes an effective no-notice evaluation. Make use of the simulator and always include emergency procedures during all simulator scenarios. A simulator is the only place you can press the PAUSE button and rehearse the emergency procedure over and over. A real emergency doesn't allow such a luxury. Remember—know your emergency procedures BEFORE you need them! ♦

Fly Safe!

—LTC Mike Cumbie, Aviation Systems and Accident Investigation Division, DSN 558-9858, (334-255-9858), e-mail robert.cumbie@us.army.mil

After the Crash

Karen Fleming-Michael
U.S. Army Medical Research and Materiel Command

After an Army helicopter crashes, safety investigators meticulously search to find the chain of events that caused the accident. But when an accident involves an aircraft's life support equipment, another lesser-known team springs into action as well. Seats, seatbelts, helmets, survival vests—these are just a few of the items the Aviation Life Support Equipment Retrieval Program (ALSERP) team from the U.S. Army Aeromedical Research Laboratory (USAARL) examines after crashes.

When an investigation team from the U.S. Army Safety Center (USASC) is deployed to an accident site, investigators look for ALSE-related issues in an attempt to paint the entire picture of the accident. If something with the ALSE doesn't look right or is suspect during the course of the investigation, that component is shipped to the ALSERP team. On occasion, an ALSERP team will deploy to the accident site to inspect the equipment as well. On average, USASC investigators send ALSE to the ALSERP team in about 25 percent of accidents.

ALSERP investigators look at a wide variety of ALSE gear, including individual protective equipment such as flight helmets, to determine why a particular injury occurred (e.g., head blows to a helmet). They also examine pieces of the aircraft to see if they responded as they were designed in a crash sequence. The ALSERP team's findings are then included in the final report that is catalogued at the USASC.

In existence for more than 30 years, ALSERP's mission is simple: to make a very dangerous job safer. When conducting an investigation, ALSERP experts take many different factors into consideration. Take, for instance, aircraft paint schemes. All aircraft are configured differently, and paint schemes reflect whether it is a night vision compatible cockpit or cabin or a basic trainer. If a helmet has yellow and black paint on it, then the experts can conclude the pilot hit the doorframe of a certain aircraft. But if he spots yellow paint only, either the pilot went up or the top of the cabin came down, because that's where the yellow knob for the fuel cutoff is located.

One of the things USASC investigators try to determine is how the accident sequence unfolded and what G forces were involved in the impact. The ALSERP team members provide that link. Based on what they see in the ALSE, certain determinations can be made and, sometimes, conclusions already drawn can be confirmed. Using the helmet example, if it appears there was an apparent blow to one of the helmets, ALSERP's information might confirm autopsy results.

When they do find a problem, the ALSERP team tries to initiate a fix before one more injury is incurred or life is lost. Their philosophy is that something can always be learned from a crash. If they see the start of a trend, then they chase it.

Take, for instance, the new Infantry cloth-sided boot that recently entered the supply system. The Army had experienced survivable accidents where the aircrew had to run through up to an estimated 6 inches of fuel in jungle boots. When the crewmembers lifted their feet, the separation between the foot and the boot's sole created suction and essentially pulled the fuel to the bottom of the boot. Upon

stepping down, the fuel would gush out and turn the crewmembers into "human wicks." The ALSERP team recognized this and, thanks to their championing of rigorous protection requirements, the new and safer boot has been approved for use.

ALSERP traces its roots to the Vietnam War, when Army Aviation medicine identified fire as the number one cause of death in helicopter crashes. Data analysis conducted at the USASC's predecessor, the U.S. Army Board of Aviation Accident Research (USABAAR), identified that rigid fuel systems caused helicopters to ignite during crashes. In response, the Army revamped the fuel system to be more crashworthy and ballistically resistant. The self-sealing fuel tanks and lines found on today's helicopters can take a 20mm round and not significantly spill fuel. Tanks containing flammable fluids also are designed to break away from the aircraft and automatically seal, so there is no significant spill.

After fixing the fuel tank issue, the ALSERP team set out to remedy any problem that worked its way to the top of the list as a primary cause of significant trauma or death in crashes. Research showed that older helicopters—UH-1s, AH-1s, CH-47s, OH-58s, and OH-6s—impacted the ground at a rate of 28 to 32 feet per second. In these accidents, the aircrew inevitably died from massive internal injuries. Working with industry partners, ALSERP experts developed seats with load attenuators (built-in shock absorbers) to prevent both death and spine trauma. Today's UH-60 is designed to afford survivable protection at a 48 feet-per-second impact velocity.

Helmets, too, have been a program focus. The ALSERP team created crushable ear cups for helmets to prevent the skull fractures that resulted from rigid cups not giving when aircrew heads flailed during a crash. Crushable ear cups are now standard in all of Army Aviation, as well as Air Force, Navy, Marine Corps, Coast Guard, and Bureau of Land Management rotary-wing crews. Though protecting the skull through helmet improvements was undertaken to save lives, the changes now allow aircrews to avoid concussive injury as well.

What about that smart-looking survival vest you just picked up from the ALSE shop? It didn't get that way overnight. Improvements in survival vests show ALSERP's handiwork. Vests issued even as little as 20 years ago held all the needed survival equipment,

(Photos by Scott Childress, Graphics Editor, USAARL)

Top Photo: Joe Licina verifies that a NOMEX flight jacket, which burned during a helicopter crash, protected the crewmember who wore it.

Bottom Photo: Joe Licina examines a crewmember seat from a UH-60 that tore during a crash in Hawaii several years ago. Licina works for ALSERP, which examines safety equipment involved in aircraft crashes.

but that was about it. Modern vests not only hold all the necessary survival equipment, but also are sturdy enough and built so a hook can be attached to a crewmember if they need to be lifted out of an accident.

The world scene and face of combat is ever-changing, and the ALSERP team continues to work on survival vest updates. Lessons learned from operations in Grenada, Somalia, and Iraq show aircrews are going down "in the middle of the fight." The need to provide immediate protection from the enemy, which is translated to personal fire power, has become evident. The decision to increase the amount of ammunition in the survival vest has created concern for the ALSERP team, because they need to determine where to place extra bullets so they don't injure the aircrew in a crash.

New equipment also passes under the watchful eye of ALSERP experts. The team rigorously examines every proposed change to aircraft safety equipment to predict possible consequences. When a proposal to install cockpit airbags came about, which seemed logical given airbags' effectiveness in vehicle crashes, the team urged caution. The environment in Army aircraft, however, is vastly different from that in the family minivan. One potential problem is that if an airbag were to deploy in an aviation accident before the pilot's body flails, night vision goggles (NVGs) will stay in place. The NVGs normally break away from the helmet when the human body flails in an accident sequence, but the airbags possibly could force the NVGs into the face without that crucial movement. Whatever protection is designed into new airframes or equipment must be approved with the certainty that a new hazard is not created with its implementation.

Whatever the need, whatever the call, the dedicated professionals of ALSERP and USAARL have answered the challenge. Do your part and have your gear inspected and updated regularly. Your crew and your Army are relying on it! ♦

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Flight Helmet Success Story

A recent accident indicates the need to re-emphasize the importance of aviation life support equipment (ALSE) and the value of ALSE training. While we often hear stories of ALSE failures due to lack of maintenance or other problems, most of the success stories, such as the following, go unnoticed.

The mission was to execute an approach to exfiltrate a ground force from a military operations urban terrain (MOUT) site. While flying a day mission as Chalk Two in a flight of two aircraft, an MH-60L inadvertently struck an obstacle and suffered severe damage. The aircraft went into a series of violent vertical vibrations that ended with the main transmission module being torn from the aircraft. Fortunately, the crewmembers were properly wearing their HGU-56/P helmets, all of which took some impact and protected the crew's heads from serious injury. The PI's and PC's helmets were both badly damaged with the PI's being the worst (see photo). The two crew chief's helmets were undamaged. Luckily, the PC and the two crew chiefs didn't experience any head injuries. The PI suffered a concussion but will be flying again soon. The investigation board and the U.S. Army Aeromedical Research Laboratory (USAARL) believe that the PI would have suffered a permanent head injury, or worse, if he had been wearing any variant of the SPH-4. Chalk up a saved life to the "Darth Vader Helmet." *(Editor's note: The PI's and PC's helmets were forwarded to USAARL for further analysis.)*

PI's helmet, left seat, knocked unconcious

Proper wear, fit, and maintenance required

The HGU-56/P helmet can't protect you unless it's maintained, fitted, and worn correctly. It is imperative that flight crews preflight their helmets and flight gear. No one has more at stake than the person who is counting on his or her flight helmet for protection. Helmets with discrepancies should immediately be taken to the unit ALSE maintainer for correction.

The Army's desire is for you to always have the best helmet available, but to never have an opportunity to prove it. If the worst does happen, your life could depend on your ALSE. It can happen to you! Be prepared every time you fly—careful inspection, fitting, and proper wear of your helmet will maximize protection for the most important and most

PC's helmet, right seat, no head injury

vulnerable part of your body: your head.

Deploying ALSE

Just one more note. The old axiom "train as you fight" applies to the ALSE program. For those deploying overseas, a major lesson learned from Desert Shield/Storm concerned ALSE. If you leave the ALSE program (and the ALSE shop) in garrison when you deploy to the field, your transition to combat will suffer predictable consequences.

Weak ALSE programs can contribute to the severity of injuries incurred during accidents or lessen the chances of survival should your crewmembers be faced with a survival situation. Members of your unit, as well as your commander, expect you to identify and eliminate problems before they result in injury or damage. ♦

—LTC W. Rae McInnis, Aviation Systems and Accident Investigation Division, U.S. Army Safety Center, DSN 558-9851 (334-255-9851), e-mail william.mcinnis@safetycenter.army.mil

Storage of Personnel Distress Flares as Part of ALSE

Bruce Williams
Aviation Branch Safety Office

1. Packaged flares should be stored in the unit arms room or other approved locations.

■ The approved location must meet the explosives safety requirements of Department of Army (DA) Pamphlet (PAM) 385-64 and security requirements of Army Regulation (AR) 190-11.

■ The storage location does not require an explosives safety site plan; however, it does require an explosives storage license IAW DA PAM 385-64, Chapter 9.

■ Flares can only be stored with other compatible ammunition and explosives (AE) as identified by DA PAM 385-64, Table 4-3.

■ A fire extinguisher (minimum of 1 each) should be immediately available in case of fire.

■ Other hazardous materials must not be stored together with the flares or any other AE.

■ Packaged flares need to be secured and access-controlled to prevent unauthorized access in accordance with (IAW) AR 190-11.

■ Packaged flares need to be accounted for IAW AR 710-2 and DA PAM 710-2-1.

2. Flares located in survival vests.

■ Vest should be secured IAW AR 190-11, TM 55-1680-317-23&P and/or other applicable accountability regulations and local policies.

■ Maintain accountability IAW DA PAM 710-2-1 and/or other applicable accountability regulations and local policies.

■ A fire extinguisher (minimum of 1 each) should be immediately available in case of fire.

■ Other hazardous materials should not be stored together with, or near, the vests containing flares or any other AE.

3. References:

■ AR 95-1
■ AR 190-11
■ AR 385-64
■ AR 385-95
■ DA PAM 385-64
■ DA PAM 710-2-1
■ TM 55-1680-317-23&P
■ FM 1-302
■ FM 1-508 ♦

—Bruce Williams, Aviation Branch Safety Office, Fort Rucker, AL, DSN 558-1950/3000 (334-255-1950/3000)

WAR Stories

Risk management lessons learned

All Things Considered

CW2 Derek S. Goodrich
ASOC 03-003

The mission, cross-country flight in Pakistan, was now becoming routine. Our flight of four CH-47s was to depart under night vision goggles (NVGs) and take supplies to Kandahar, Afghanistan. Crew selection is always an important part of pre-mission planning, and I was paired with a senior aviator that had just been signed off as an NVG pilot in command (PC). The decision was made that our aircraft would be lead because we both were NVG PCs.

Our flight departed just after sunset and headed north toward Afghanistan. We always flew at altitude while in Pakistan to avoid small-arms fire, but when we crossed the Afghanistan border we descended to terrain flight altitude. Once inside Afghanistan, the weather began to deteriorate and visibility steadily decreased due to blowing sand. The zero-illumination conditions and blowing sand made artificial lighting useless, and actually became a hindrance.

Despite the conditions, we picked our way through the sand dunes to Kandahar. After landing, I went to talk with the other crews about the return trip. After having a conversation with a friend who suggested that we make the flight at 500 feet above ground level (AGL), I returned to tell the other pilots the change in plans.

During our run-up procedures, the briefed PC decided that it would be too risky to fly at an altitude of 500 feet in Afghanistan. Instead of arguing, I decided that we had made it in and we would make it back out the same way. I briefed the rest of the flight on the most current change. We departed Kandahar with no problems for the return trip.

We had been flying for about 15 minutes

at 125 feet AGL when it became impossible to see the desert floor in the zero illumination and blowing sand. I was on the controls, and the other pilot was calling out altitude using the radar altimeter. I looked at the radar altimeter and saw that our altitude had dropped to 100 feet. I put in a small amount of power to start a climb and noticed the radar altimeter read 80 feet. The next thing I saw was the radar altimeter at 8 feet.

At this point a crewmember began yelling that he had terrain out the cabin door. I immediately applied maximum power and aft cyclic, but there was a huge impact much like a car accident. The rotors lit up as the sand flew in the air from the impact. We both struggled to maintain control of the aircraft after striking the ground. No one saw it coming and we weren't sure if it was over, but within seconds I regained control of the aircraft and returned to level flight.

Just as we returned to level flight, a call came over the intercom from our crew chief (CE) in the back that the ramp was missing. With our hands full flying the aircraft—to include eight caution capsules and inter-flight communications, among others—losing a ramp didn't seem like much of a problem. Hearing fear in the CE's voice, I tried to calm him down by telling him not to worry about the ramp. However, I was not expecting his next transmission: "Clay was on the ramp." Clay was our flight engineer (FE), and I knew there was no way he could survive what had just happened.

A decision had to be made quickly, as hard as it was; we now had the task of saving the remaining five lives on board the aircraft. We made a radio call to the rest of the flight to inform them that we had impacted the ground and during the impact, we had lost our FE. The other aircraft volunteered to remain in the impact area to search for Clay. The weather continued to deteriorate and, while conducting a brief search, two more aircraft in the flight almost slammed into the ground.

We decided to make our way back to Kandahar and while en route, a damage assessment was made: All four landing gear were ripped off, as was the ramp; both main fuel tanks were cracked; and the aircraft structure was bent in two places. We also had multiple fuel leaks and no utility hydraulic system.

Thankfully, there was good news. On our way back, the CE began yelling that we still had Clay. What? The CE spotted him hanging in his harness underneath the aircraft. He had done what was briefed and had hooked his tail to the aircraft floor, not the ramp. The remaining three people in the back tried to pull Clay back into the aircraft, but were unable to get him in. I knew that with the blowing sand, we never would be able to get him if we put him down.

We made an emergency call to tower, explained our position, and told them to have an ambulance waiting for us at the end of the

runway. As we approached the runway we had to be extremely careful—we couldn't land because we didn't have any gear, and we didn't want to cause any additional injuries to Clay. We lowered him to the runway, and the CE cut Clay's restraint.

After Clay was rescued, we hovered down the runway and were instructed to hover until a landing pad could be constructed. Ground support personnel and fellow pilots built a landing pad out of Air Force pallets. I was able to get the aircraft on the pallets and shut it down without further incident. As it turned out, we'd hit a 150-foot wall of sand on the back side of a river valley. We didn't descend; rather, the ground came up and we never saw it.

Lessons learned

When I think back on that night, there were many things we could have done to have helped us avoid this situation. I want people to learn from what we went through because no one died. This was not a training mission, so I wanted to make sure this mission was accomplished, and so did the rest of the crew.

This incident could have ended tragically, and I would venture to say we were about 4 feet from that ending. Zero-illumination operations are what we train to fly in and learn to love due to the concealment that darkness provides. But when flying over very low-contrast terrain, combined with blowing dust and sand, special considerations must be taken, including possible adjustments to altitude and airspeed. When I left Afghanistan, no NVG flights were allowed if illumination was below 23 percent. I'm not sure this restriction is the answer, but it has helped.

We all, as Army aviators, want to complete our missions successfully and safely. We must do whatever it takes to complete the mission, but don't let things stack up against you to the point that an accident happens. Remember that the mission can be changed without canceling it. If you have the luxury of flying with a crew in the back of the aircraft, LISTEN to them. Without the quick thinking and decision-making abilities of our crew, we would have lost a life in our accident.

The final point I would like to mention is that Clay hooked his tail to the aircraft floor and not to the ramp, just the way he had been taught. If he would have done otherwise, well, I don't want to think about that. All things considered, we were very lucky. I hope my experience will help others recognize when conditions warrant a change of mission. ♦

—CW2 Derek S. Goodrich wrote this article while attending the Aviation Safety Officer Course, ASOC 03-003, U.S. Army Aviation Center, Fort Rucker, AL. CW2 Goodrich is a CH-47 pilot stationed in Korea. He may be contacted by e-mailing derek.s.goodrich@us.army.mil.

Learned a lesson lately?

We don't have to learn our lessons the hard way—through accidents. We can also learn from close calls, near misses, and minor mistakes—both our own and those of others. This column is an opportunity for us to share experiences with each other. They can be long or short, recent or from the past.

Share your lessons learned with all of Army Aviation by sending your "War Story" to *Flightfax*:

- U.S. Army Safety Center, ATTN: *Flightfax*, Bldg. 4905, 5th Ave., Fort Rucker, AL 36362-5363
- **Flightfax@safetycenter.army.mil**
- Fax DSN 558-3003 (334-255-3003), ATTN: *Flightfax*

NCO CORNER

MSG Shane Curtis
U.S. Army Safety Center

A Push in the Night

The mission for our CH-47 aircraft started out as a combat support night vision goggle (NVG) flight into Iraq during the first Gulf War. The aircraft tail number and crew were selected and, at the last minute, a crewmember change was made. I was assigned as flight engineer (FE), and for whatever reason, my regular crew chief, Tom, didn't make this flight with me. Tom and I had worked together for the past year. We knew each other's every move, and we knew our duties as a crew.

On this particular night the pilots performed their pre-flight inspection, checked the logbook over, and briefed us on what we were doing and where we were going. The mission went well until the flying part was over and we returned around 0130. As the blades coasted to a stop, I was ready to jump upstairs and start the post-flight inspection. The new CE wasn't thinking along the same lines. He was ready to start putting on the blade ropes and was looking forward to tying down the aircraft. As soon as I got up on top of the aircraft, he rotated the blades. He didn't announce the blade rotations, because he thought the reason I went up top was to put the blade ropes on.

At the very last second, I heard the sound of the drive shafts turning. It was dark outside and I knew if the drive shafts were turning, the blades had to be turning. The fact that I couldn't see anything scared me. In a split second, it was like something from the dark reached out and pushed me. I didn't have time to grab onto anything to break my fall, but it wouldn't have mattered anyway—there was nothing to grab.

I remember having two hits on the way down: First, slamming into the top of the right-side forward auxiliary fuel tank, and then the ground. I landed flat on my backside, still holding a flashlight in my hand. I guess I made some noise during my fall (I can remember saying a few choice words on the way down), and hitting the top of the fuel cell made a good thumping noise too. People came from everywhere once I was on the ground, and it didn't take long to get me to the medic station.

Our battalion flight surgeon was on-site in less than 20 minutes. He quickly discovered that I had broken my tailbone during the fall. He said, "I know it hurts, Sarge. Don't try to move, much less walk. I would give you something for the pain, but I can't." He explained there was no pain medication I could take and still perform my flying duties. In effect, I'd be grounded. The unit still had missions to fly, and we were already short on crewmembers because of increased personnel requirements. Our missions required three crewmembers in the back of the aircraft; a normal crew required only two.

Lessons learned

The new CE and I thought we had done everything right that night, but what we didn't do was discuss what actions to take post-flight. Being used to my regular CE, I failed to ensure the new CE for this flight knew what I was doing. What happened? Crew coordination broke down. Everyone in the crew must understand his or her duties and responsibilities in the order that they should be performed. We must talk! We must ensure that each crewmember is actively involved in the mission planning process and understands mission intent, as well as operational sequence.

I hope my experience with crew coordination, or should I say, lack of crew coordination, will be a wake-up call to everyone in Army Aviation. We shouldn't *assume* actions the other crewmembers will make, as well as they shouldn't assume actions we're going to make. Crew coordination is a must for soldiers to be able to complete their jobs and do so in the safest manner possible. ♦

—MSG Shane Curtis is an Aviation Systems Safety Manager for the CH-47 at the U.S. Army Safety Center.
He can be reached at DSN 558-9859 (334-255-9859), e-mail: shane.curtis@safetycenter.army.mil

ALSS Update

The following information is an update for the Aviation Life Support Systems (ALSS) from the Naval Air Technical Data and Engineering Service Command (NATEC).

■ **Crew chief hardware connection**: Called the Pear Quick Link, this hardware is used to interface the current crew chief tether to the AIRSAVE vest. Purchase from Wichard, Inc., 47 High Point Ave., Portsmouth, RI 02871; 401-683-5055, FAX 401-683-5077, **www.wichard-usa.com**, click "Climb Safety & Rescue," then click Mallon Rapide, Pear series P. Part #P070SS, $5.10 each.

■ **Crew chief tether assembly**: An NSN is being assigned for the crew chief tether as part of the AIRSAVE system. Defense Supply Center, Philadelphia, PA; DSCP expects NSN by Sep 03.

■ **Safety restraint tether (SRT)**: Climb High, 135 Northside Dr., Shelburne, VT 05482. Provide: (1) the item number, (2) quantity, (3) shipping address, (4) credit card number for billing, and (5) contact phone or e-mail information. SRT Item #SS1DR, price is $2.60 each. Orders can be e-mailed to Hannah@climbhigh.com with a copy sent to info@climbhigh.com. For more information contact Hannah Davidson, Climb High, Inc., 802-985-5056 or FAX 802-985-9141.

■ **Carabiner**: Seattle Manufacturing Corp., 6930 Salashan Parkway, Ferndale, WA 98248; 800-426-6251 or 360-366-5534, FAX 360-366-5723, **www.smcgear.net**, click "aluminum carabiners," part #17002, cost $9.30 each; purchase 50 or more and the cost is $6.25 each. Item will have an NSN assigned in Sep 03.

Hardware for harness quick release

Installation of leg strap quick-release fittings are at the option of the assigned aircrew and will be performed at the organizational maintenance level.

MATERIALS REQUIRED

Quantity	Description	Reference Number
2	Ejector Snap	68D37721-3
2	V-ring	59C381
As Required	Sealing Compound	F-900 Torque Seal (color optional)
As Required	Ink, Black, Washproof	TT-AI-542

Note: The ejector snap costs $26.04 and the V-ring $4.67. It can be ordered through the Naval Supply System or direct from Capewell Life Support, 105 Nutmeg Road South, South Windsor, CT 06074; 860-610-0700, ext. 3398, or FAX 860-610-0120, **www.capewell.com**.

Snap and setter information

M370 Snap Setter: $225 each for iron, or $235 each for aluminum. The four part numbers are:

LIFT THE SPOT ITEM

1. PN190000W74B - SK50 HBR POST STD MIL TEFL (BS-10413-3C) BLACK DOT POST

2. PM420000359B - SK 50 HBR STUD MIL LIFT SPO (BS-18303-3C) BLACK DOT STUD

3. PQ910000359B - SK 50 HBR SOCKET MIL LTS (XX-18201-3C) BLACK DOT SOCKET

4. PM99G340906B - 24 HBR CAP EYE 359/359 (XE-18103-3C) BLACK DOT CAP

OMNIDIRECTIONAL SNAPS

1. POST SAME AS ABOVE

2. PX240000359B SK50 HBR SOCKET MIL STD TE (XX-10224-3C) BLACK DOT SOCKET

3. PK870000359B SK50 STUD ROLL MIL (BS-10370-3C) BLACK DOT STUD

4. PJ460000906B - 24SK50 CAP EYE MILL (X2-10127-3B) BLACK DOT CAP ♦

—POC: Shane Bearly, General Manager, Index Fasteners, Inc., Ontario, CA, 909-923-5002, FAX 909-923-5322, www.indexfasteners.com

Editor's note: The above information was provided by Erich AmRhein, U.S. Army Natick RDT&E Center, Natick, MA, DSN 256-5450 (508-233-5450), erich.amrhein@us.army.mil. For more info, log on to the Air Warrior Web site, ***https://airwarrior.redstone.army.mil.***

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

D Model

■ **Class A:** During a maintenance test flight, the intermediate gearbox temperature warning came on in the cockpit. The gearbox failed while at an out of ground effect (OGE) hover. The aircraft crashed in an upright position and was destroyed. Both pilots received serious injuries. Investigation is ongoing.

■ **Class C:** While on a down-wind approach, the aircrew reported a 10-second aircraft vibration, followed by a hot metal odor and "APU FIRE" audio warning. The aircraft was landed without further incident, and the post-flight inspection revealed an APU clutch failure. The APU clutch, fuel pump, drive shaft, and anti-flail device were damaged in the incident, with possible structural damage to the catwalk area.

■ **Class C:** Contract crewmembers were conducting an engineering test flight to complete the AH-64D Lot 7 software baseline verification test (SBVT) software regression test. While at a hover, the APU FIRE light illuminated, and the aircrew smelled smoke and felt a vibration. The crew then executed a precautionary landing. Inspection revealed the APU power takeoff (PTO) clutch had failed and the #7 drive shaft had sheared. The aircraft was ground transported to the factory and secured for investigation.

CH-47

D Model

■ **Class E:** During four-wheel taxi, the power steering master CAUTION light illuminated. The aircraft was lifted to a hover, and the swivel switch was cycled in an attempt to lock the swivel. After several attempts the swivel lock still would not engage, and the aircraft was landed and shut down without further incident. The power steering actuator was replaced.

MH-6

J Model

■ **Class D:** While at flight idle, the pilot attempted to toss a water bottle to the crew chief. The bottle flew in the air and hit one main rotor blade. The aircraft was shut down, and an inspection of the blades was performed. Maintenance determined one rotor blade was unserviceable and replaced it. The aircraft was returned to service without further action.

M Model

■ **Class E:** During manual full authority digital electronic control (FADEC) operations training, the rated student pilot experienced trouble modulating the throttle smoothly and allowed the power turbine speed (N_2) to climb above limits. The instructor pilot (IP) attempted to press the FADEC control reset but could not avoid the overspeed. The exceedance was 109.6 percent for 2.5 seconds. The aircraft landed without incident and returned to service after maintenance inspection.

OH-58

A Model

■ **Class C:** The aircraft was parked on a ramp when another aircraft hovered by and blew a door off of the parked aircraft.

DR Model

■ **Class B:** Aircraft impacted a tree and other vegetation during a local orientation flight, resulting in a hard landing. No other details were provided.

■ **Class C:** Aircraft sustained a 122-percent mast torque reading for 30 seconds during a landing sequence with a left-quartering tailwind. The transmission, mast, tail rotor driveshaft, and gearbox required replacement.

UH-60

L Model

■ **Class D:** One blade tip cap contacted a tree branch during nap-of-the-earth (NOE) flight during a situational training exercise (STX). The pilot flew the aircraft to the pickup zone (PZ) and declared a precautionary landing. During the post-flight inspection, a 4- to 5-inch hole was found on the top leading edge of one blade tip cap. In addition, a small ¼-inch dent was discovered in a second blade tip cap. One tip cap was replaced, and the second was repaired. The inspections were completed with no additional damage found, and the aircraft was returned to fully mission capable (FMC) status.

A Model

■ **Class A:** While conducting night vision goggle terrain flight, the aircraft descended to a sandbar to conduct hoist training when the aircraft struck two cables suspended across the river. After contacting the cables, the aircraft descended aft and impacted the stabilator in the riverbed. The aircraft subsequently rolled left and settled on its left side in the river. No personnel were injured in the accident.

■ **Class E** (FOD): During #2 engine start, the auxiliary power unit (APU) failed. The #1 engine was shut down. It was discovered that a K-dry paper towel was covering the APU inlet screen.

Editor's note: **Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Iraqi Freedom. We will publish those details in future Flightfax articles.**

Don't Whine About Chapter Nine!!!

The AH-64 crew performed the appropriate emergency procedures, landed safely, and egressed the aircraft just prior to it being consumed by fire. See *"Know Your Equipment"* article from July 2002 *Flightfax*.

While flying over water, an OH-58D crew experienced a loss of tail rotor components. They executed the emergency procedure and completed what witnesses called a "perfect autorotation." The crew then swam out of the aircraft and were rescued.

Instructor pilots always say Chapters 5 and 9 are non-negotiable. The crews of these aircraft are glad they are. Proper diagnosis of emergencies and execution of the right procedures saved these crews from injury or death!

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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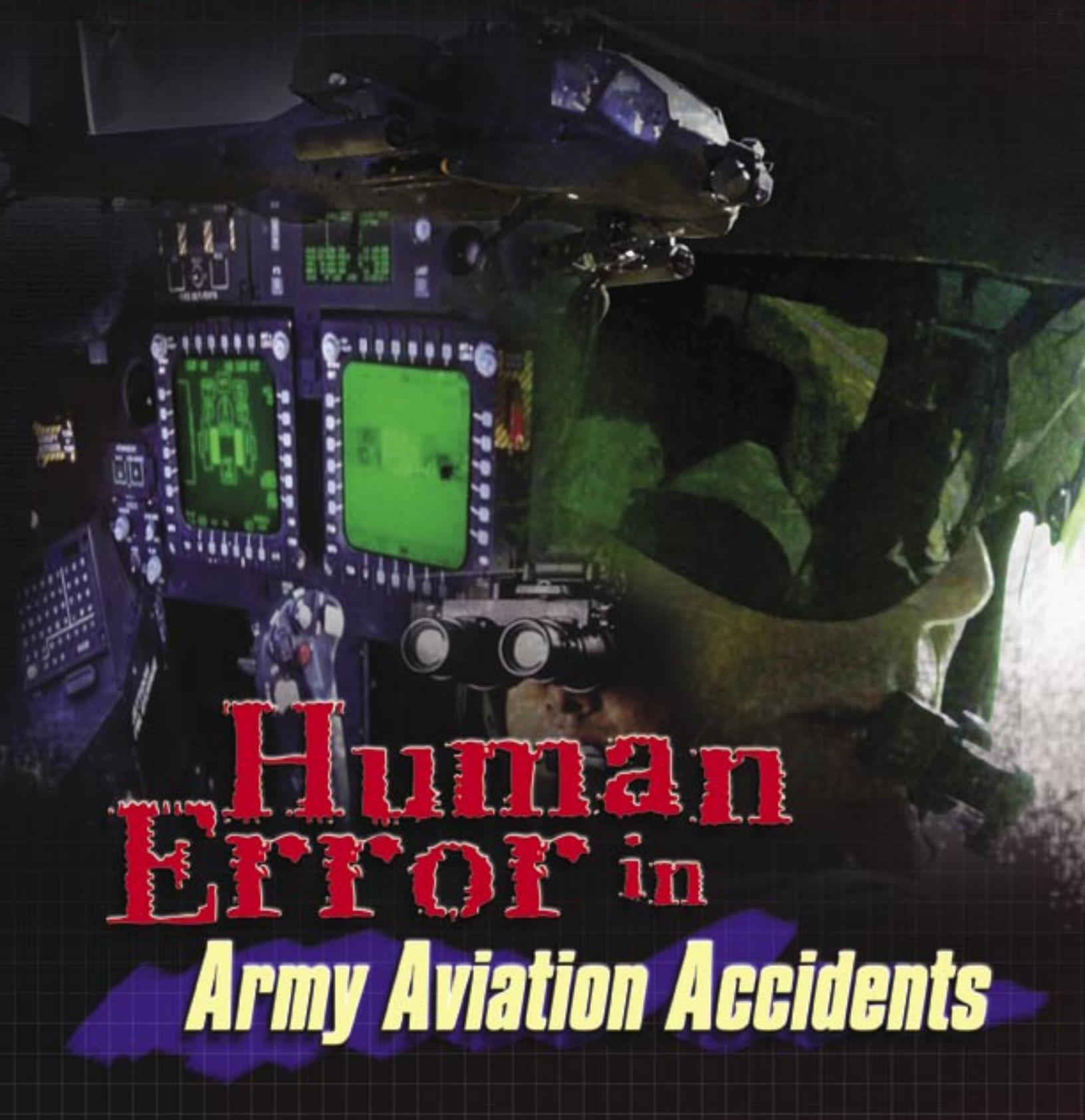

Human Error in Army Aviation Accidents

Flightfax

ARMY AVIATION RISK MANAGEMENT INFORMATION

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U.S. ARMY SAFETY CENTER

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JOSEPH A. SMITH
Brigadier General, U.S. Army
Commanding

DASAF's Corner

FROM THE DIRECTOR OF ARMY SAFETY

Safe Aviation Operations— It's a Team Sport!

Over the past 30 years, the Army has made great strides in reducing aviation accidents. The green line on the "Historical Aviation Trends" chart clearly shows the downward trend. Initiatives such as crew coordination, flight data recorders, accident investigations, and command emphasis collectively have made a difference.

We have seen a dramatic upward trend in the number of aviation-related accidents and fatalities in the last 3 years. Deployments, OPTEMPO, and flying in adverse environments blend together into a tough challenge, but it is one we can and must overcome. It's time to take a new look at our culture and accident profile to reverse course before we lose more soldiers to aviation accidents.

Looking Back

Before I joined the Safety Center team I would have said, without hesitation, that the aviator most likely to have a preventable accident would be the overconfident, 1,000-hour aviator or the young, 500-hour pilot in command (PC), with crew coordination as a root cause. I was shocked to find the profile in the adjacent chart: our instructor pilots (IPs) are having approximately 40 percent of the accidents. Further, statistics show they are not having accidents on collective missions, but rather during individual crew training. Approximately 50 percent of our accidents occur at night or during single-ship operations. No, they are not inexperienced pilots. As you can see in the profile on the next page, the average hour level for an IP involved in a Class A accident is more than 2,800 total hours. As I look at the aviation accidents from Operation Iraqi Freedom,

FY03 Class A Aviation Trends

Events *

Brown/white out	11 (39.3%)
Collision w/Ground	5 (17.9%)
Tree/Wire Strike	3 (10.7%)
Materiel failure	4 (14.3%)
IIMC	2 (7.1%)
Mesh Rotor Blades	1 (3.6%)
Mid Air Collision	1 (3.6%)
Collision w/Grnd object	1 (3.6%)

Profile */**

Night	**56.0%**
IP	**39.1%**
Single ship	**43.5%**
IP (total/type)	2814/1466
PC (total/type)	1457/900
PI (total/type)	715/338

Causes */**

Individual failure	20 (90.9%)
- Crew coordination	12 (54.5%)
- Overconfidence	12 (54.5%)
- Indiscipline	4 (18.2%)
Environment	13 (59.1%)
Support failure	4 (18.2%)
Leader failure	8 (36.4%)
Training failure	4 (18.2%)
Risk Management	2 (9.1%)
Standards	3 (13.6%
Unknown	1 (4.5%)

Type (YTD)

(ClassA/Fatal)	FY03	FY02
AH-64	9/3	8/4
MH/CH-47	5/0	5/8
OH-58D	3/0	5/2
MH/UH-60	11/28	5/2
Fixed-wing	1/2	1/1

* Three Accidents still under investigation
** Non-material failures
As of 21 Oct 03

FY03 Class A Aviation Trends OIF AOR

Events **

Brownout	**9 (75%)**
Collision w/Ground	1 (8.3%)
Wire Strike	1 (8.3%)
Materiel Failure	1 (8.3%)

Profile *

Night	**58.3%**
IP	**25%**
Single ship	**41.7%**
IP (total/type)	1271/unknown
PC (total/type)	1166/993
PI (total/type)	602/431

Causes *

Individual failure	8 (88.9%)
- Crew coordination	6 (66.7%)
- Overconfidence	3 (33.3%)
Environment	**8 (88.9%)**
Support failure	2 (22.2%)
Leader failure	4 (44.4%)
Training failure	3 (33.3%)
Standards	2 (22.2%)
Risk Management	1 (11.1%)

Type

(ClassA/Fatal)	
AH-64	5/0
MH/CH-47	1/0
OH-58D	2/0
MH/UH-60	5/8

* Three accidents still under investigation/Non-material failures
As of 21 Oct 03

one other statistic hits me square in the face: 75 percent of our accidents in theater are caused by brownout. Brownout is an obvious hazard in the desert, so why aren't our IPs adequately training crews to operate in this environment? The answer is simple. It's not just an IP problem—it's an Army Aviation problem, and it's time for a cultural change.

Looking Ahead

To conduct proper risk mitigation, an organization must have three levels of experienced leadership involved in the process, a state the Safety Center calls "3-Deep Risk Management." Recently, we have accepted a process that is "1 deep." Centralized accident investigations show over and over again that our IPs are doing most of the risk management at company level. We load up our IPs' rucksacks with the challenge of advanced aircraft and an exorbitant number of young pilots to train. Then we surround them with technically inexperienced leadership and say, "This is all about combat readiness—make it happen!"

One quick example illustrates my point. While in Iraq, I visited an aviation unit that recently fought in An Najaf and Karbala. The standardization instructor pilot (SP) looked worn and tired. After asking some questions, I found the aviation safety officer (ASO) had 700 hours, but was not a PC. When I asked him how he did his job, he said, "I just ask the SP every day and he tells me what I need to do." The company commander and platoon leaders were not PCs either, and the maintenance pilots were, of course, focused on keeping the aircraft mission ready. The only aviators involved in mission planning with enough technical expertise to be a PC were the IPs. We are, in effect, asking IPs to do a big part of everybody's job while they are attacking their own difficult task of progressing young pilots in combat. Risk management 3-deep at the company level needs to be the PC and company and battalion leadership. The triangle of commanders, ASOs, and IPs needs to be tight.

Our young aviators need to start carrying their part of the load. Here at Fort Rucker, I speak to all students in the Aviation Safety Officers course. I recently asked, "Of the 30 of you in this class, how many are PCs?" Three answered they were. What's up with that?!? We must change culturally. Safety officers and company commanders must have the technical expertise of a PC to understand which control measures will mitigate risk effectively. We cannot afford to have "sandbag" front-seaters or mid-level warrant officers who are not PCs. We need young aviators who are actively learning and are part of the risk-management process. Many are hungry and ready for the challenge; we must set the conditions for their success. For brigade commanders, this means resourcing collective training with well-maintained aircraft. Flying 3 days in the middle of the week to protect operational readiness rates is not the solution. **Experience only comes from flying**.

Senior leadership can help IPs by providing the required training time and resources to train aviators properly. A perfect example is environmental training. Statistics show that we are falling short of properly preparing pilots to fly in our current operational environments. We must figure out how to make environmental training a key part of long-range training plans. The IPs cannot train aviators safely unless we give them the means to do so. Again, with the current operation tempo, this will be a tremendous challenge. It's not an IP problem—it's a *system* problem.

The risk-management process must be embedded throughout all stages of the planning and training process. When I was a brigade commander, I didn't get it. Many times I would wait until mission execution before letting my boss in on the known hazards. I thought it was my responsibility to figure out how to get the job done and do it safely. I was focused on supporting the ground commanders. The quarterly training brief process, as well as the military decision-making process, moves quickly, but 3-Deep Risk Management is very powerful. Division commanders have tools to mitigate risks that are not part of the brigade commander's tool kit. You just have to tell them early. The goal is not to be risk adverse; rather, it is to accept residual risk after 3-Deep Risk Management.

As an aviation team we can reduce our accidents by reducing the workload and risk we lay on our IPs. Everyone needs to participate. If any of us fails to do our part, we become just another sandbag in the cockpit and another weight for the IP to carry. Every aviator counts, and every leader makes a difference.

Keep your leader lights on!

Joe Smith

COVER STORY

CPT Gina E. Adam, Ph.D.
U.S. Army Aeromedical Research Laboratory

Human Error and Individual Fai in Army Aviation Accidents

"The human is the weakest link." This statement often can be heard when people describe accidents of any sort. Given the complexity of the machinery and computer technology that make up today's aircraft, it is mind-bending to think humans would be the weakest link.

Surely, components will break and computers will fail more than aircrew! On the other hand, could it be that machine parts and computer processes perform consistently, whereas humans are more easily affected by situations, environments, and personal factors? This is a question that plagues the field of human factors.

The Army Aviation environment is ripe for human errors due to factors such as operational tempo and the addition of advanced technology in the cockpit. For example, today's aircraft with multifunction displays (MFDs) often have increased capabilities over their traditional counterparts (e.g., map displays vs. kneeboards and paper maps). This increase in functionality might not only increase the amount of information available to aviators in the cockpit, but also increase the missions and tasks they are responsible for while in flight. The addition of functions and tasks requires pilots to spend more time managing the aircraft as opposed to flying it. Essentially, the more time pilots need to spend inside the cockpit managing the aircraft and flight systems, the less time and attention they have to direct towards keeping the aircraft in flight and away from obstacles. Increased heads-down time in the cockpit can significantly impair pilots' abilities to maintain situational awareness, as well as properly coordinate their actions and that of their crew. The combination of these factors might lead to increased aircraft accidents due to human error.

Within the aviation realm, it is common to hear the statistic that 80 percent of accidents are due to human error. In fact, there are whole divisions of researchers working on these questions, trying to determine the incidence of human error, the best way to classify accidents, and how to catalog human error in these accidents. The main reason to do

this is to better learn from accidents in order to improve risk management and thus reduce the potential for future accidents.

While the Safety Center is the organization primarily responsible for accident investigations and analysis, the information gathered by their investigators is useful for many in the human factors field. Their Risk Management Information System (RMIS) Web site provides information regarding accident rates and statistics, as well as details about accident causes and recommendations. Researchers then use this information to answer some of these human factors questions.

There are several frameworks used by different organizations and researchers to evaluate accidents and their causes. Before getting to the big questions regarding human error in Army Aviation accidents, let's review a few facts about accident data. We all know that aviation accidents can be called flight, flight-related, or ground accidents (depending on their circumstances) and are classified according to their severity (Class A, B, C, D, or E accidents). The accident investigators determine the causes (environment, materiel, or human error) of each accident to answer the question of *what happened*. Investigators also evaluate the system inadequacies or root causes present in each accident in order to determine *why the accident happened*. This further classification allows for a more detailed understanding of factors present in the Army Aviation environment that can hinder safe operations.

The system inadequacies or root causes considered include support, standards, training, leader, and individual failures. Each of these root causes is mapped and detailed in the figure 1 located on the following page. Of course, many accidents have more than one causal factor and multiple root causes can be present. For our current purposes, we are interested in examining human error more closely and also looking specifically at individual failures present in those human error accidents.

One important question in analyzing Army Aviation safety is, "How often is human error a cause of accidents?" By looking at the RMIS database for years that both traditional and MFD-equipped cockpits were flying, we see that human error definitely played a role or was suspected in 42 to 72 percent of accidents (see the table below).

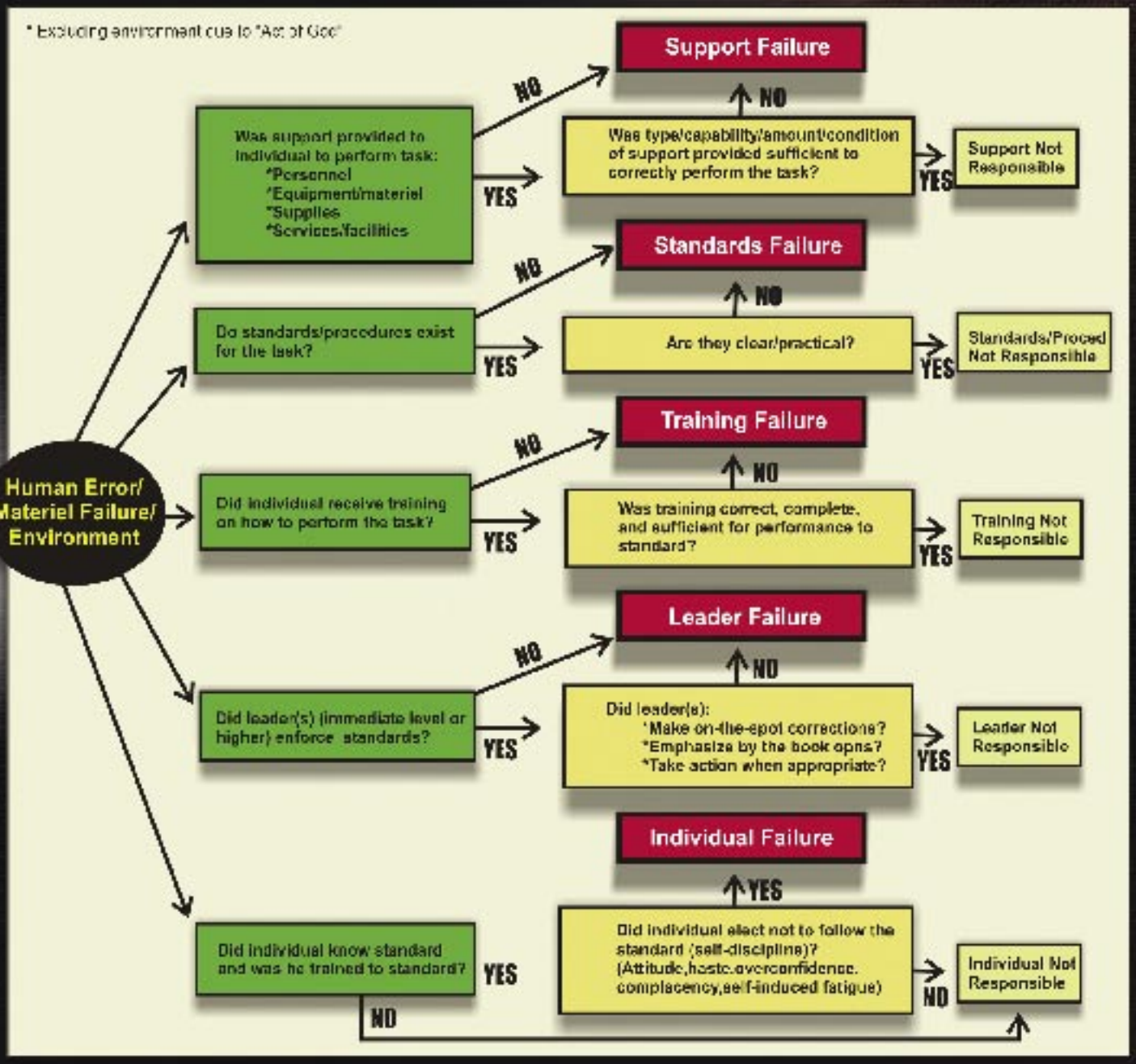
However, acknowledging the presence of human error is merely the first step. A more complete understanding can only be developed when looking at the root causes of these accidents. As described in figure 1 on the next page, there are several root causes, all of which are important. Yet, the individual failure category contains failures that are most typical when thinking about human error. These failures are actions tied directly to the crewmembers. Some errors categorized as individual failures are overconfidence, complacency, crew coordination lapses, crew issues, and distraction due to high workload. While it is not possible in the space allotted here to define every possible individual failure, here are a few descriptions and examples.

Overconfidence and complacency

These two attitudes often are found in similar situations. They are both tied to an individual's confidence in himself, his crew, his aircraft, or his ability to handle situations, and can result in poor decisions while in flight. Pilot confidence is a very good thing; however, in Army Aviation, the saying "You can't have too much of a good thing" is not always the case. A common example of overconfidence is continued flight in decreasing weather, which often leads to problems.

		Chinook		Black Hawk		Kiowa		Apache	
		FY90-02		FY90-02		FY85-02		FY97-02	
		No.	%	No.	%	No.	%	No.	%
	Total	101		267		385		107	
Human Error Present?	Definite	38	38%	159	59%	263	68%	43	40%
	Suspected	4	4%	19	7%	16	4%	8	7%
	Unknown	0	0%	10	4%	6	2%	3	3%
	No	59	58%	79	30%	100	26%	53	50%

FIGURE 1. Determining System Inadequacy(cies)/Root Cause(s) Responsible for Accident Cause Factors (Human Error/Materiel Failure/Environment*)



Crew coordination

Thankfully, much attention and training have been geared toward improving crew coordination. The ability of crewmembers to distribute workload while flying and accomplish their missions is dependent upon their ability to communicate effectively. Unfortunately, there are other crew issues that often are not addressed that can adversely affect a crew's coordination abilities.

Crew issues

The makeup of a pilot crew can be an important factor in crew coordination. How often have you heard of situations where a student pilot said he assumed the instructor pilot (IP) had the controls or knew what he was doing? What about times when there are experience or rank differences in the cockpit? Is it possible that student pilots and junior officers are reluctant to question their copilots' actions, thus hampering crew coordination? In fact,

Figure 2. Percentage of accidents that had a human error cause also had at least one individual failure

Note: Accidents included in this chart are from the same sample as displayed in the table on page 7 due to the author's ongoing research.

accident investigators have found that, oftentimes, a pilot's confidence in his IP or higher-ranking copilot can hamper communication. For example, he might refrain from providing obstacle clearance details because he thinks the other pilot's experience means he doesn't need assistance. However, what the pilots in these situations didn't know (because there had been a breakdown in communication) was that their experienced copilot was involved with other tasks and needed their input.

Distraction due to workload

Workload in aviation operations is often high, especially with the technological advancements of recent years. The susceptibility to distraction while flying is always a great risk and a major contributor to individual failures. The need to maintain attention outside the aircraft is in conflict with the time taken to manage flight tasks with attention inside the aircraft. A brief review of accident findings shows that division of attention is extremely important. For example, in one accident the findings included statements that, "Both crewmembers were focused inside the cockpit…" and "Failure to effectively divide cockpit duties…." Another accident with a completely different flight scenario was found to be the result of "…attention diverted inside the cockpit" and "…both of the crewmembers had focused their attention inside the aircraft…." As you can see, these are very similar findings indicating improper management of workload and cockpit attention is an important and common individual failure.

These individual failure descriptions are examples of how crewmember actions and attitudes can affect human error in Army Aviation accidents. You might be wondering how commonly individual failures actually are identified in the accident database. As it turns out, when looking at the same sample of accidents discussed earlier, we see there are individual failures identified in 84 to 92 percent of accidents classified as having a human error component. Figure 2 shows the percentages for each airframe found in the Army today.

This is not to say that only individual failures are present. These numbers indicate at least one individual failure was identified by either the accident investigators or the author's research team; many of the accidents had a combination of failures, including support, standards, training, and leader failures. For example, of the 42 Chinook accidents in this sample that were due to a definite or suspected human error, 37 (88 percent) had at least one individual failure. The other 5 accidents (12 percent of the 42) had other failures identified, but no individual failures present.

Thus, at least within this sample of human error accidents, individual failures occurred frequently. A more detailed review of all accidents might be of interest to evaluate the prevalence of individual failures across the board. Nonetheless, it is important to remain aware of the importance of workload, crew coordination, and aircrew attitudes such as complacency and overconfidence in order to increase Army Aviation safety. ♦

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Investigators' Forum

Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

Just How Valuable Are Hazard Maps?

MAJ Ron Jackson
U.S. Army Safety Center

With Army Aviation relying more and more on automated systems (e.g., FalconView) to assist in mission planning, can automated systems truly take the place of a good, old-fashioned, 1:50,000 map?

Human error is almost always involved in wire strike mishaps. Rarely does a wire strike occur after an in-flight materiel-related emergency. The following are some examples of the kind of human errors that have resulted in wire-strike accidents this year.

Accident 1

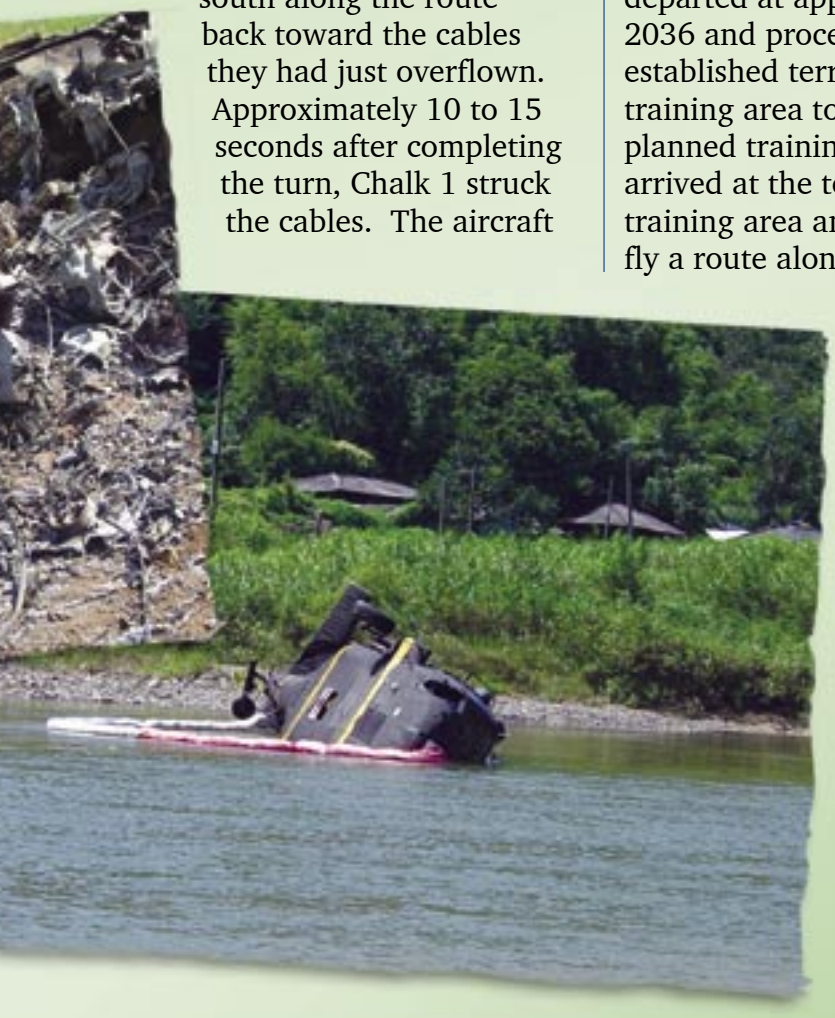
The mission was an ongoing reconnaissance and surveillance (R&S) of 20 named areas of interest (NAI), which was to be conducted over a 9-day period. The unit was tasked to be prepared to increase their day and night R&S patrols to support intelligence collection within the area of operation (AO).

The concept of the operation was for two aircraft to conduct the R&S during the day, followed by two aircraft to complete the same R&S plan at night. The aircrews were required to R&S a northern and southern sector, with one refuel stop between the sectors.

The day crew completed their R&S patrol with no issues and debriefed the night crew of a large set of cables located along their route of flight on the northern route. The crew cross-referenced the flight operations hazard map and noted the hazards were indeed plotted; thus, they updated their map accordingly. This particular set of cables was suspended approximately 150 feet above ground level (AGL) and was difficult to see even during the day.

The night crew departed the airfield at 2130L. The first leg of the mission covered the first 12 NAIs in the southern AO. After approximately 2.6 hours, the crew returned for refuel without incident. After refuel, the flight departed to survey the remaining eight NAIs in the northern AO. After completing the R&S of their sixth NAI, the flight proceeded north along the route, which required them

to overfly the large cables that were discussed after the day mission. The flight proceeded over the cables, completed their R&S, and departed the NAI executing an airspeed over-altitude takeoff. They then turned left 180 degrees around a hilltop and proceeded south along the route back toward the cables they had just overflown. Approximately 10 to 15 seconds after completing the turn, Chalk 1 struck the cables. The aircraft was destroyed, and both crewmembers were killed.



Accident 2

The purpose of the mission was to conduct aircrew continuation training using night vision goggles (NVGs) and non-rated crewmember NVG readiness level (RL) progression training.

As part of the requirements to conduct NVG terrain flight training, the accident crew coordinated with a previous aircrew to conduct a day route recon of the authorized terrain flight route.

The accident aircraft departed at approximately 2036 and proceeded to an established terrain flight training area to conduct the planned training. The aircraft arrived at the terrain flight training area and began to fly a route along a roadway. However, due to excessive lights, the crew elected to start a second terrain flight route through an adjacent valley. The crew decided they didn't like the second route and chose instead to fly a third route, which was along a river. After crossing over a high set of cables, the crew selected a sandbar from which to conduct hoist operations.

At an altitude of 40 feet AGL and 40 knots and just prior to the sandbar, the crew chief saw a reflection of two cables crossing the river and immediately shouted, "Climb! Climb! Climb!" However, it was too late; the main rotors came into contact with the cables. Subsequent control inputs resulted in the aircraft traveling backwards and descending until the stabilator struck the riverbed. The aircraft continued down until settling in the river on its left side. The aircraft was damaged severely, and the crew suffered minor injuries.

Accident 3

The mission was to conduct a medical evacuation (MEDEVAC) of an "urgent-surgical" patient. As part of standing operating procedures (SOPs) for MEDEVAC operations, two MEDEVAC aircraft were launched to provide support for the evacuation. As with many MEDEVAC and quick reaction force (QRF)-type missions, the crew did not have access to a hazard map of the area they were to be operating in.

The flight of two aircraft arrived at the scene without incident and proceeded to upload the patient. Flight lead landed in the pickup zone (PZ), while Chalk 2 orbited the PZ at an altitude of approximately 300 feet AGL. While flight lead loaded the patient, Chalk 2 departed its orbital pattern, descended to approximately 50 to 55 feet, and began flying up a river located east of the PZ. Approximately 1 kilometer north of the PZ and out of

sight of flight lead, Chalk 2 struck a cable suspended over the river. The aircraft was destroyed, and the three crewmembers were fatally injured.

Lessons learned

These are three examples of wire strike accidents that are attributable to human error. Other than the commonality of the wire strike, these three accidents provide a contrast and comparison to the importance of maintaining hazard maps when conducting terrain flight operations. Accident 1 depicts an aircrew that had a current hazard map, as well as a briefing on the known obstacle, but chose not to use the map to maintain navigational orientation. Accident 2 illustrates the hazards of not performing terrain mission planning, in particular not updating the hazard map, even though the information was available. And Accident 3 demonstrates the hazards of operating in an area with no hazard map and no control measures to prevent wire strikes.

Wire strike avoidance

Although wire strike avoidance procedures have remained relatively unchanged over the years, their effectiveness is still as valid as they were during their development.

- Always remain oriented on the map. All things being equal, if you are not where you think you are on the map, neither are the wires.
- Update and post hazard maps.
- Conduct thorough terrain flight mission planning when operating at terrain flight altitudes.
- Conduct flight, map, or photographic wire hazard recons to include reviewing the currency of recon products and wire hazard information.
- Establish minimum en route altitudes when operating in unfamiliar environments.
- Always associate wires with manmade features and long linear areas such as fields.
- Reduce airspeeds at lower altitudes.
- Never assume the aircraft in front of you sees the wires.
- If possible, post wire hazard markers.
- Utilize proper scanning techniques for wire hazards in the high and low recon of your intended flight path. ♦

Editor's note: These accidents are currently under investigation.

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Brownout: Reducing the Risk

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Operating in limited-visibility conditions caused by blowing dust can be challenging, risky, and potentially destructive. In this article, one commander shares his unit's success in search for safer brownout operating techniques and provides a sample of their Eight Step Training Model in the hope that others may find his unit's experience and techniques helpful.

After returning home from Operation Iraqi Freedom and quickly changing command, I had the opportunity over the summer to reflect on our 5-month deployment and assess what I thought was our greatest accomplishment as a unit. For the 1-227th, or "First Attack," was it the many successful missions conducted in support of the 11th Attack Helicopter Regiment, 82d Airborne Division, 2d Armored Cavalry Regiment, and the 101st Airborne Division during combat? Those successful missions were very rewarding indeed, but merely the culmination of the expectations required by our senior leadership and the soldiers we lead. No, the real reward was seeing the faces of the families and parents of my soldiers as I brought them home safely. This final task is made all the more challenging in combat since the enemy has a vote.

While we all agree with this, we must never lose sight of the fact that, during war, accidents often cause more fatalities than the enemy. This has proven especially true in Army Aviation since operations began in Iraq almost a year ago.

According to data gathered at the Army Safety Center, a large percentage of the accidents in Iraq were attributed to environmental factors. In Iraq, as one might imagine, the biggest culprit is brownout. I feel extremely fortunate and blessed that First Attack is not a statistic, and I would like to share a couple of ideas that I feel helped us during our training over the past 2½ years to get to this point.

First, let's make the assumption that every unit out there has the same quality junior leaders, NCOs, warrant officers, and commissioned officers First Attack does. Then, let's assume the higher chain of command, like that in the 1st Cavalry Division, is focused on fundamentally sound collective training. The difference, then, is found in how well the unit is able to integrate risk management in their training planning process.

In the September 2003 issue of *Flightfax*, BG Joe Smith, Army Safety Center Commander, discusses in his monthly column that, as a whole, units do a fine job in the early stages of the risk management process—identifying and assessing hazards. It is at these steps, though, where most units stop. They simply fail to cross the chasm and integrate steps three through five into their training plans. LTG Richard Cody, Deputy Chief of Staff, G-3, makes the same assertion later in the article. First Attack crossed this chasm, and in the following paragraphs I will explain how.

Training guidance

As a commander, your annual and quarterly training guidance is a critical step toward developing control measures (step three). The standards and goals established in this document lay the groundwork for the training events your unit will focus on in the near-term. My guidance habitually contained

three important elements: establishing one major event that provides unit direction during the training period; emphasis on collective training; and emphasis on night training.

■ **Establishing one main event**. At the battalion level, your unit is only capable of properly executing one, or possibly two, events in a given period. Any more and its focus is lost, causing distraction and indecisiveness, which in turn leads to accidents. As a commander, you provide this main effort focus, ensuring all training objectives support this training event. This is the initial step in making the first decision and developing the control measures for risk reduction.

■ **Emphasize collective training**. My guidance for collective training events revolves around a class given by LTG(R) Dan Petrosky when he was commander of Fort Rucker. He emphasized the standards required for aviation battalions to conduct battle drills. His requirements included: a set minimum for the number of iterations and number of helicopters per unit involved; use of forward area refueling points (FARPs) and operations forces (OPFOR); battalion command and control (C2) node; observer/controllers (O/Cs); and an after action review (AAR).

Using these guidelines as a template for our training, my standard was for each company to execute one battle drill per month, with the battalion executing two per quarter. This schedule required the unit to plan and resource each event well in advance, thereby highlighting risk and resource shortfalls early so leaders could continue to develop positive control measures. It also set the stage for step five, supervising and evaluating, during training execution.

■ **Emphasize night training**. The final element in training guidance that helped prevent accidents for First Attack is our dedication to night training. I made a commitment to conducting 60 percent of our training at night. While we never reached 60 percent (our annual average was 57), I believe that without that goal we never would have come close.

Let me also point out that I'm not discussing night vision goggle (NVG) training here. First Attack did not use NVGs while I was in command. I know I'm in the minority concerning the use of these devices, but I do not feel our young aviators are ready for that additional burden in the aircraft. We must first teach them to be proficient with the system they have and understand its limitations, as well as their own, so they can make prudent decisions in the cockpit. Without a good base of 200 to 300 hours of night system time (aviator dependent), we are setting our younger aviators up for failure by letting them use NVGs. An aviator proficient in the use of the Apache Forward-Looking Infrared (FLIR) system and the improved symbology of the Longbow significantly reduces his or her risk of brownout.

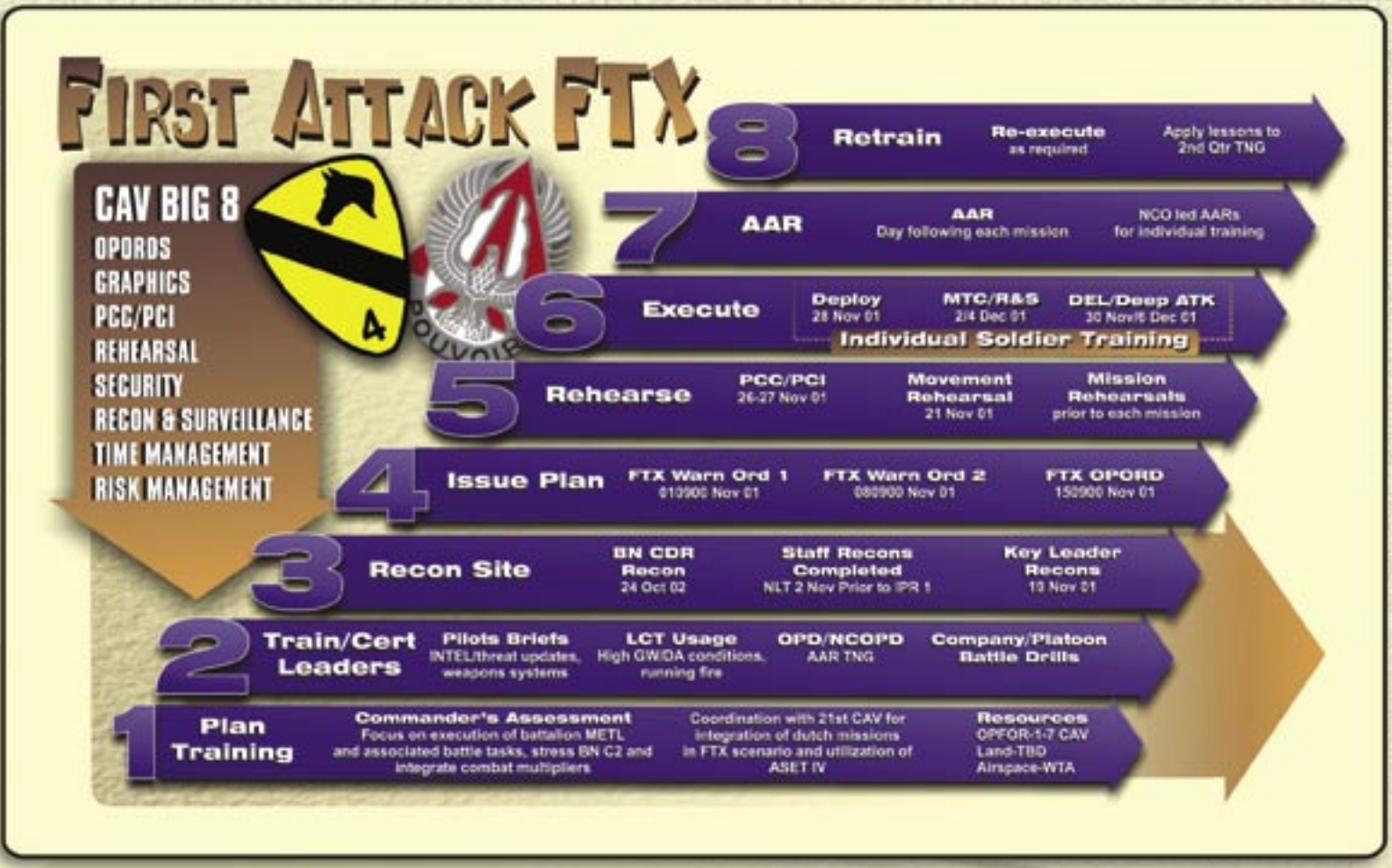
Integrating step four of the risk management process into our training plans can be illustrated best by the chart on the next page.

Proper use of the eight-step training model is the best way I've found for not only completing the training process, but also the risk management process. The example above is representative of the thought process First Attack went through for every major training exercise. Linking this back to commander's guidance, this document provides the single-event focus a battalion needs in order to continue developing controls and begin implementing them. Notice the early involvement by the commander in identifying and assessing hazards during the planning phase, and then the educating of key leaders about the hazards during their certification and leader's recon.

As we move up the training model ladder, the extensive use of simulators and rehearsals is critical to the integration process to help leaders refine those control measures already in place and determine their validity. Finally, the most important part of the training model is the involvement of the chain of command in the AAR process. By default, if the chain of command is responsible for the AAR, then they must be present for mission execution. I'm not just talking about the battalion commander: ALL senior leaders, including the command sergeant major, field grade officers, and senior warrant officers should place themselves at critical points on the training field. (Remember LTG(R) Petrosky's requirements for training, which included a battalion C2 node?)

Completing the eight-step training model also achieves integration with the risk management model. As we retrain, we also re-evaluate the hazards and begin the process again—if not for the current exercise, then for the next major training event.

This article is not meant as a lockstep solution to prevent brownout during aviation operations.



I simply will tell you that it worked for 1-227th. We aggressively flew more than 5,000 hours each year for the past 2½ years, including three National Training Center (NTC) rotations, a Roving Sands exercise, a Joint Task Force (JTF) mission along the Texas border, two major deployments to Fort Bliss for gunnery, and numerous exercises at Fort Hood. Throw combat operations during Operation Iraqi Freedom into the mix and there were plenty of opportunities for brownout accidents, but none occurred. Good pilots, yes; an understanding chain of command who supported quality training, yes; but all units start there. To get to the next level, though, you must fully integrate the risk management process into your training plan.

Hopefully this article demonstrated a way to do this by focusing on commander's training guidance and the eight-step training model. Let me close by saying Army Aviation safety is important and indeed the focus of this article, but ground safety is enhanced with this process as well. Oftentimes the most dangerous place on the training field or the battlefield is the FARP. Everyone understands that if you can't get your maintenance to the battle, you won't be flying long. Using this same focus on commander's guidance and the eight-step training model, First Attack also enjoyed success in ground safety. During all our major training exercises and combat operations (where our FARP assets traveled extensively on unimproved surfaces), we had zero ground accidents in our FARP or on our convoys.

There is no substitute for quality training done to standard that replicates, as closely as possible, the conditions where the chain of command can expect to fight. Focusing training on your commander's guidance and integrating risk management with the eight-step training model ensures this training is done safely, thereby enhancing our chances of bringing our most precious resource—our soldiers—home safely. ♦

—LTC Daniel Ball has completed his command after redeploying First Attack safely back from Operation Iraqi Freedom. He has been selected for War College and is attending a fellowship at the University of Texas this fall.
LTC Ball holds a Masters degree in Aerospace Engineering from Auburn University. He is qualified in the AH-64 Apache Alpha model and Longbow, a distinguished honor graduate of the Air Assault School, and Airborne qualified.

Human Factors in Aviation Maintenance

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Human error is cited as a major cause of aviation mishaps. When it comes to human error, the blame has traditionally been laid on flight crews rather than on maintainers. Although human factors-related maintenance failures are not always evident, the National Transportation Safety Board (NTSB) and the U.S. Army Safety Center (USASC) routinely investigate maintainers' performance.

The human factors that can affect aviation maintenance include: (1) environmental factors; (2) individual human factors; and (3) human-factors training for maintenance personnel. Let's look at these in more detail.

Environmental human factors

The aviation mechanic works in a variety of environments. Maintainers work on aircraft not only in hangars, but also on flightlines in all types of weather at any time of the day or night. In the case of military aviation, mechanics may even have to work in a chemical environment which could drastically affect their performance. Categorized more broadly, these environmental factors can be broken into noise and weather conditions.

■ **Noise.** The noise an aviation mechanic may encounter varies considerably, but is universally loud. It's not unusual for the noise on an airport ramp or apron area to exceed 85dB to 90dB, loud enough to cause hearing damage if exposure is prolonged. Turbine engine, rotor blade, and transmission noise can contribute to distraction, stress, and fatigue. If not closely supervised, a distracted mechanic could be killed or injured, or could severely damage an aircraft.

■ **Weather conditions.** Environmental temperatures vary depending on the time of year and the region of the world and whether the workplace is climate controlled. The physical effects of working in conditions that are too hot or too cold can substantially decrease a mechanic's performance.

When working in extreme temperatures, a mechanic may rush through the task and overlook an important step. Supervisors should do everything possible to provide adequate shelter from inclement weather so that mechanics can work effectively. If this is impossible, mechanics should take breaks to either warm up or cool down. Hangars with climate control are the ideal working environment as long as the doors remain closed.

Individual human factors

The leader or supervisor must be able to differentiate between errors and violations when considering a mechanic's performance. Individual factors such as physical fitness, fatigue, and stressors must be taken into account when considering what might lead a person to make errors or violations. The leader or supervisor should consider these factors seriously before assigning a mechanic to work on a multi-million dollar aircraft.

■ **Physical fitness.** A physically fit mechanic has more energy and tends to be more productive than a deconditioned mechanic who may not be able to do what is required for a particular task. Fitness and health can have a significant effect upon a mechanic's physical and cognitive job performance.

Several conditions can affect health and fitness and diminish a mechanic's ability to perform proper maintenance. These include physical illnesses, mental illnesses, and injuries and can range from a winter cold or flu to a sprained or broken ankle.

■ **Fatigue.** Another factor affecting maintenance errors is fatigue. One can not overemphasize the importance of getting a good night's sleep to do a good job the next day. Unlike their civilian counterparts, military aviation mechanics have many other duties in addition to the task of maintaining an aircraft. It's not unusual for a military mechanic to work a 10-12 hour workday. Habitually long work days can cause confusion and fatigue increasing the chance of human error. To prevent fatigue-related accidents, leaders and supervisors must understand how

fatigue and the body's sleep and wake cycles affect each other.

■ **Stress**. Everyone experiences stress in one form or another. Aviation mechanics are stressed by the demands placed upon them. Problems develop when mechanics are unable to control their reactions to job demands. This is why it's important for supervisors to recognize the symptoms of stress in their employees. Money problems, marriage conflicts, a new baby, or death of a family member can all increase stress and worsen the problem. Although it is impossible to eliminate human error, learning to effectively manage stress can reduce human errors.

Some ways to manage stress include relaxation techniques, counseling, a good sleep and a healthy diet. Making resources available and encouraging mechanics within your organization to learn to cope with stress can decrease human error.

Human factors training

Effective organizations realize that leaders need to understand human factors training so they can recognize the role that good or bad planning has on the performance of maintenance. The vitality of a human factors program depends upon proper planning in hiring qualified, alert individuals, and maintaining tools, equipment, materiel, maintenance data, and facilities. This can be achieved by incorporating organizational safety, qualified trainers, and error management into the human factors training program.

Human factors play a huge role in the quality of maintenance training. Statistics show that 18 percent of all accidents are due to maintenance factors.

■ **Organizational safety.** Human factors play a huge role in the quality of maintenance training. Statistics show that 18 percent of all accidents are due to maintenance factors. To reduce errors and make aviation maintenance more reliable, human factors training and research must be an ongoing effort. The following are steps organizations can take to do this:

- Provide and share knowledge with maintenance personnel.
- Develop skills.
- Positively influence attitude.
- Positively influence behavior.
- Practice daily what is taught and learned.

■ **Trainer.** An effective human factors training program begins with a good trainer thoroughly knowing the subject. Some guidelines to look for when choosing a trainer are formal education on the subject, training to teach the subject, and at least 3 years experience with a maintenance organization. The trainer must be able to motivate people, not just pass on knowledge.

The training program should include initial and sustainment training to keep employees current in human factors, target areas where training is needed, and evaluate the training program's effectiveness. The best training is tailored to each organization and presented by an instructor from within the organization. This way the trainer will know the areas within the organization needing the most focus.

■ **Error management.** This concept focuses on eliminating errors and can be broken down further into error management and error containment. By monitoring and documenting incidents and accidents, organizations can compile information helpful in predicting and preventing these errors in the future.

On June 10, 1990, the left windscreen on British Airways Flight 5390 blew out shortly after takeoff. Although the pilot was sucked halfway out of the hole, other crewmembers held onto him until the co-pilot could land the airplane. In this incident, the windscreen had been replaced using the wrong size bolts. The shift maintenance manager was so short staffed that he replaced the windshield himself. He used the bolts that held the old screen in place for comparison as he looked for new bolts the same size. He ended up using bolts that were longer and thinner than the ones he needed. He also failed to notice that the countersink was too low. He signed off the job himself without any type of pressure check or duplicate check. Eighty-four of the ninety bolts holding the new windscreen were too small.

The employees in this incident were considered qualified, competent, and reliable. This situation could have been avoided had the employees practiced error management. With today's technology, there is little room for error and human factors training is vital to reducing the aviation accident/incident rate.♦

—The author wrote this article while attending Embry-Riddle Aeronautical University, Fort Rucker, AL. He can be reached at (334)255-3422/3406 or e-mail Cornelius$@rucker.army.mil.

Wanted: Safety Successes

LTC Robert Black
Training Director
U.S. Army Safety Center

Attention commanders, safety managers, unit safety officers, and NCOs at all levels! Do you know a MACOM, installation, military organization at division or below, or an exceptional Army member or DA civilian doing great things to further Army safety or with an outstanding safety program? Sure you do! Would you like to see your organization or that individual recognized at Army level for their accomplishments? Sure you would!

With the ever-increasing OPTEMPO and the worldwide high-risk environments our units and personnel are operating in, it is critical as safety leaders that we take time to recognize those who are getting it right. And while unit- and MACOM-level safety awards can be appropriate, another venue is available for those who clearly are the Army's best. The Chief of Staff, Army (CSA), and the Director of Army Safety (DASAF) both have awards for recognizing outstanding achievements in Army Safety.

These prestigious awards are available from the MACOM level down to individuals. Included are awards presented for annual achievements and those presented for specific events or acts. The regulation governing these awards is Army Regulation (AR) 672-74. Below is a list of the Army-level awards available.

■ The **Chief of Staff, Army, MACOM Safety Award** is presented annually to MACOMs that make significant improvement in evaluated areas. The award nomination is initiated by a MACOM commander or safety manager, or the DASAF. The nominations are due to the U.S. Army Safety Center (USASC) by 1 December each year. A USASC panel meets in January to determine the winner.

■ The **Chief of Staff, Army, Award for Excellence in Safety** is presented annually to Army personnel and DA civilians who make significant contributions to accident prevention. The award nomination is initiated by a brigade or higher commander, or MACOM or installation safety manager. The nominations are due to USASC by 1 December each year. A USASC panel meets in January to determine the winner.

■ The **Director of Army Safety Award** is presented annually to Table of Distribution and Allowances (TDA) or Table of Organization and Equipment (TOE) detachments through division-level units, or activities or installations that make significant improvements in accident and injury rates. The award nomination is initiated by the unit commander, or installation or unit safety manager. The nominations are due to USASC by 1 December each year. A USASC panel meets in January to determine the winner.

■ The **United States Army Safety Guardian Award** is presented to Army personnel or DA civilians who take extraordinary action in an emergency. The nomination is initiated by the unit commander, or installation or unit safety manager. A USASC panel meets quarterly to determine recipients.

■ The **Army Aviation Broken Wing Award** is presented to Army and DA civilian aircrew members for outstanding airmanship while preventing or minimizing aircraft damage or personnel injury. The nomination is initiated by the unit commander, or installation or unit safety manager. A USASC panel meets as needed to determine recipients.

■ The **Director of Army Safety Special Award for Excellence** is presented to Army personnel and DA civilians who demonstrate exemplary leadership in safety programs in the field. This is a DASAF impact award. The award is initiated by the DASAF; however, nominations are encouraged from the field.

In order to breed safety success, you must foster it and then reward those who achieve it. The CSA and DASAF want to help reward your successes.

Your Awards Program

While the purpose of the awards program is to recognize deserving individuals, groups, and units for their mishap prevention efforts, we also want to give our readers the who, what, when, where, why, and how things turned out. In addition to serving as recognition, award nominations and write-ups provide valuable lessons learned for our readers. The information could save another soldier from a similar situation or hazard mishap. ♦

—POC: CW4 Paul Clark, (334) 255-3712, DSN 558-3712, e-mail clarkp@safetycenter.army.mil

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class C:** Aircraft experienced an embedded global positioning system/ inertial navigation system (EGI) failure during a mission. The crew unsuccessfully attempted a reset and landed the aircraft on a 10,400-foot pinnacle. The aircraft made a hard landing, which compressed the right strut. The 30mm gun also hit the ground, and the overhead windshield cracked. The crew flew the aircraft back to their base camp.

D Model

■ **Class B:** Aircraft reportedly made a hard landing following settling with power condition. No crew injuries were reported.

■ **Class E:** The PC noticed a slight electrical burning odor in the cockpit during a daytime multi-ship mission. Immediately after noticing the odor, the #1 generator failed in flight. The crew performed a precautionary landing at the airfield for possible smoke in the cockpit due to failure. The aircraft landed without incident. Maintenance determined the #1 generator was inoperable and replaced it. The aircraft subsequently was released for flight.

CH-47

D Model

■ **Class A:** Aircraft encountered dust conditions during landing at a refuel point and crashed, coming to rest on its right side. The crewmembers suffered treatable injuries.

OH-58

A+ Model

■ **Class C:** During reconnaissance flight, aircraft's MASTER CAUTION and ENGINE OIL lights illuminated, followed by a loss of engine oil pressure and torque reduction readings. Subsequent inspections revealed more than $100,000 in related and collateral component damage.

D(R) Model

■ **Class B:** Aircraft reportedly made a hard landing and suffered damage. No other details were provided.

D(I) Model

■ **Class C:** Aircrew had been practicing environmental flight operations and landings in a dusty area. After completing the third landing, the instructor pilot (IP) suspected that a hard landing might have occurred. The IP inspected the aircraft and found damage to the lower wire cutter. The IP declared a precautionary landing and secured the aircraft.

■ **Class C:** Aircraft experienced an engine over-temperature on first start after a 600-hour engine service.

UH-1

H Model

■ **Class E:** The aircrew heard a loud bang during low-level flight. The crew suspected that they had a compressor stall and immediately landed the aircraft. A post-flight inspection revealed the inlet guide vane actuator was out of rig. During the maintenance operational check (MOC), the bleed band closure setting also was discovered to be out of parameters. The aircraft was repaired, checked again, test flown, and released for flight.

UH-60

A Model

■ **Class C:** On start-up engine turbine gas temperature (TGT) rose to 1,005 degrees. The pilot in command (PC) initiated emergency shutdown procedures.

L Model

■ **Class A:** Aircraft was Chalk 2 in a flight of three when it encountered heavy dust conditions during an approach to a landing zone and impacted the ground, coming to rest inverted. One passenger was thrown from the aircraft and suffered fatal injuries, and the aircraft was damaged extensively.

■ **Class E:** During visual meteorological conditions (VMC) approach to a sod area at an airport, aircraft was allowed to descend without proper pilot control inputs to cushion the aircraft while landing. During a PMS-1 inspection, maintenance found rotor blade paint on the ALQ-144 top screws. It was suspected that the main rotor blades contacted the ALQ-144 during landing and was not noticed during aircrew post-flight inspection. No other damage was found during aircraft inspection.

C-23

■ **Class C:** While conducting aircraft qualification course (AQC) training, the left main tire blew during a night landing, causing damage to the honeycomb around the wheel well and tire rim.

Editor's note: Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Iraqi Freedom. We will publish those details in future Flightfax articles.

Hi, I'm Joey, the Army's newest aviator. I've had excellent training, but these brownouts are tough! Maybe you have some ideas to keep me and my buddies from bustin' up our helicopter while flying in the "sandbox." I could sure use your experience to pass along to other crewmembers to help reduce the accident rate by 50% during the next 2 years.

Learned a lesson lately?

Tell Joey

We don't have to learn our lessons the hard way through accidents. We can also learn from close calls, near misses, and minor mistakes both our own and those of others. This is an opportunity for us to share experiences with each other. They can be long or short, recent or from the past. Share your lessons learned with Joey, as well as all of Army Aviation. Send your story to U.S. Army Safety Center, ATTN: "Joey," Bldg. 4905, 5th Ave., Fort Rucker, AL 36362-5363 or fax to DSN 558-3003 (334-255-3003), ATTN: "Joey." You can also e-mail joey@safetycenter.army.mil.

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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Enough is Enough!

PLUS: 2003 Flightfax Index

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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U.S. ARMY SAFETY CENTER

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JOSEPH A. SMITH
Brigadier General, U.S. Army
Commanding

DASAF's Corner

FROM THE DIRECTOR OF ARMY SAFETY

Safety Success in Korea: Leadership in Action

As our Army continues to operate at an OPTEMPO not seen in 50 years, the safety challenges our commands face are unique and require unique initiatives. As I analyzed recent safety statistics across our MACOMs, Korea's figures caught my attention. Over the last 5 years, 6.9 percent of the Army's Soldiers have been stationed in Korea; however, Korea has only suffered 4.5 percent of our accident fatalities.

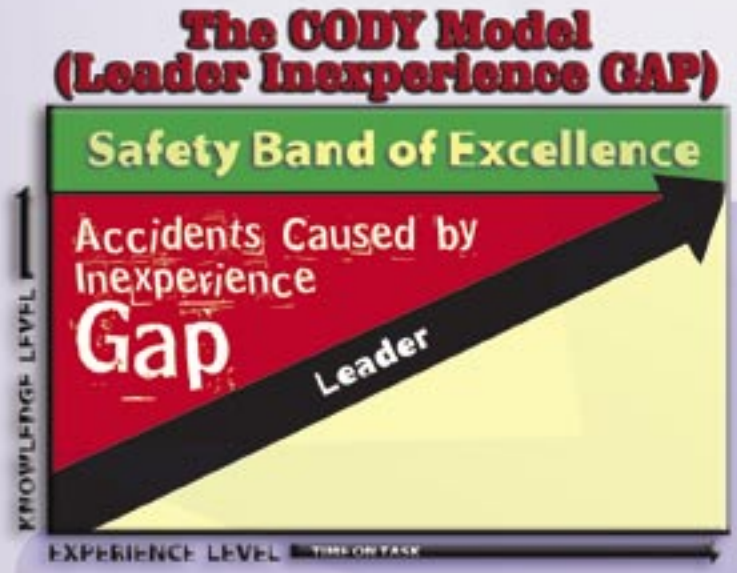
The power of this statistic is significant to me considering the current world environment. For the past 50 years, we've asked our Soldiers in Korea to remain at the highest level of readiness every day. We've asked them to train and operate at that level in one of the world's harshest environments, and to do so with a new team of Soldiers every year. We've been patching the line across from the world's sixth largest Army with 50 years of 1-year Band-Aids™. What could be more challenging? Yet, Korea continues to have a lower accident rate than the Army at large.

Now we are asking the entire Army, including the Guard and Reserve, to prepare for and face an unpredictable enemy in a harsh environment with inexperienced Soldiers. My hypothesis is that through 50 years of lessons learned, Korea has developed some safety initiatives that could be shared as Army "best practices." Although I've never been stationed in Korea, I visited there for the first time in years last month. What I found was an organization that understands its hazards and overcomes them through effective control measures.

Aviation operations accentuate Korea's challenges. The 8- to 15-percent monthly aviator turnover makes crew coordination within combat teams a constant battle. Twelve-month tours force leaders to rush pilots through training to get 10 months of flying before they leave. Most of all, terrain, power lines, weather, and communication dead zones create extra hazards. Added is the fact that Korea consistently receives the highest percentage of first-tour aviators, including 62 percent of UH-60 pilots last year.

Korea's solution: Leader involvement at all levels, including the implementation of an **8th Army Aviation Review Team.** This team creates control measures by developing, prioritizing, and funding aviation safety initiatives. The program's success is proven in the numbers—six aviation-related fatalities during the last 3 years. This is well below the Army average, and yet they accomplished this while exceeding their flying hour program.

The 8th Army Aviation Review Team continues to improve their safety rates in a challenging environment. They are working to build a Korea **"Green Platoon,"** hiring DACs to train aviators to



fly safely. The team inspired leaders to build remote weather terminals and communication towers to prevent dead space and predict harsh weather in mountainous regions.

Control measures, however, do nothing unless they are implemented and supervised by leaders. To ensure that happens, 8th Army leadership applies the **"3-Deep"** concept, involving leaders at multiple levels to provide young leaders with the necessary knowledge.

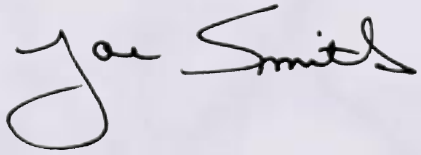
When a Soldier signs into 2ID, they are given a small pamphlet called ***The Tribal History.*** That history lists every fatal accident in 2ID over the last 10 years, along with their causes. On Day 1, senior leaders give junior leaders the historical knowledge to keep their Soldiers safe. During mission planning, junior leaders must brief their commanders in detail on their control measures and contingency plans. Mission briefs are NOT done in passing or over the phone. Commanders train junior leaders on the five steps of risk management so they can safely perform their mission. The junior leaders then reinforce those five steps to their Soldiers in the **"safety-minute"** just prior to mission execution.

Korea has identified a further hazard threatening the Army as junior leaders gain experience. I have previously discussed the hazard of the **"Inexperience Gap"** in the Cody Model, showing how accidents occur when junior leaders lack experience in mitigating risks. Time on task (experience) reduces this hazard and enhances junior leaders' risk management skills. Until that point, it's the junior leader's inexperience that puts themselves and their Soldiers at increased risk.

But there is a second risk that can occur after these junior leaders have gained some experience. As junior leaders remain in position after a high OPTEMPO period, new Soldiers will move into their units to replace others who are leaving. When this turnover occurs, those junior leaders' safety experience will exceed that of their new Soldiers. However, in the young leader's mind, he may still think of his unit being as capable as it was during the high OPTEMPO point. This mindset can cause junior leaders to be overconfident and assume their Soldiers will understand and correctly implement control measures. This assumption breeds complacency, causing leaders not to properly supervise their new, less-experienced Soldiers.

Units in Korea are not risk-averse; they don't have that luxury. They must be ready to "fight tonight" every night. What they have done is identify the challenges of their mission and mitigate risks by combining safety initiatives and good old-fashioned leadership. As the rest of the Army's challenges look more and more like Korea's, we can look to Korea's 50 years of experience for guidance.

Keep your leader lights on!



FY03 Aviation Safety Performance Review

Charisse Lyle
U.S. Army Safety Center

The number of Fiscal Year (FY) 2003 Class A accidents remained fairly constant from FY02 (30 versus 28, respectively). However, Army fatalities more than doubled from FY02 to FY03 (17 versus 35). There were 10 fatal accidents during FY03: three involving definite or suspected inadvertent instrument meteorological conditions (IIMC) (i.e., fog, sandstorms), two wire strikes, one brownout during an attempted landing, one impact with the ground during aerial gunnery (caused by an over-aggressive bank at low altitude), a fast-rope accident, and a fixed-wing accident which occurred while executing stall procedures during a maintenance test flight. The cause of one accident was undetermined.

As of 29 October 2003, there were 124 Class A through C accidents in FY03, resulting in a cost of over $242 million. Over a third (37 percent) of the accidents occurred in theater during missions associated with Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). Brownouts were by far the top accident event in FY03 (16 percent of the 124 accidents), with the majority (85 percent) occurring in OEF- and OIF-related operations.

Airframes

The table on page 7 depicts the accident number breakdown by accident class and fatalities for each aircraft type.

UH/MH-60 Black Hawk (32 percent)

Over a third of the FY03 Class A accidents and the majority of the fatalities occurred in the Black Hawk. Eighty-two percent of the fatalities during FY03 occurred in six Black Hawk accidents. The high number of fatalities was due, in part, to the fact that there were

troops onboard in some of the accidents. In one accident alone there were 11 fatalities. IIMC was a definite or suspected contributing factor in two accidents resulting in nine fatalities. There were two wire strikes, one of which resulted in three fatalities. Three of the Class A accidents were caused by loss of visual references due to rotor-induced brownout during takeoffs and landings. One of these accidents resulted in a fatality when a passenger was thrown from the aircraft during the crash. A mid-air collision during a night formation flight resulted in a Class A accident but, thankfully, no fatalities.

The Black Hawk also had the majority of Class B and C accidents for this timeframe. There were three accidents in which the main rotor blade struck the AN/ALQ-144 or the tail rotor drive shaft cover during a hard landing. In another Class C accident, a jammed round of an M-60D machine gun accidentally discharged through the floor of the aircraft. There were two instances of in-flight aircraft component detachments caused by materiel failure: the anti-collision light shield and the tail de-ice bracket. In both cases, the components struck the tail rotor.

AH-64 Apache (26 percent)

The Apache had the second-highest number of accidents in FY03. Brownout conditions were contributory in seven of the accidents, six of which occurred in Iraq. There were two wire strikes, one resulting in two fatalities. An IIMC accident resulted in two fatalities.

In one accident, a malfunction of the digital automatic stability equipment (DASE) computer caused uncommanded flight control inputs, which resulted in the aircraft impacting the ground in a tail-low, left-turn attitude. Other events included inadvertent drift while at an out-of-ground effect (OGE) hover resulting in a tree strike, and a bird strike.

There were four reported auxiliary power unit (APU) clutch failures during FY03, all resulting in Class C accidents. Thus far in FY04, we have had two Class A accidents involving APU clutch failures. In both cases, the crews reportedly received warning light indications and were able to land the aircraft and egress without injury. AMCOM Engineering has identified a potential corrective action. In the interim, Safety of Flight (SOF) Message AH-64-02-08 specifies inspection procedures for the power takeoff (PTO) clutch assembly. An updated SOF currently is being disseminated that provides further instruction and inspection procedures to address this problem.

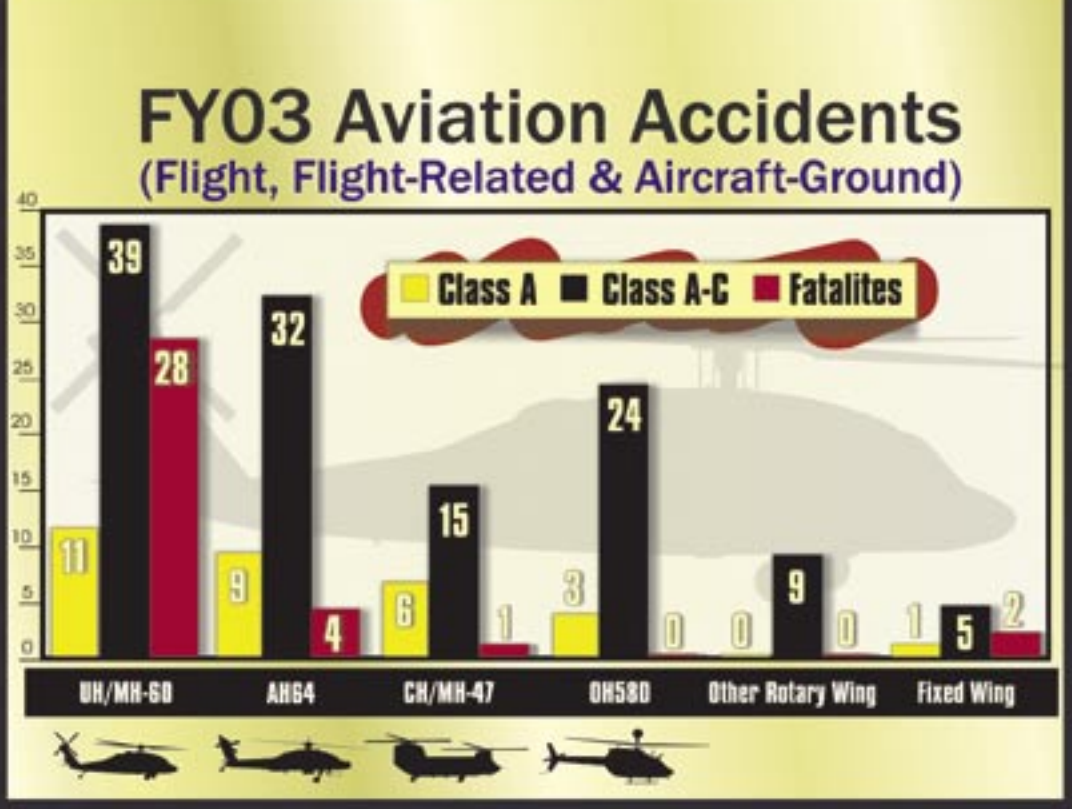
OH-58D Kiowa Warrior (KW) (19 percent)

In comparison to the other force modernized aircraft, the KW had the lowest number of Class A accidents and no fatalities. Brownout or whiteout was a contributing factor in two of the Class A accidents. Eight of the KW accidents involved emergency procedures training (full authority digital electronic control [FADEC] manual throttle operations [4], autorotations [3], and a simulated engine failure [1]). The majority of these mishaps resulted in Class C rotor or engine overspeeds or overtorques and/or hard landings. However, one KW crashed into the ground, resulting in Class B damage. One FADEC failure was reported during this timeframe.

Two Class C accidents involved inadvertent drift into a tree while at an OGE hover during night battle position operations. Another involved a wire strike during night vision goggle (NVG) terrain flight. In this case, a flight of two KWs conducting NVG multiship training descended into a valley for low level flight. The lead aircraft struck a set of three power lines. The crew escaped without injury, and there was minor damage to the aircraft.

CH/MH-47 Chinook (12 percent)

The Chinook had six Class A accidents and one fatality in FY03. However, when compared to the other force modernized aircraft, it had the lowest number of Class C accidents. Sixty percent (9) of the accidents occurred in theater during OEF- and OIF-related operations. Five involved brownout conditions (four combined in OEF and OIF). One involved a wire strike during a precautionary landing.



There was a flight-related accident involving a fast rope insertion in which a soldier fell approximately 20 feet to his death. In another Class A accident, there was a hard landing following failure of the #1 engine. In one Class C accident, the aircraft was taxiing forward when the road under the aircraft collapsed.

Fixed Wing (4 percent)

There were five Class A through C fixed-wing accidents, three of which involved C-12 aircraft. One of these accidents occurred during the conduct of stall procedures on a maintenance test flight. In this particular accident, the C-12 aircraft entered a right spinning descent from 9,000 feet and crashed, causing two fatalities.

Summary

Environmental conditions were a contributing factor in many of the accidents during FY03. IIMC claimed 11 lives, and brownout conditions contributed to 20 accidents. During their assistance visits, the Directorate of Evaluation and Standardization (DES) identified poor environmental training programs as a trend across the Army (see the article "Standardization Review" in this edition): "Poor environmental training programs commonly address academic training of unique environments, but delay flight training until deployment into those conditions." In this same article, DES also notes a weakness in instrument proficiency and makes the observation that, "Instrument proficiency is a by-product of how frequently crewmembers fly in instrument conditions."

The Army Safety Center is involved in pursuing three initiatives to combat the brownout problem: (1) advanced simulators that replicate the building of brownout at slow airspeeds; (2) the Tactile Situation Awareness System (TSAS); and (3) aircrew coordination training.

The Safety Center also is developing an automated risk management tool to help commanders and mission planners identify accident hazards and apply controls to mitigate risks. Training initiatives include on-site assistance visits and an NCO professional development mobile training team to help corps-, division-, and brigade-size units and installations in need of safety assistance. The Safety Center assistance team will "train the trainers," leaving units with a core of trained personnel capable of more fully integrating risk management into their operations and missions. ♦

Editor's note: These statistics are current from the Safety Center database as of 29 October 2003. Delayed reports could change these figures somewhat in the coming months.

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STACOMs are Back!

CPT Thad D. Fineran
Directorate of Evaluation and Standardization
Fort Rucker, AL

Most of you will recognize the Standardization Communication (STACOM) format from previous editions of *Flightfax*. The Directorate of Evaluation and Standardization (DES), Fort Rucker, AL, is reintroducing the STACOM as a viable method of communicating clarification information for standardization personnel. These STACOMs will be prepared by DES and staffed through appropriate proponents to clarify issues when published guidance is ambiguous or can be misinterpreted. The information generally precedes official Department of the Army (DA) policy and is valid until changes are made to respective publications. Previously issued STACOMs should be considered expired and no longer referenced. The STACOM is published to enhance aviation operations and training support and, as such, is informative in nature and NOT regulatory. Look forward to seeing STACOMs regularly in *Flightfax*.

2003 Flightfax "Standardization Review"

Another year of assistance visits and evaluations within the Army Aviation community has been completed by DES. DES conducts these unit evaluations as a Headquarters, Department of the Army (HQDA) field operating agency, with a mission of providing real-time feedback on the standardization of aircrew training programs at the individual and crew level. DES attempts to execute this mission in accordance with (IAW) Army Regulation (AR) 95-1, *Flight Regulations*, and by visiting aviation units every 18 to 24 months. As part of our mission to assist aviation units in standardization, we identify trend information and prepare it for commanders and crewmembers at all levels. In the next few pages, we'd like to share some of the common trends found during the previous 12 months.

Aircrew Training Program (ATP) management

One of the most significant administrative issues DES encounters is a lack of ATP management. Leadership understanding of the ATP is weak, and many unit standardization pilots (SPs) manage the ATP in its entirety. A predominant reason for this is a lack of core training to educate commanders about their own program. DES recommends that commanders at all levels take an active role in educating themselves on and administering their unit ATP. This active role requires a comprehensive understanding of Training Circular (TC) 1-210, *The Aircrew Training Program (Commander's Guide to Individual and Crew Training)*, and AR 95-1. This understanding is a fundamental tenet of successful standardization

programs.

Additional ATP management issues of note include task list development and actual accomplishment of ATP requirements. TC 1-210 addresses the importance of individual task list development as a joint venture between the commander and the standardization officer. This team assesses the unit mission essential task list (METL) and determines appropriate task requirements for each Modified Table of Organization and Equipment (MTOE) or Table of Distribution and Allowances (TDA) position on flight status. Task iteration requirements are then determined by assessing the individual crewmember's proficiency and experience. Generic task lists (every crewmember in the unit has the same mission tasks listed on the critical task list [CTL]) are difficult for most commanders to justify when assessing unit requirements IAW TC 1-210. Units that have successfully addressed this issue frequently have completed position-specific task lists filed under each appropriate paragraph and line number of the MTOE or TDA. Then, when a new crewmember is integrated, that task list is loaded and personal data is completed.

When addressing the accomplishment of ATP requirements, commanders must closely monitor the use of extensions and waivers. In most circumstances, these tools are justified courses of action as explained in AR 95-1. The requirements of transformation, deployment cycles, and maintenance and safety messages all plague crewmembers in their accomplishment of ATP requirements. Many other actions, however, distract otherwise proactive crewmembers and do not warrant a commander's extension. Likewise, the 30-day extension period authorized in AR 95-1 should not be the normal extension time. One highly effective extension seen this year was an 8-hour extension for completion of a –10 examination. That Annual Proficiency and Readiness Test (APART) requirement probably won't be overlooked again. Finally, commanders and unit SPs should review AR 95-1, paragraph 4-10, when authorizing extensions and/or waivers. Make sure the appropriate restrictions are annotated in the crewmember's individual aircrew training folder (IATF). The crewmember also must know the process should he or she not complete requirements in the allotted time.

For those ATPs that include nonrated crewmembers (NCMs), rated standardization personnel frequently overlook nonrated standardization training. The cargo community has an established DA school to train flight and standardization instructors, and the utility community will soon have one. Successful crewmember standardization requires command and SP support of nonrated training and evaluation.

Additional training requirements

TC 1-210 addresses additional training requirements as part of the unit ATP. The requirements of aircraft survivability equipment training (ASET); fratricide prevention training; aeromedical training; nuclear, biological, and chemical (NBC) training; and environmental training are the most common areas of difficulty. ASET-AT is available as an unclassified, easily duplicated training program, yet many aviation units have difficulty organizing and tracking effective ASET. Under this same topic, aircrew familiarity with Mode IV operations and other installed countermeasures is marginal unless they are trained frequently. The most successful unit programs DES has seen require routine ASET and secure communications

operations.

Using this tenet of recency, one successful National Guard facility maintained 100-percent proficiency with secure communications in a very simple manner—base operations only communicated secure. All flight operations required the crews to have, fill, and operate avionics with appropriate keys. While not directly a part of ASET, the principles this National Guard unit used enabled effective operations and practice year-round, not just on field exercises. It is this type of ingenuity and practice that can make your unit ASET interesting, not just reminiscent of the ASET II laser disc training.

Fratricide prevention and aeromedical training also are overlooked frequently. Field Manual (FM) 3-04.301 has been out for over 3 years now. Academic requirements should have covered all applicable topic areas, but DES frequently finds academic training hasn't prepared crewmembers for evaluation in this topic. Fratricide prevention is equally weak. Given Army Aviation operations in joint and coalition environments, fratricide prevention should be instructed routinely. Successful training programs often address recent incidents and missions, and much information can be gathered from the Center for Army Lessons Learned (CALL) and joint publications.

NBC training is another marginal area found in most visited aviation units. TC 1-210 requires commanders to develop an NBC evaluation program along with the mandated NBC training listed in each ATM, meaning he or she must determine individual tasks that must be evaluated sometime during a no-notice, APART, or Army Readiness and Training Evaluation Program (ARTEP) evaluation. Many weak evaluation programs only require one or two tasks to be evaluated in mission oriented protective posture (MOPP) gear, one of which is preflighting the aircraft. DES recommends that commanders identify multiple primary base tasks (involving flight) as evaluation task requirements under MOPP conditions to ensure thorough proficiency and familiarity with NBC equipment.

Environmental training is another key requirement and is especially pertinent to units deployed in support of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). Common weaknesses in environmental training predominantly revolve around a lack of flight training in difficult environmental conditions. Snow, sand, and dust are the most common visibility-limiting environmental conditions, but crewmembers do not routinely practice in these conditions. Since these particular environmental conditions are seasonal in nature, commanders must take advantage of them when they occur and plan unit training to maximize crewmember familiarity and proficiency. Poor environmental training programs commonly address academic training of unique environments, but delay flight training until deployment into those conditions. If your aviation unit has the potential to deploy into a snow, sand, or dust environment, DES recommends that environmental training, both academic and flight, be an active part of crewmember progression and evaluation.

Individual and crew proficiency

From a crewmember's perspective, probably the most interesting information is how individuals have been doing on proficiency evaluations. Overall flight proficiency is, for the most part, meeting the standards set forth in the aircrew training manuals (ATMs). Some particular areas of emphasis that need to be addressed are academic knowledge, instrument proficiency, crew coordination, and emergency procedures understanding.

Academic knowledge, while not the ultimate proficiency indicator, might well be a cornerstone of safe and efficient flight operations. We're not talking about the gear ratio of the intermediate gearbox here; we're talking about basic, working knowledge of topics outlined in the ATM. As many crewmembers know

from personal experience, most evaluations are not unsatisfactory because of a maneuver or decision—rather, they just didn't know what they were talking about. It's often difficult to identify time to spend "in the books." We must take this responsibility seriously, however, and realize our study time will not fall solely during the hours spent at the hangar. Units that have active, no-notice oral and written evaluations frequently do very well in the academic topics evaluated by DES. One successful unit recently administered a written limit and emergency procedures test 30 days before their DES evaluation. Both the satisfactory and unsatisfactory evaluations were annotated in the crewmembers' IATFs. Nearly every crewmember performed exceptionally during the subsequent evaluation, largely due to their unit's effective no-notice evaluation program.

Instrument proficiency is a by-product of how frequently crewmembers fly in instrument conditions. A lot of units are not taking the time to plan and execute effective instrument training. Many crewmembers are not comfortable in instrument meteorological conditions (IMC). While effective synthetic flight training system (SFTS) usage can be helpful for some airframes, nothing substitutes the intensity of actual instrument conditions. This requires a priority shift for many aviation units since instrument flight training is not always compatible with mission requirements or post support. Again, ingenuity and resourcefulness can integrate effective instrument training into your ATP. As a commander or SP, ask yourself how comfortable you are with a flight of five going inadvertent IMC, and work backwards in your continuation training programs to ensure effective instrument proficiency in your crews.

Crew coordination is a constant issue that can never be over-emphasized. Part of every maneuver performed in aviation operations, crew coordination must be trained and enforced from the top down. Like other important flight tasks, crew coordination failures must result in unsatisfactory evaluations. To emphasize this, crew coordination is mandated as an integral part of every APART evaluation. DES also recommends including elements of crew coordination in mission briefings, crew briefings, and after-action reviews. Leadership also needs to be familiar with the five objectives of crew coordination and spot-check aircrews to ensure they are being achieved.

Surprisingly, emergency procedures training is an area in which most units could be more effective. DES predominantly finds that crewmembers know underlined procedures well from a rote memorization standpoint, but when asked to identify malfunctions in the aircraft or respond to emergency situations the success rate drops drastically. This is normally an indicator of standardization personnel taking proficiency for granted or routinely training emergency procedures the same way over and over again. As mentioned earlier, crewmembers that know emergency procedures well belong to units that have a strong, frequent, and accountable no-notice program in place.

Conclusion

Hopefully, these trends will benefit your ATPs and provide guidance in preparing for your next evaluation. The trends addressed here are only a fraction of our assessment data. If you would like clarification or further information from us, please contact your respective aircraft representative at DES. As mandated by the Director of DES, we are here to help. Our philosophy and charter require assistance on par with evaluation, so please contact us with your questions or concerns. A contact roster can be found in the DES Information Portal within AKO. ♦

—The author is the acting Deputy Director and Operations Officer at DES. He can be reached at DSN 558-3589 (334-255-3589) or by e-mail thaddeus.fineran@rucker.army.mil.

Dust Takeoffs and Landings in the UH-60

CW3 Thomas J. Cuscito Jr.
B Co, 1st MI BN, Wiesbaden, Germany

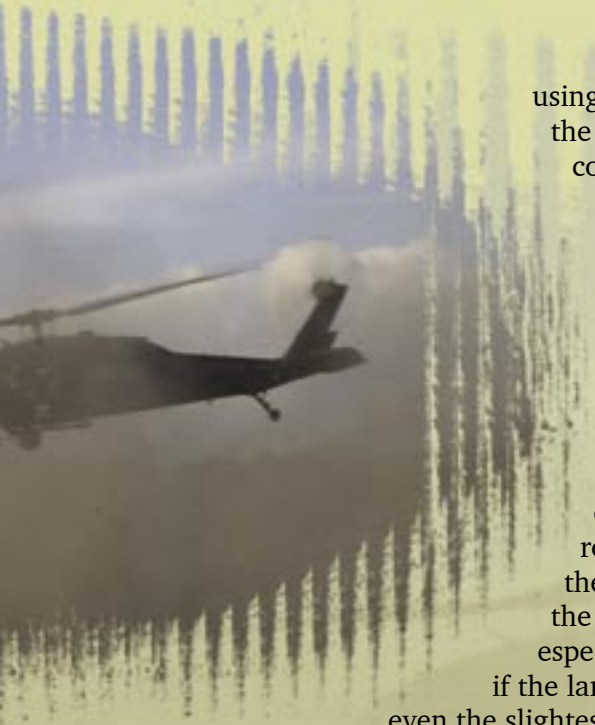
Perhaps the most dangerous phase of a UH-60 mission in a dusty environment is takeoff or landing. Missions in such an environment are required all over the world, and UH-60 crews must be proficient and confident in their ability to execute under these conditions. Attitude, understanding, and skill are required for safe mission accomplishment. Planning and clear crew briefings are irreplaceable as well. Unfortunately, however, references on the subject are limited, and dangerous misconceptions abound.

Information about UH-60 operations in blowing sand or dust can be found in the UH-60 Aircrew Training Manual (ATM) (Training Circular [TC] 1-212) and in Field Manual (FM) 1-202, *Environmental Flight*. Many units also have 3000-series tasks and standing operating procedures (SOPs) for operations in snow, sand, and dust. This article is intended to take a serious look at the different approaches these publications reference on landings and takeoffs in "brownout" conditions. The same technique is not correct for all situations. Most importantly, there is a myth in the Black Hawk community that outrunning the dust cloud and "planting it in there" is the only way to land in a dusty environment. I believe this is a dangerous attitude that has caused and will continue to cause many accidents and incidents in dusty environments.

According to FM 1-202, "The best procedure to minimize blowing sand and dust is a running landing. If the terrain does not permit a running landing, an approach to touchdown should be made. A landing should not be made to a hover." Many aviators focus on the first sentence in the quote, when in almost all dusty field environments "the terrain does not permit a running landing." In the next paragraph, FM 1-202 states, "If a running landing can be made, the touchdown roll should be kept to a minimum to prevent the possibility of overloading the landing gear." Once again, the situation where a roll-on is appropriate is rare, and even the slightest ground roll can cause significant aircraft damage if the terrain is not even and smooth.

Regarding takeoff, FM 1-202 says, "If rotor blades…stir up sand and dust, the takeoff should be executed as rapidly as possible." The aviator must focus on the word "possible" and make a calm, performance planning card (PPC)-planned, instrument-referenced takeoff—but more on that later.

Obviously, TC 1-212 addresses the same issue, but with the UH-60 specifically in mind. Task 1028, "Perform VMC Approach" and Task 1018, "Perform VMC Takeoff," provide snow, sand, and dust considerations. These considerations compare three methods of termination for the approach: to a point out of ground effect (OGE), to the surface with forward speed, and to the surface with no forward speed. We will take a look at the last two methods. The ATM recommends the "with forward speed" technique for "an improved landing surface or suitable area with minimal ground references." Improved and suitable landing areas are hard to find in the field. The ATM goes on to say, "Apply slight aft cyclic at touchdown to prevent burying the wheels…." To prevent serious damage to the rotor blades and aft portion of the aircraft while



using this method, the aviator must correlate Task 1029, "Perform a Roll-on Landing," by centering the cyclic before lowering the collective. Reversing the order often has caused main rotor contact with the aft portion of the aircraft. This is especially important if the landing area is even the slightest bit downslope—a condition difficult to deduce from above and especially at night.

Perhaps the most important statement the ATM makes about takeoff is, "Be prepared to transition to instruments and execute an instrument takeoff if ground reference is lost." This can be uneventful **IF** the pilots work together. The pilots must know the maximum torque available and the torque required to hover. If the torque is too low, the aircraft will settle. If too much collective is applied, the rotor will droop and the aircraft will settle. Ground contact while in instrument meteorological conditions (IMC) is not desired for obvious reasons. Even with a wings-level attitude, drift is extremely difficult to detect.

There is no substitute for an accurate and briefed PPC. If the aircraft is heavy or the conditions extreme, the crew may be IMC for several seconds. This is not a problem if appropriate power is set and maintained during the instrument takeoff (ITO). If a brownout takeoff is likely, then the pilots should look at the instruments prior to focusing outside and taking off. This makes the transition back to instruments smooth, since you were just looking at them and are expecting to look at them again. Also, the pilot not on the controls needs to attend to nothing else during the takeoff other than assisting the pilot on the controls. Riding the controls will minimize reaction time if inputs are required or spatial disorientation requires a transfer of controls.

Let's take an organized look at the landing sequence. I'd like to put it in a checklist format I often use for crew briefings:

■ **Wind:** When single-ship, land into the wind. When in formation (echelon is ideal), lead should put the wind on the front quarter of the formation side. This will pull the dust away from the formation. Consider having the upwind pilot on the controls during a crosswind.

■ **Power:** Know your maximum torque available. The excitement of an IMC go-around is not the time to guess how much torque will bleed off the rotor.

■ **Go-around:** Brief go-arounds before the mission, and plan your go-around path during every approach. Rebrief the go-around contingency to your crew during the approach. Glance at your instruments as you begin the approach so your eyes are used to referencing your attitude on instruments in case you have to during a go-around. In an echelon formation, the ideal go-around for an individual aircraft in the flight is to continue straight forward out of the dust and land when the terrain is suitable. (This does not alleviate the necessity of briefing the direction to circle if a go-around to another full approach is necessary. In any event, the initial path out of a dust cloud must be forward to prevent drift or collision with another aircraft.)

■ **Co-pilot backup:** The pilot not on the controls must stop all other activity during the landing and back up the pilot on the controls. Riding the controls makes an immediate transfer of controls possible, should that become necessary. A dangerous amount of drift can develop in just a couple seconds—seconds that cannot be revisited.

■ **Crew chief (CE) assertiveness:** The ATM and FM 1-202 say all doors and windows should be closed during a dust landing. I would add to this by saying they should be closed when they no longer need to be open. CEs must understand their critical role during landing. Before the mission, the entire crew must be clear on how the CE will call the dust cloud and clear the aircraft down. Standard calls like, "dust is at the tail, my door, your door, clear down left, clear down right" are critical for the pilot to understand the rate at which the dust is approaching and when it is safe to completely lower the collective. The CE must have his head outside the gunner window for these calls to be accurate. The CEs should agree on who will call the dust to eliminate confusion, and they also must announce any drift immediately, clearly, and concisely (e.g., "drifting right").

■ **Analyze terrain on short final:** Rocks, slopes, ditches, gullies, waddis, and any uneven terrain can cause serious damage even without any ground roll. Ground roll on this type of terrain makes damage more likely and dynamic rollover a real possibility. Look at the terrain and decide if that is what you want to land on before you get engulfed in a cloud of dust. If the terrain is unsuitable, continue forward in your previously reconned go-around path until you find a suitable spot.

■ **Brakes:** If you make the decision to land on anything but smooth, level terrain, set the brakes. This simple precaution will minimize the possibility of damage to the underside of the aircraft that even the slightest ground roll can cause.

■ **Choose a reference:** Identify a good reference (if available), such as a bush or a distinct pattern in the ground or rocks. Make your approach (if you intend to have no ground roll) very close to your reference so you can see it as long as possible. If you can, put this reference right next to or under your chin bubble. Observe how your reference point lines up with other points to prevent the aircraft from drifting and pivoting around the nose.

■ **Scan:** This is probably the most important thing you can do during a dust landing. The UH-60 offers three windows for the pilot to look through for close references during a dust landing. Deliberately scan from one to the other. Look out the bottom of the windshield at the ground close to the aircraft. When that gets dusty, look out the chin bubble and then out the door over your shoulder. When that gets dusty, look out front. If you brownout while looking through any window and your next window also is browned out, it's time to do a go-around. As the rotor wash pushes the cloud past the aircraft in the worst dust, all three windows rarely are browned out completely at the same instant if you look at the ground very close to the aircraft.

■ **Announce loss of visual contact with the ground:** Pilots must immediately inform each other if they lose sight of the ground. Awareness of what the other can see will aid in the decision to transfer controls or go-around.

■ **Lighting:** A narrow beam searchlight during night vision goggle (NVG) dust operations is ideal for lighting up your chosen reference point. Keep the light on the reference point, but deliberately scan through the other windows. If available, chem lights taped to your reference spot make visual cues last longer in a dust cloud. If your lights cause disorientation, dim them or turn them off. Be aware of the crater illusion if you tuck the searchlight beam under the nose.

■ **CEs call "clear down":** CEs need to understand they must tell the pilot as soon as the aircraft is safe to continue down. Terse directions to move slightly for a safe spot are often necessary (e.g., "hover right, two, one, clear down left, clear down right"). This is the most critical phase of the landing, and a competent CE can save the day with timely drift calls (e.g., "drifting back, drifting right"). Once the aircraft is on the ground, only the CE can tell if it is safe to lower the collective all the way down.

■ **Anyone can call a go-around:** There are an infinite number of circumstances that might require a go-around. All crewmembers need to understand that if they doubt the landing can be completed safely, it is their responsibility to call a go-around. No matter who calls the go-around, the pilot on the controls needs to immediately execute and ask questions later. The hazard requiring the go-around might not allow for an immediate explanation.

In conclusion, there is such a thing as an unsuitable landing area. Aviators get so focused on their mission they often fixate on a landing zone (LZ) without considering ways to mitigate the risk of the hazards present. As funny as it sounds, no one would land on a lake or in a volcano because these are unacceptable LZs, but aviators routinely land on rough, rocky, dusty terrain that has facilitated many fatal accidents. Although many missions require challenging LZs, some areas are not safe and often require an adjustment of only a few yards to find a suitable spot. Analyze your LZ and make a decision. Consider the best spot, especially if there is a better spot just a few yards away. A landing with any forward motion at termination is rarely appropriate in a field environment. The attitude that "the Black Hawk can take it" is a myth. If you freight-train a helicopter into an LZ "within Chapter 5 limits," you are asking for dynamic rollover or rotor contact with something other than air. ♦

—The author, CW3 Thomas J. Cuscito Jr., has over 3,000 total hours, with 1,900 as a UH-60 IP/IFE. CW3 Cuscito has flown more than 2,500 hours in the UH-60 in Germany, Fort Rucker, Korea, and Fort Campbell, and has been an IP since 1995. He is serving currently as an RC-12 Company Safety Officer in B Co, 1st MI BN, Wiesbaden, Germany. He may be contacted by mail at B Co, 1st MI BN, CMR 467 Box 726, APO AE 09096; by telephone at DSN 314-337-5250/6173, commercial 011-49-611-705-5250/6173; or by e-mail at thomas.cuscito@us.army.mil.

NCO CORNER

Wrong Part, No Book

MSG Shane Curtis
U.S. Army Safety Center

A buddy and I were talking about the Chinook and all the changes made over the years. Our talk brought back old memories from years ago regarding why you should always use "The Book."

I was crewing a CH-47C in 1979, when it was known as a "Baby C" aircraft because it had two L-7 type engines. A "Super C" aircraft, on the other hand, had two L-11-ASA or L-11 Ram-D type engines installed. The Ram-D engine was to be installed on the new CH-47D as an upgrade from the L-11 ASA engine. The CH-47D was still another 2 years or so away from being fielded to its first unit; so, if you were crewing a Super C, you had the best the Army had to offer in the Chinook world.

Sometime in 1980, we had the L-11 Ram-D engines installed on our CH-47 Baby C, making it a Super C. The wiring for the airframe and engine combination was different, which meant our aircraft had to be wired for the bigger engines. That task was completed without a hitch.

The next step was for our aviation intermediate maintenance (AVIM) support unit to install the new L-11 Ram-D engines. Production on the L-11-ASA and Ram-D engines had a pretty quick turnaround time, so the engines were being delivered to the units before portions of their manuals ever got there.

Experienced maintainers didn't need The Book anyway. Wasn't maintenance for replacement of the engines the same? Nope! We could install the engine with or without the transmission already installed. We decided to install the engine with the transmission. This task wasn't hard and everything looked the same, so the new maintenance manuals weren't used.

My flight engineer (FE) and I flew a 2-hour mission on our Super C shortly after the engine upgrade. When we were back on the ground, we noticed oil seeping from the front of the #1 engine. The oil was coming from where the engine transmission and the engine connected. We thought the wrong torque had been used during installation, so we did a retorque on the mounts.

Despite our "fix," the engine transmission started to leak again during the next flight. This time we removed the engine transmission and noticed something unusual—the backside was burned black! The snubber had melted to nothing, and the lip on the quill shaft was razor sharp. We finally realized something was definitely wrong! What did The Book say about converting from the L-7 engine to the L-11 engine? Well, The Book said to use the new, longer quill shaft with the L-11 engine.

Problem solved, right? Remember, the leak was on the #1 engine. It never occurred to us to check the #2 engine. You guessed it; that engine started leaking at the same place during the next flight. The first thing we did was pull the engine transmission to see how badly it was burned. It was bad!

We were lucky—this could have ended in tragedy. A second or two longer, and those engine transmissions could have come apart on us. Remember to read The Book. It doesn't matter how often you've performed a job; if you don't have the most current and up-to-date information, you'll never know what changes to make. Both our unit and the AVIM unit learned a valuable lesson that day: always read The Book and stay aware of any changes. The Books are published and changed for a reason—to keep YOU alive and safe. ♦

—MSG Shane Curtis is an Aviation Systems Safety Manager for the CH-47 at the U.S. Army Safety Center. He can be reached at DSN 558-9859 (334-255-9859), or e-mail shane.curtis@safetycenter.army.mil.

Investigators' Forum

Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

What We Do...

Insight from an aviation accident investigator

CW4 David Laramore
U.S. Army Safety Center

As an Army Aviator and accident investigator assigned to the U.S. Army Safety Center (USASC), a lot of people have asked me what accident boards really do when they are deployed. I would like to explain our purpose and goals so everyone can understand what we do and how we do it.

The primary objectives of our investigations are to identify causal factors and/or system deficiencies and then make recommendations to remedy causes and minimize the chance of similar recurrences. To put it simply, we want to know what happened, why it happened, and what can be done to prevent it from happening again. Our goals are to save lives, reduce damage to equipment, and maintain the fighting force for commanders.

Before explaining how the board works, I'd like to start with a little background information. Inevitably, we have to start our investigations by quoting a regulation. According to Army Regulation (AR) 385-40, any Class A or Class B accident, along with any Class C aviation accident, must be reported to the USASC. For all Class A and selected Class B accidents, our first-up team is dispatched from Fort Rucker, AL, to conduct a Centralized Accident Investigation (CAI).

This team includes, at a minimum, two people—a board president (LTC or MAJ) and a board recorder (CW4 or CW5)—from the USASC. These two individuals are the core of the accident board, and they are schoolhouse-trained in accident investigation procedures. A point of contact is assigned as well, usually a trained safety officer assigned by the appointing authority. Since we don't know everything about all the systems in the Army inventory, we also have subject-matter experts (SMEs) to assist us. The SMEs are drawn from other units and include (at a minimum) an instructor pilot (IP), a flight surgeon, a maintenance test pilot, and a technical inspector for the involved aircraft. Technical advisors from Corpus Christi Army Depot (CCAD), TX, and the system manufacturer also may be used.

So, where does the priority of our investigations fall in the grand scheme of things? There are three types of investigations that can occur: a Criminal Investigation Division (CID) investigation; an accident investigation; and a collateral investigation. Representatives from CID are on-site before we arrive in most cases, and they either will have released the site or be able to tell us that no criminal intent was found. If we start an investigation and find criminal intent, we stop and let CID take over. Only the factual, non-privileged portions of our investigation are then turned over to them.

In an accident investigation, we have priority for access to evidence, witnesses, and the accident scene. However, a spirit of cooperation with the collateral board is required. In that spirit, we begin to turn over common-source, factual, non-privileged information to the collateral board as soon as we have reviewed and recorded it.

Now, let's get into the meat of the subject. What do we do, and how do we do it? The first-up team is required to be deployable within 2 hours of notification. The team is placed on orders

for the duration of the investigation, typically 14 to 21 days; however, we do not leave until we are sure we have all the facts and evidence. I will say this now and a couple more times as we go: OUR INVESTIGATIONS ARE FOR ACCIDENT PREVENTION PURPOSES ONLY! People must know we need the facts so we can prevent the same accident from happening in the future.

Accident investigations are conducted FOR ACCIDENT PREVENTION PURPOSES ONLY! We want to make sure the same accident doesn't happen again to your unit or another somewhere in the world.

No witness statements are taken; instead, we conduct interviews with those involved and write witness summaries. This is so people will feel free to talk to us without fear of retribution from the chain of command. Remember, our investigations are not for legal or punitive purposes, and the USASC has an assigned legal officer to protect the confidentiality of the information we gather.

Everyone involved in an accident investigation must be as honest and forthright as possible. We need to know everything, even if it is admitting a task was done the wrong way. Perhaps others Armywide are doing the same task the wrong way as well. In that case, we must change how the task is being performed. USASC investigators also have access to a worldwide accident database to determine trends and pinpoint recurring problems in different systems. Should your unit experience an accident or incident, report it. If we don't know about it, we can't fix it!

A timeline for the investigation already has been established before we arrive on-site. Phase one of the investigation is the organization and preliminary examination, where the board president has his or her inbrief, organizes the board, assigns duties and responsibilities, takes control of the site, and does an initial site assessment. Generally, this phase takes 1 to 2 days.

Phase two—data collection—begins on day 3. During data collection, we look not only at the accident, but also at the unit as a whole and the chain of command, up through the appropriate Major Command (MACOM). This process allows us to make accident prevention recommendations all the way up to the Department of the Army (DA). Not only do we handle witness summaries, we also inspect the unit's maintenance and personnel records, personnel equipment (kneeboards and ALSE), and duty logs; check weather; and perform any equipment teardown or operational checks. This process could take 3 to 8 days.

Analysis and deliberations make up phase three. At this point, we begin putting all the pieces together. In order for the correct conclusion to be reached, all the gathered information must be accurate and truthful. This process requires 4 to 7 days. Phase four—completing the field report—occurs between days 12 and 18. When the report is completed, the findings are staffed through USASC SMEs as a quality assurance measure. Once we have a "go" on our results, we outbrief the chain of command. The outbrief is made up of two parts: an informal pre-brief with the unit and their higher command (if time, location, and schedules permit), and then a formal outbrief with the MACOM involved.

For several different reasons, individuals often are reluctant to talk or interact with us. A few of these "myths" include:

- We are out to get the pilots or the crews.
- We are out to get the chain of command.
- We are here because the unit is messed up.
- We are here to upset as many people as we can in the shortest amount of time.

In fact, these myths couldn't be farther from the truth: We want to prevent another accident from happening, and we have very strong feelings about it.

There are several different factors that make people feel uncomfortable around us, too. Some of these include:

- We are from the outside, not part of that unit.
- We don't know the people involved.
- We disrupt the unit's routine.
- We ask that a lot of information be made available to us in a short amount of time.
- We aren't there because you had a good day.
- We are a DA-level investigation.

What accident investigations come down to ultimately is this: We take our jobs and your life very seriously. There is no need to feel uncomfortable; after all, accident investigations are conducted FOR ACCIDENT PREVENTION PURPOSES ONLY! We want to make sure the same accident doesn't happen again to your unit or another somewhere in the world. ♦

—CW4 David Laramore, Aviation Systems and Accident Investigation Division, USASC, DSN 558-9856 (334-255-9856), e-mail laramord@safetycenter.army.mil

WAR Stories

There I was...

LTC Cynthia Gleisberg
U.S. Army Safety Center

The Need to Know

I was 18 and a student at Florida Institute of Technology (FIT), enrolled in the aviation program. I started college in July, right after my high school graduation to take advantage of a summer on the beach in Melbourne, FL. The FIT summer program was an accelerated course for earning my private pilot's license. I took academic classes each morning for 8 weeks and flew every afternoon.

Soon into the course, I got to make my first solo. Under the watchful (and prayerful?) eye of my instructor standing near the edge of the runway, I flew the traffic pattern three times with relatively smooth landings. That lesson was a great success (at least it seemed so to me).

After I had proven that I could land the aircraft without the aid of an experienced instructor, I was permitted to fly solo away from the airfield. On my first such solo, with just over 10 hours of flight experience, the syllabus called for me to fly to the training area and practice various maneuvers. I was to practice lazy 8s, turns about a point, and stalls.

I ran through the 8s and the turns several times each without any difficulty. I was quite confident in my flight skills, so I proceeded to practice stalls. The standard in the training syllabus was very clear: climb to 5,000 feet above ground level (AGL) to initiate the maneuver. I saw no purpose in that guidance. I was going to climb the aircraft, allow the wings to stall, let the nose fall forward, and gently add power and fly out of a shallow dive. I was flying a Piper Cherokee 140 and it was a very stable aircraft. I was great; the aircraft was great; I had nothing to fear...or so I thought.

In violation of the syllabus standard, I was about 1,200 feet AGL when I initiated my stall maneuver. I pulled back on the yoke, and the Cherokee started to climb. This climb was faster than I remembered from the prior stall practices with my instructor on board, and the airspeed was not bleeding off very quickly. I passed through 2,000 feet and continued climbing. I thought back to my 1 week of aerodynamics training

and realized that without my instructor's weight, the Piper would probably perform better. So, I banked the wing and entered a turn to add to the weight (g-load) of the aircraft. It was at that precise moment that the wings stalled.

Well, the way I practiced stalls in my vast 10 hours of experience was nose up, stall, fall forward, and pull out. This stall was different: nose up, BANK, stall, SPIN!!!! At first I thought, "This is cool!" Then, reality set in—I didn't know how to recover from a spin! I looked out my windshield and saw a flurry of green with a slight hint of blue swirling around it. I was in a steep dive with the aircraft spiraling VERY quickly to the ground.

I pulled back the yoke to bring up the nose, but the darn aircraft wouldn't respond! I pushed the yoke forward and pulled it back again. I guess I thought recycling the controls would change things. It didn't. I continued to spiral toward the ground. More green flurries and little spots of blue sky crossed my view.

Somehow, I ended up in such a steep dive that I was standing on the rudder pedals. My weight must have rested more on one pedal than the other because I stopped the spin. Once that happened, I was able to pull back on the yoke and get a response; finally, the aircraft pulled out of its crazy dive. I was barely 500 feet AGL. Within a few more seconds, the police would have been notifying my parents of my untimely death.

I pulled out of the dive and flew directly back to the airfield, scared and angry. I was scared because I had almost killed myself. It was my fault for not following the standard, but it was also my instructor's fault. When I asked her why she had not covered spin recovery with me before my solo, she told me I didn't need that yet. She also said that Cherokees were stable and unlikely to spin; thus, I never would need spin training while flying the Piper 140.

My instructor was wrong! Yes, the aircraft is unlikely to spin, but when you make major weight changes to the aircraft such as halving the number of occupants, you change the normal characteristics. I weighed about 98 pounds at the time. My instructor weighed much more. That weight loss dramatically changed the flight characteristics. Instructors should cover those points with novice aviators.

When I first soloed in a TH-55, I was up to about 105 pounds and my instructor was pushing 240. He remembered to warn me that a different cyclic position would be needed to lift off to a hover without him in the aircraft. Had he not warned me, I might have had a dynamic rollover right on the ramp.

I encourage all instructors and unit trainers to recognize the overconfidence your junior aviators have in themselves and never assume they don't need to know something yet.

All crewmembers should know the steps to recover from every conceivable emergency.

But, back to the story... The standard for 5,000 feet AGL maneuver starts was wise, but no one ever explained to me that the standard was for my benefit. It was to give me added time to recover the aircraft from the stall (or, in my case, spin!). If I had understood the purpose, I would have taken the standard more seriously.

I encourage all instructors and unit trainers to recognize the overconfidence your junior aviators have in themselves and never assume they don't need to know something yet. You never know when an emergency will occur, so all crewmembers should know the steps to recover from every conceivable emergency. ♦

—LTC Cindy Gleisberg is the Command Judge Advocate of the Army Safety Center and a former Black Hawk maintenance pilot with the 101st Airborne Division. She earned her FAA private pilot's license at the age of 18 and her commercial and instrument tickets before she was 20. She can be reached at DSN 558-2924 (334-255-2924) or e-mail cynthia.gleisberg@safetycenter.army.mil.

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A Formula for Safety—Oct
Bridging the Gap Between Lack of Experience and Safety Excellence—Sep
I'm Excited to Join Your Team!—Jul
Keep Your "Leader Lights" On—Aug
Keeping the Attack Aggressive on Deadly POV Accidents—Mar
Keeping Our Guard Up—Jun
Leading is not Always Easy, but Profoundly Rewarding—Feb
Managing Risks Prevents Fratricide—Jan
Remembering Heroes and Keeping Future Ones Safe —May
Safe Aviation Operations—It's a Team Sport!—Nov
Safety Success in Korea: Leadership in Action—Dec

DEPLOYMENT
Aviation Maintenance in the Desert—Mar
Get-Home-Itis!—Jul
Going Somewhere?—Feb
Operations in Afghanistan —Feb

DES
Improper Hardware Installed on OH-58A/C—Jul

DYNAMIC ROLLOVER
A New Look at an Old Problem...Dynamic Rollover—Jul

EMERGENCY PROCEDURES
Don't Whine About Chapter Nine!—Oct
Emergency Procedures—Know Them BEFORE You Need Them—Oct

FALL PROTECTION
Integrating a Fall Protection Strategy—May

FARP
I Knew Better (Refueling)—Mar
Safe and Effective FARP Operations—Mar
The Danger of the Assumption (Refueling)—Mar

FLIGHT DATA RECORDERS
FDR System Overview—Aug

FOD
24th Annual National Aerospace FOD Prevention Conference—Jul
All But One (FOD)—Jul

FRATRICIDE
Fratricide: Reducing Self-Inflicted Losses—Jan
Managing Risks Prevents Fratricide—Jan

HOT WEATHER
Hot Stuff for Aviators—Apr

HUMAN FACTORS
Human Error and Individual Failures in Army Aviation Accidents—Nov
Human Factors in Aviation Maintenance—Nov

INSTINCT
Basic Instinct—Sep
Things That Go Bump in the Flight—Sep

INADVERTENT INSTRUMENT METEOROLGICAL CONDITIONS (IIMC)
Easy Approach to Instrument Flying—Aug
Lightning Strikes Two Ways—Aug

INVESTIGATORS' FORUM
Gremlin Light—Do We or Don't We? (Misdiagnosing Emergencies)—May
Just How Valuable Are Hazard Maps? (Wire Strike)—Nov
Perishable Skill—Currency is Not Proficiency (NVGs)—Feb
The Danger of the Assumption (Refueling)—Mar
UH/MH-60 Lessons Learned —Jun

JOEY
Keep the Happy in the Holidays!—Dec
Where's the Ground?—Nov

LEADERSHIP
Leading is not Always Easy, but Profoundly Rewarding—Feb
One Moment Can Affect a Lifetime—Jan

MAINTENANCE
AH-64D Longbow Tool Kit Modification Authorization—Mar
All But One (FOD)—Jul
Aviation Maintenance in the Desert—Mar
Human Factors in Aviation Maintenance—Nov

MISCELLANEOUS
A "Sometimes Humbling" Experience—Jul
Above the Best—Aug
What We Do...Insight from an Aviation Accident Investigator—Dec
Attack Aviation in Restricted Terrain—Sep
To Bury a Son—May

NCO CORNER
A Push in the Night (Crew Coordination)—Oct
Get "On-Target" With Your

Weapons Training—Jul
I Am Still Here—Jun
One Moment Can Affect a Lifetime—Jan
Wrong Part, No Book—Dec

NVGs
NVG Desert Operations—Apr
Perishable Skill—Currency is Not Proficiency—Feb
Taking Back the Night—Apr
The Black Hole of Night: Shipboard Operations—Apr

NEWS & NOTES
Correction: 2002 AAAA Winners!—May
Infantry Combat Boot Approved for Army Aviation Use—Feb
Storage of Pilot Equipment—Jan
Update on the New Boot—May
Yaw Kick—Jan

OBSERVATION/SCOUT HELICOPTERS
Improper Hardware Installed on OH-58A/C—Jul

OVERCONFIDENCE
Basic Instinct—Sep

PERFORMANCE
2003 Flightfax Standardization Review (STACOMs)—Dec
A Closer Look at FY03 Accidents—Jun
CH/MH-47 Safety Performance Review—May
FY03 Aviation Safety Performance Review—Dec

POSTERS
"A Troop Who Rode One In"—Jan
Army Safety Center at Your Service...for FREE!—Sep
Don't Whine About Chapter Nine!—Oct
Heat Injuries are Preventable—Apr
Keep the Happy in the Holidays! (Joey)—Dec
Routine Mission? I Don't Think So!—Aug
Speed Kills, Slow Down!—Mar
Use Extreme Caution! (Mines & UXO)—Feb
Use Risk Management—May
Where's the Ground? (Joey)—Nov
Wrong Assumption!—Jun
You Don't Need a Slope to Have a Dynamic Rollover—Jul

POV
I Am Still Here—Jun
Keeping the Attack Aggressive on Deadly POV Accidents—Mar
Speed Kills, Slow Down!—Mar

POWER MANAGEMENT
Power Management—What Is It?—Jun

PPE
PPE: It Can't Protect You If You Don't Wear It—Apr

REFRACTIVE LASER SURGERY
Refractive Surgery for Army Aviation—Jan

RISK MANAGEMENT
Assessing Mission Risks Versus Just Checking the Block—Jul
Brownout: Reducing the Risk—Nov

SAFETY MESSAGES
Recap of Selected 1st & 2nd Qtr—Jun

SAFETY PROGRAMS
Wartime Safety—Feb

SHIPBOARD OPERATIONS
The Black Hole of Night: Shipboard Operations—Apr
Aircraft Refueling and Defueling Aboard Navy Ships—Jun

STANDARDS
Never Underestimate Those "Simple" Missions—Aug

STRESS
High Temperatures and High Stress—Aug

TAIL ROTOR FAILURE
Things That Go Bump in the Flight—Sep

TRAINING
Preparing for the NTC—Feb
Unit Training and the New Aviator—Feb
Who Ya' Gonna Call? (MTT, JOPD, Assistance Visits)—Feb

UTILITY HELICOPTERS
Dust Takeoffs and Landings in the UH-60—Dec
Ensure Faceplates are Correct for PDUs—Jul
UH/MH-60 Lessons Learned—Jun

WAR STORIES
A Dark and Stormy Night (Complacency)—Apr
All Things Considered (Brownout)—Oct
Engine Flameout—45 Seconds to Initial Impact—Jan
Get-Home-Itis!—Jul
I Knew Better (Refueling)—Mar
The Need to Know—Dec
You Don't Know as Much as You Think—Aug

WIRE STRIKE
Just How Valuable Are Hazard Maps? (Wire Strike)—Nov

WEATHER
Lightning Strikes Two Ways—Aug

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

D Model

■ **Class C:** At approximately 200 feet above ground level (AGL) and 80 knots true airspeed (KTAS) during aircrew training manual (ATM) training, the pilot on the controls attempted a nap-of-the-earth (NOE) deceleration. The rate of descent became excessive, and the aircraft descended to approximately 80 to 100 feet AGL. The aircraft then encountered brownout conditions, and the pilot in command (PC) took the controls to try to recover from the maneuver. However, the aircraft continued to descend and impacted the ground. The PC increased the collective to climb out of the brownout conditions, but the multifunction display (MFD) showed a UTILITY HYDRAULICS PSI warning and pressure dropped to 0 to 500 psi. The PC declared a precautionary landing, safely landed the aircraft, and called air traffic control to initiate aircraft recovery procedures.

CH-47

D Model

■ **Class C:** Aircraft encountered extremely dusty conditions during a battalion air assault mission while carrying a sling-loaded HMMWV. The pilot initiated an approach to the landing zone, which was a hard-ball road, but brownout conditions were encountered again. Visibility with the ground was lost. The crewmember calling the load was directed to release the vehicle as soon as it contacted the ground. The vehicle was released as it contacted the ground, and the HOOK OPEN lights illuminated. The pilot began his climb out, but the crewmember told him to stop because the forward hook did not open. The aircraft was unable to hold its position over the load due to the dust and the attempted climb. The pilot told the crewmember to release the load again, but the crewmember was slow to react. The load finally was released by the pilot.

OH-58

D(I) Model

■ **Class C:** Aircraft reportedly experienced engine and transmission overtorque readings (128 percent and 131 percent [mast] for 4 seconds, respectively) during a quick reaction force (QRF) mission.

D(R) Model

■ **Class A:** While attempting takeoff over an ordnance berm, aircraft experienced brownout conditions and struck the ground on the opposite side of the berm. The aircraft had refueled at a forward area refueling point (FARP) and had tried to climb over the berm several times. The aircraft's landing gear collapsed, and the tail boom, tail rotor, and main rotor were damaged in the accident. No personnel were injured.

■ **Class A:** Aircraft landed hard on a single-ship maintenance test flight. The hard landing caused the skids to spread, and the main rotor blade struck and severed the tailboom.

UH-60

L Model

■ **Class B:** Aircraft was Chalk Two in a flight of four conducting an air assault under night vision goggles (NVGs) when it hit a rock outcropping in the LZ. Unaware of any damage, the crew returned the aircraft to the pickup zone (PZ), where the APU FIRE light illuminated. The APU was not running at the time, and the mission was halted. During post-flight inspection, damage was noted on the aft underbelly of the cargo door. The sheet metal, stringer, and antenna were damaged, and the tail rotor was scratched.

■ **Class C:** Aircraft was on final approach to landing when brownout conditions were encountered at 15 feet AGL. In response, a go-around was initiated. The crew chief (CE) told the PC that one passenger had exited the aircraft. The crew immediately landed the aircraft and began a search for the missing passenger. The missing soldier was found with fractures to the pelvis and femur. The aircraft was not damaged.

UH-1

V Model

■ **Class D:** At approximately 50 feet AGL and 30 knots indicated airspeed (KIAS) on an approach to a landing zone (LZ), the main rotor blades contacted a tree at the aircraft's 10 o'clock position. Climb power was applied, and the approach was aborted. The PC, who was in the left seat and on the controls, felt no abnormal indications in the flight controls and decided to return to the airfield. Post-flight inspection revealed damage to both main rotor blades.

Editor's note: **Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Iraqi Freedom. We will publish those details in a future *Flightfax* article.**

A lot of soldiers, civilians, and families will be traveling to visit family and friends this holiday season. Plan ahead for your safety and the safety of your family. Apply the same risk management principles to your off-duty activities as you do on the job — only then can you be sure that you and your family have nothing but happy memories of the holidays this year.

From our family to yours, we wish you a truly happy, healthy, and safe holiday season.

U.S. ARMY SAFETY CENTER