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REPORT OF ARMY AIRCRAFT ACCIDENTS

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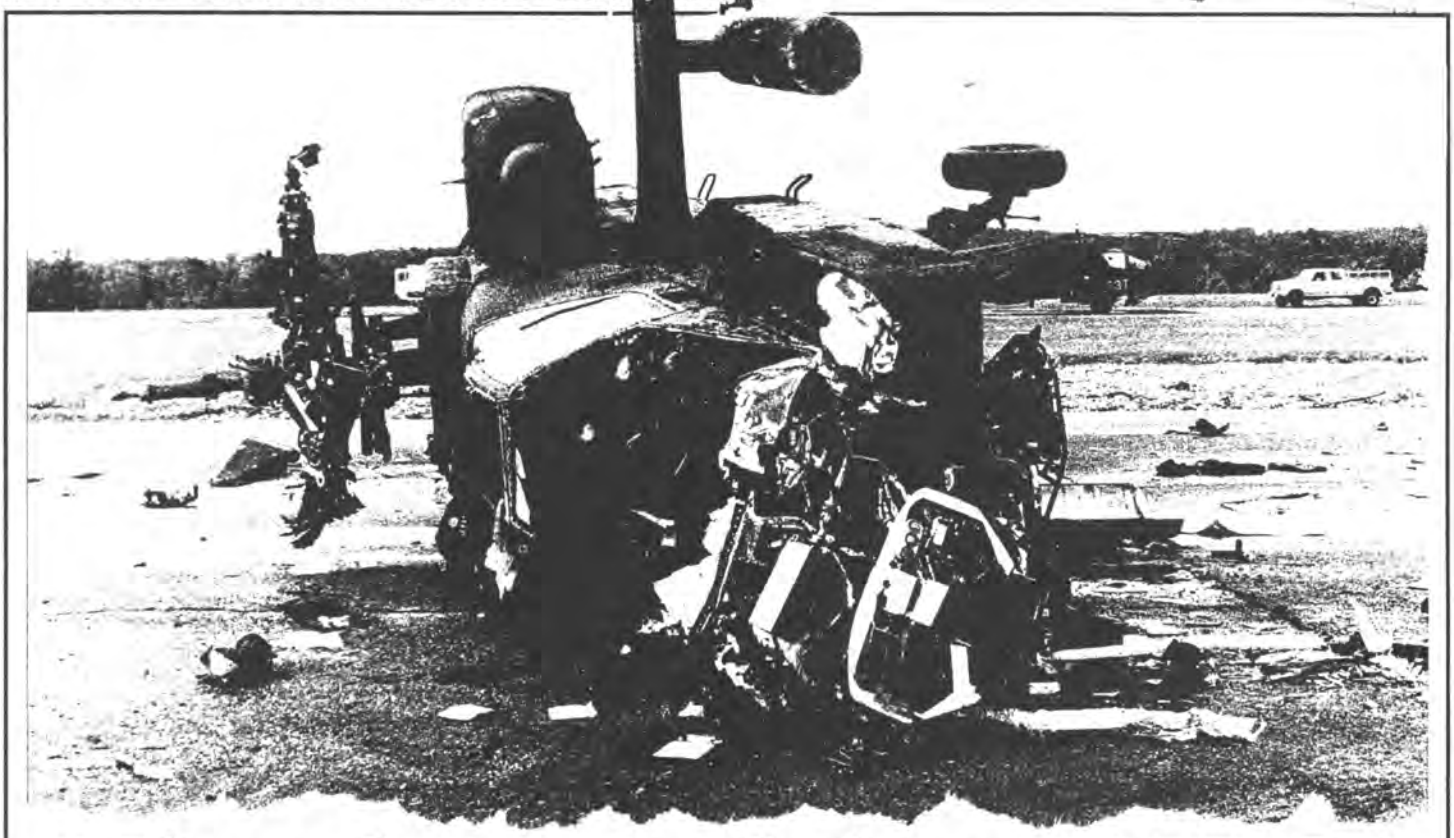


Microburst claims AH-64

During a day VFR training flight, the AH-64 was on lane No. 1 when rain intensified to the point that the rated student pilot could not maintain visual reference using his pilot night vision system. The pilot transferred the controls to the instructor pilot (IP), who elected to return to parking. Cleared by the tower to return to parking, the IP was ground taxiing the aircraft across lane No. 3 when the tail was lifted by strong winds from the northwest. The aircraft became airborne in an extreme nose-low condition and subsequently began a rapid right spin about the nose of the aircraft. As the aircraft completed approximately 180 degrees, the main rotor blades flexed down and struck the right side of the front cockpit canopy structure, instrument panel, nose of the aircraft, and the asphalt surface of the taxiway. The aircraft continued to spin to the right and came to rest on its right side.

Although the isolated rainshower had appeared virtually harmless, the onset of the microburst was so sudden and so violent (as high as 89 knots) the IP was unable to maintain control of the aircraft. An environmental phenomenon known as a "microburst" claimed his life and destroyed an almost $11 million aircraft.

Microbursts

Due to their small size, short lifespan, and the fact that they can occur over areas without surface precipitation, microbursts are not easily detectable using conventional weather radar or wind-shear alert systems. At best, present systems can only detect microbursts as they are occurring. Reliable forecast techniques have yet to be developed.

Microbursts are probably one of the most alarming meteorological phenomena known to aviation. The danger from a microburst stems from the combination of its unpredictability and its violent power. A severe microburst can be produced by any moderate convective activity, even the most innocuous-looking rainshower.

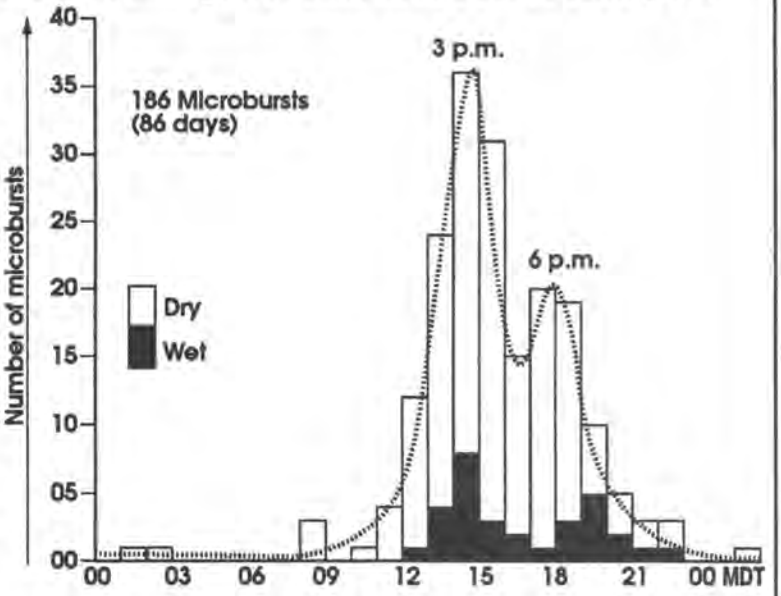


Figure 1. Diurnal variation of microbursts

Definitions

A microburst is a subtype of the meteorological phenomenon known as a downburst, which is a classification of a downdraft. A downdraft results when the upper-level winds associated with convective activity reach the ground. Every thunderstorm produces a downdraft.

A downburst is a strong downdraft that induces a strong outburst of damaging winds on or near the ground. This downburst is stronger than the main downdraft and affects a smaller area. A downburst is classified as either a microburst or macroburst, depending on the spatial and temporal scale involved. A typical downburst affects a 5-kilometer (3-nautical-mile) area.

■ **Macroburst.** A macroburst affects an area ranging from 4 kilometers (2.4 nautical miles) to 40 kilometers (24 nautical miles) with damaging winds lasting from 5 to 20 minutes. The strongest downburst ever recorded was 67 meters per second (150 miles per hour) at Andrews Air Force Base on 1 August 1983. This event occurred 6 minutes after Air Force One had landed.

■ **Microburst.** A microburst ranges in size from 0.4 kilometer (.24 nautical mile) to 4 kilometers (2.4 nautical miles), and peak winds generally last from 2 to 5 minutes. These peak winds create an average differential velocity of 12 meters per second (27 miles per hour) to 24 meters per second (54 miles per hour) but can achieve much higher speeds.

Depending on the amount of precipitation reaching the ground, downbursts are further classified as either wet or dry. There is no correlation between the intensity of the downburst and whether the downburst is wet or dry. Further, the ratio of wet to dry downbursts seems to be geographically dependent. An extensive study of downbursts near Chicago found that 64 percent were wet compared to a study of downbursts near Denver in which only 17 percent were wet.

Physical causes

The physical forces that create a downburst are not completely understood. Several theories exist that attempt to explain the energy required to produce the magnitude of wind speeds witnessed; however, none are definitive yet. One thing is certain, there is a strong correlation between solar heating and the occurrence of downbursts. As shown in figure 1, downbursts rarely occur before 1100 or after 2300 local time.

Effects on aircraft

The first indication of a typical aircraft encounter with a microburst would be an increased headwind (normally a 20- to 30-knot increase). This will cause the aircraft's nose to pitch up and

the indicated airspeed (IAS) to increase. Normal pilot response would be to decrease power and reestablish correct pitch attitude. As the aircraft enters the core of the downburst, the pilot will probably perceive a sinking sensation, along with a descent indication on the vertical speed indicator (VSI). Once the aircraft exits the core of the downburst, a strong tailwind will exist, causing a loss of IAS and increasing the descent of the aircraft. Due to the speed of these changing conditions, recovery at low altitude can be extremely difficult (see figure 2).

It is very important that the pilot recognize the microburst quickly, apply maximum power, and achieve the best rate-of-climb attitude in order to safely transit the microburst. Remember that an average microburst has a differential velocity of between 12 meters per second (27 miles per hour) and 24 meters per second (54 miles per hour). This means that within a 5-kilometer (3-nautical-mile) area, a pilot could encounter a headwind of 60 knots, followed quickly by a tailwind of 20 knots.

As illustrated in a recent AH-64 accident, the potential for microburst damage to aircraft at NOE altitude or during ground operations is high even if only apparently harmless-looking clouds or isolated showers are present. And because of the wind speeds involved, microbursts can easily cause damage to parked aircraft too. Dash 10 procedures should be followed at all times even when the aircraft is on the ground and cannot avoid the microburst.

At this time, there is no adequate way to forecast downbursts. The latest Doppler radars can perceive the wind shear in a microburst as it is occurring. But no technique currently exists for recognizing signatures in advance of their actual occurrence.

Microbursts are unpredictable, and they can be deadly. Staying alert and abreast of the weather situation—even if it's only harmless-looking clouds or an isolated rainshower—will enable you to respond quickly if a microburst is encountered.◆

POC: 1Lt Ryan W. Myers, USAF, Assistant Staff Weather Officer, Detachment 9, 1st Weather Group, DSN 558-3902

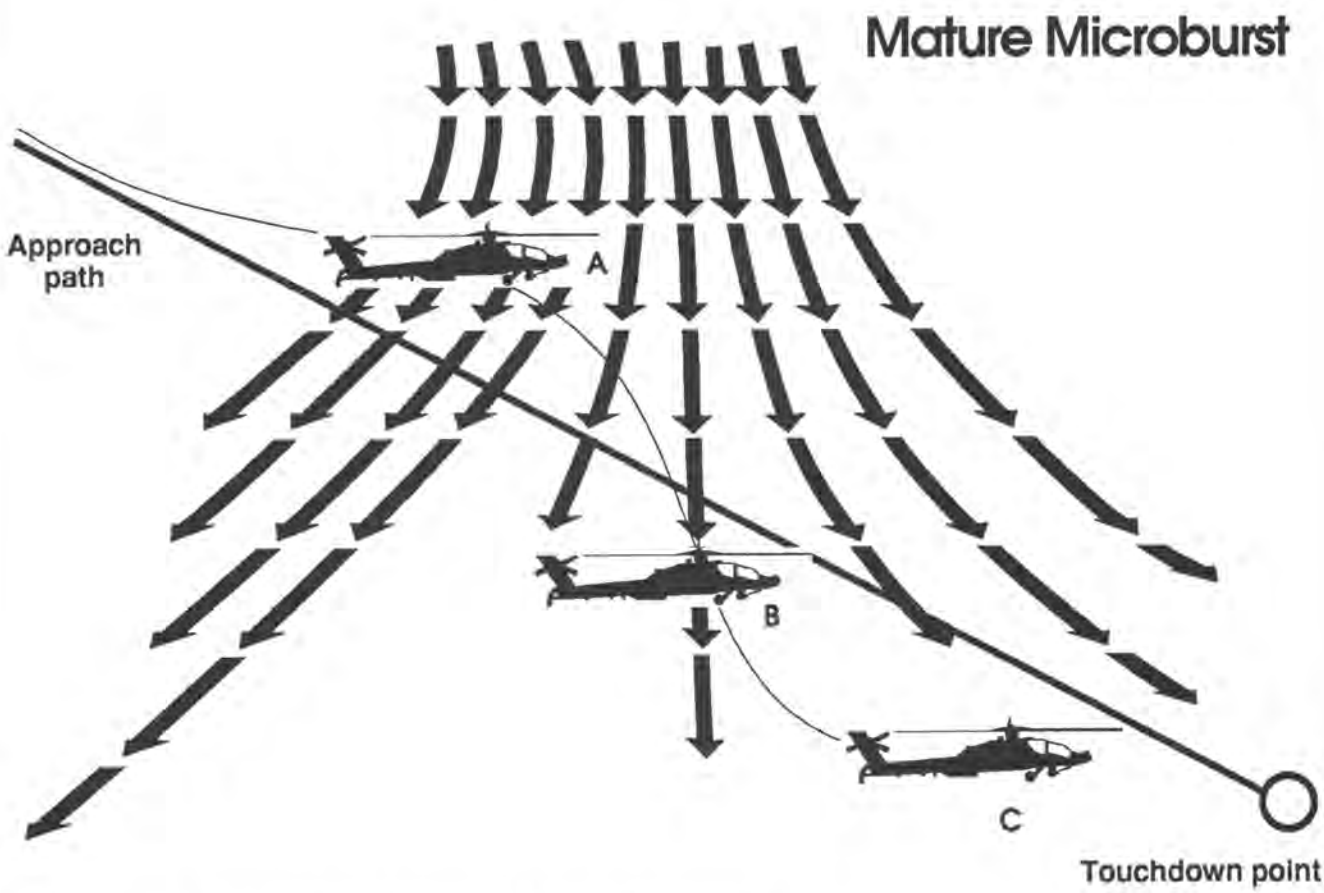


Figure 2. Microburst encounter by helicopter during final approach

(Editor's Note: Although the following article specifically addresses the H-60 ESSS/ERFS mission kits, the Apache community may find the information of interest since the AH-64 also has the long-range deployment system. If any of the AH-64 units are having problems with their long-range deployment system, we ask that you forward the information to the Safety Center through the Preliminary Report of Army Mishap (PRAM) system. Please submit a PRAM even if the problem does not meet the established criteria for submitting a PRAM.)

H-60 ESSS/ERFS mission kits

Use of the H-60 external stores support system (ESSS) and extended-range fuel system (ERFS) mission kits as daily mission equipment carries some increased flight risk for aircrews. The ESSS auxiliary management system was originally developed to satisfy an operational requirement for the H-60 to have a self-deployment capability. The system was designed for ferry missions and to be removed from the aircraft before conducting "normal" operations.

It was not until the ESSS auxiliary fuel management system development and qualification program was well underway that its potential for use in a greater variety of missions became widely recognized. Due to the increased flexibility offered by this system, employment of the ESSS/ERFS has evolved from the original operational concept to a point where apparently the ESSS/ERFS is sometimes permanently installed on helicopters for everyday use whether truly needed or not.

Limitations of ESSS/ERFS

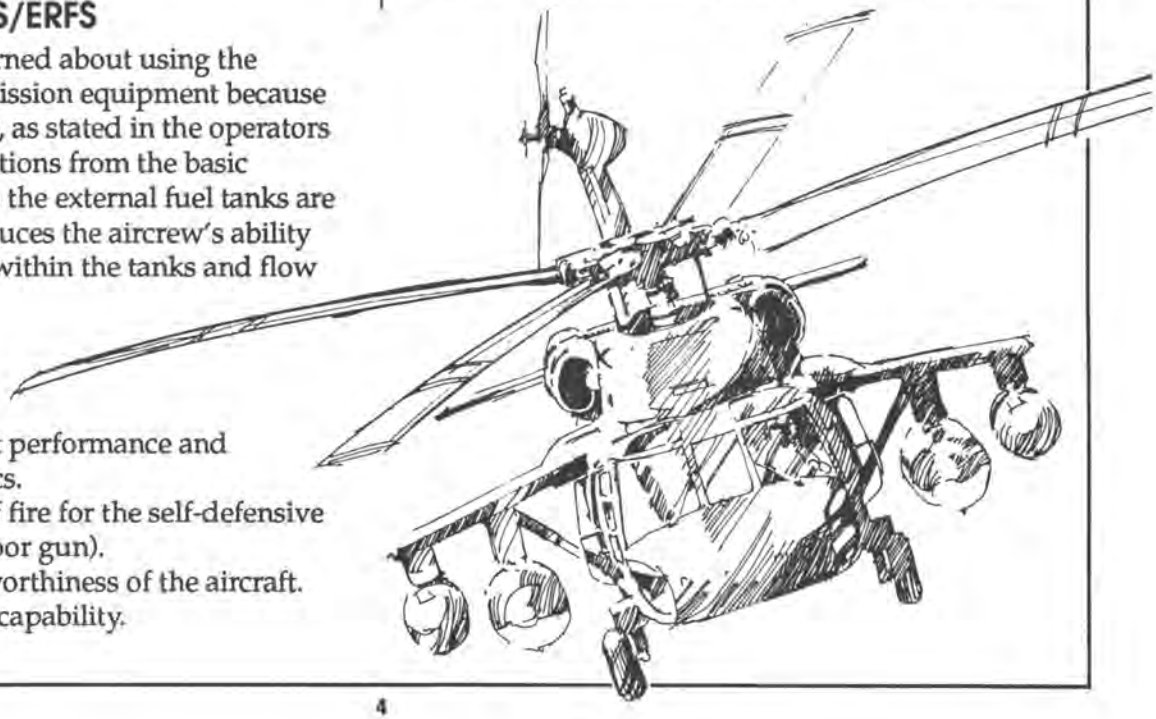
Units should be concerned about using the ESSS/ERFS as daily mission equipment because it has some limitations, as stated in the operators manual, that are reductions from the basic helicopter. In addition, the external fuel tanks are not gauged, which reduces the aircrew's ability to monitor fuel levels within the tanks and flow rates from the tanks to the internal main tanks. Other limitations include—

- Degraded aircraft performance and handling characteristics.
- Degraded field of fire for the self-defensive armament weapon (door gun).
- Degraded crashworthiness of the aircraft.
- Degraded egress capability.
- The external 230-gallon tank itself. The tank was not designed to be as ballistically tolerant or crashworthy as the helicopter's internal main fuel tank system, which increases the potential for postcrash fires.

To illustrate the increased risk that may be associated with the use of the ESSS and ERFS mission kits, a recent UH-60 accident involved the crew's inability to recognize and properly react to a lateral center of gravity (CG) shift caused by asymmetric fuel transfer from the outboard external fuel tanks. The helicopter impacted on the right outboard 230-gallon tank, which was full. The tank ruptured, resulting in an immediate flash fire that destroyed the aircraft. Recent flight testing has shown that lateral cyclic controllability may be significantly diminished in extreme out-of-balance conditions.

Other ESSS/ERFS problems

Following this UH-60 accident involving the ESSS/ERFS, the Safety Center has received several calls concerning problems with the ESSS.



For example, in extremely cold environments, the bleed air pressurized lines have apparently frozen, causing a nontransfer of fuel, which in turn can result in asymmetrical fuel loading.

When aircraft with the ESSS installed are not flown for a prolonged period, the ejector mechanisms corrode and may cause the tanks to seize and not jettison properly. In an emergency, asymmetrical jettison of the wing stores could cause a lateral CG imbalance, further complicating existing emergency conditions.

The Army is researching and validating these reports of problem areas and will follow up with additional information to the field.

Additional data needed

The Safety Center's data base has limited information concerning problems associated with the ESSS. In an effort to obtain more information, we ask users in the field to forward information about any problems they encounter or have encountered with the ESSS. This information should be forwarded using the PRAM system even if the problem does not meet the established criteria for submitting a PRAM. This request for information does not alleviate the requirement or need to prepare and submit a Quality Deficiency Report (QDR) and other deficiency reports or recommended technical manual (TM) changes to the Aviation and Troop Command (ATCOM).

Corrective actions

As a result of the recent UH-60 accident and separate deficiency reports received from field units, the Army has taken the following actions to improve the ESSS/ERFS for everyday mission use:

- Released UH-60-93-ASAM-10 dated 012000Z Apr 93 to establish and clarify cleaning procedures and requirements for the ESSS pneumatic lines, check valves, and bleed air regulator valves within the TMs.
- Released UH-60-93-ASAM-13 dated 011432Z Jun 93 to provide supplemental operational and emergency ESSS/ERFS procedures for the operators manual.
- Released UH-60-93-ASAM-14 dated 161534Z Jun 93 to require a one-time inspection of ERFS ejector racks, clarify that the 120-days clean BRU-22A/A ejector rack and firing lead cable requirement must be accomplished regardless of squib firing, and provide notification of changes required to the TMs.
- Initiated development of training films to provide enhanced maintenance and operating information for the external auxiliary fuel system.

In addition, the Army is considering the following materiel changes:

- Incorporation of an auxiliary fuel-gauge system to provide additional visual information regarding fuel quantities in external fuel tanks and asymmetric fuel transfer from the external tanks, which could lead to a shift in lateral CG.
- Incorporation of a manual override and bypass system to provide the capability to manually override an electrically failed fuel transfer valve or to manually bypass a failed bleed air regulator valve.
- Enhancements to flight simulators to incorporate scenarios for asymmetric fuel transfer and extreme lateral CG offset; for example, one full tank on the right outboard station and one empty tank on the left outboard station.

Risk assessment

Without question, there are situations in which the everyday use of the ESSS/ERFS has proved invaluable; for example, Desert Shield/Storm and Somalia, where the mission probably could not have been accomplished without it. However, commanders need to be aware that the ESSS/ERFS was not designed to be used as daily mission equipment. When considering its use, commanders should ask the following questions and build the answers into their mission risk assessment:

- Is the ERFS necessary for mission success or simply a convenience? If its use is a convenience, then consider alternative fuel sources. Elimination of the ERFS eliminates any associated flight risk.
- Will the mission profile require tight or rapid maneuvering or large roll angles? If yes or possibly yes, then be aware that aircraft performance requirements may be greater than the performance available. And if there is a significant lateral imbalance, lateral (roll) control could become a problem.
- What is the crew experience level with ERFS? If the experience level is low, consider pairing up lesser-experienced pilots with higher-experienced pilots or keeping a light mission profile. Good crew coordination concerning fuel management can reduce many of the risks associated with the ERFS.
- Have crewmembers been trained in

accordance with ATCOM message UH-60-93-ASAM-13 to recognize problems with fuel transfer? If not, then the risk is obvious. All crewmembers contemplating ESSS/ERFS operations must read and understand the contents of the ASAM. A copy should be placed in the operators manual until its contents are incorporated into a future change to the manual.

■ What is the maintenance history on the particular ERFS? Any indication that the system is not working properly raises the risk level.

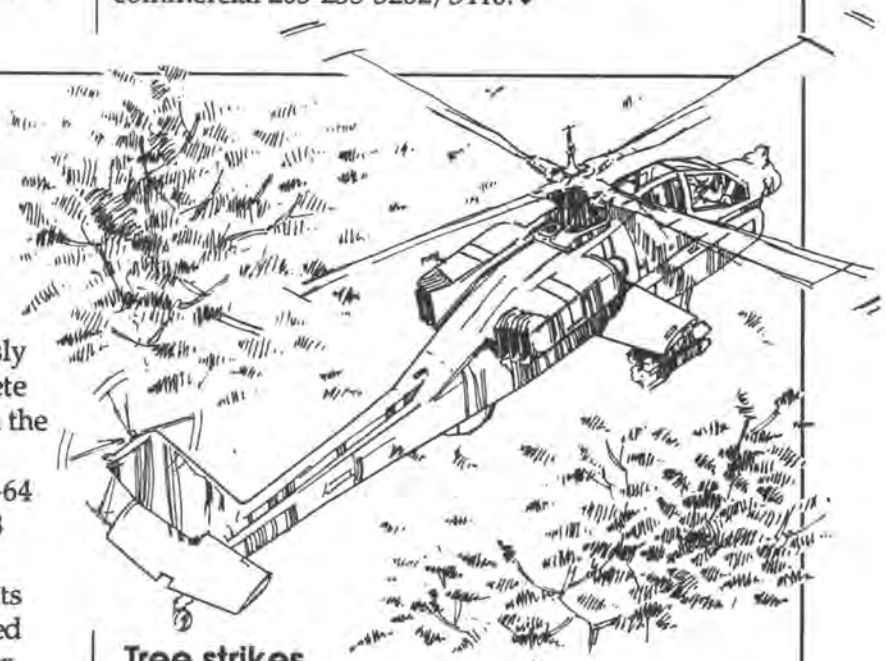
Points of contact

Anyone with questions or comments about the ESSS/ERFS should contact the following people:

■ MAJ Ken Gwynne, Army Aviation Center, DES, DSN 558-2442/6309, commercial 205-255-2442/6309.

■ MSG Robert E. Price or MAJ James Dunn, Army Safety Center, DSN 558-3262/3410, commercial 205-255-3262/3410.◆

AH-64 update



Since 1988, 6 soldiers have died and another 21 have sustained disabling injuries in 25 Class A AH-64 flight accidents. And we have destroyed and seriously damaged the equivalent of almost two complete attack battalions in Class A and B accidents. In the last 24 months alone, we have destroyed 11 Apaches. Total costs of Class A through C AH-64 flight accidents for FY 88 through 31 May 1993 exceeds $240 million.

Disturbed by this alarming jump in accidents within the AH-64 community, a team composed of representatives from the Army Safety Center, Directorate of Evaluation and Standardization, Aviation Training Brigade, Aviation Branch Safety Office, and TSM-Apache at Fort Rucker, AL, was formed to identify problem areas. The team's analysis of Class A through C accident data from FY 88 through 1 March 1993 identified the most frequently occurring accident types as tree strikes, wire strikes, object strikes, flying into the ground, and multiaircraft accidents.

With the information obtained from the analysis, along with recommended prevention measures, the team developed a briefing to assist individual crewmembers, crews, and commanders in attempting to reverse these accident trends. Although 22 percent of the accidents analyzed were the result of materiel failures, this article, which has been adapted from the AH-64 briefing, addresses only the accidents that were the result of human errors. Hopefully, the article will serve as a refresher to those who have heard the briefing and will provide useful information for those who have not yet received the briefing.

Tree strikes

Tree strikes accounted for about 36 percent of the Class A through C AH-64 accidents. By far, the most frequently occurring accident scenario involved the main or tail rotor blades striking trees. Of the 24 accidents involving tree strikes, 4 were Class As, 5 were Class Bs, and 15 were Class Cs. Total cost of these accidents was more than $46 million. Note that the number of Class Cs is relatively high compared to the number of Class Bs and As. There is a very good chance that these Class Cs could just as easily have been Class Bs or As had the aircraft struck a larger limb or the main trunk of the tree.

■ **Scenarios.** The following Class A and C accident scenarios describe typical tree-strike accidents:

• *Class A.* The accident aircraft was Chalk 3 in a night, multiship, deep-attack, battalion training mission. The back-seater was using the pilot's night vision system (PNVS), and the front-seater was using the target acquisition designation sight (TADS) during battle-position operations. While in an out-of-ground-effect

(OGE) hover, the aircraft entered a left, rearward, descending drift and struck trees with the main and tail rotor systems. The aircraft then began an uncontrolled right spin and impacted the ground on its right side in a nose-low attitude.

• *Class C.* After completing a situational training exercise, the crew arrived at the battalion forward arming and refueling point (FARP) and established an OGE hover. While waiting for the ground guides, the crew allowed the aircraft to descend into a tree. Neither the PC nor pilot detected the descent or the contact with the tree. The pilot initiated a go-around when he noticed that the radar altimeter was indicating zero altitude. On the next approach, the crew landed at the FARP and received hot refueling. After completing the refueling operations, the crew departed for their home station. During the postflight inspection, the PC found damage to the stabilator and the four tail rotor blades.

■ **Prevention measures.** Although you are probably already familiar with the following prevention techniques and procedures, a thorough review of the training and standardization ideas should be helpful. Crews should—

• Follow procedures in the aircrew training manual. Conform to established standards.

• Be very thorough and careful in maintaining—

- Takeoff obstacle clearance
- Planned terrain flight speeds and altitudes
- Approach obstacle clearance
- Hover position **and altitude**

• Be particularly cautious in areas of low contrast and definition. Be aware of motion perception deficit (undetected motion).

• Practice emergency procedures in the combat mission simulator while occupying a firing position/battle position (FP/BP).

• Be cautious when making the transition from en route to a hover mode.

• Refer to appropriate system symbology to assist in stabilizing the aircraft in the FP/BP. Don't rely on the human proprioceptive system for aircraft motion cues.

• **Not wait until you are overtasked to ask for assistance.**

Commanders and leaders should—

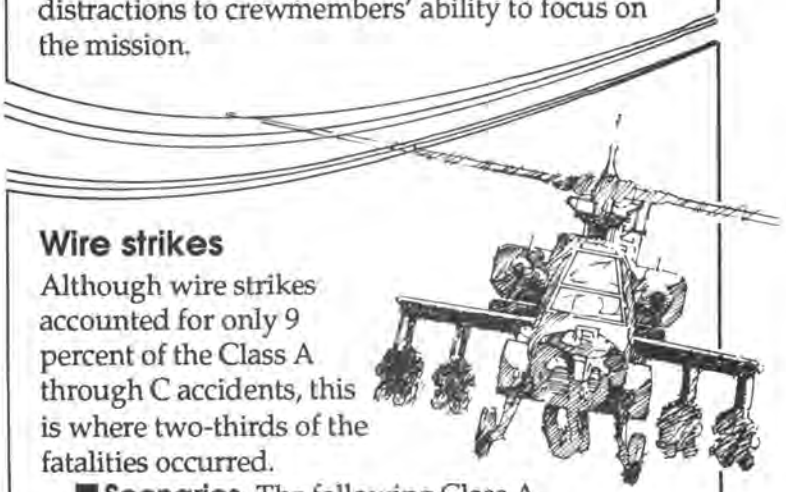
• Adhere to the crawl-walk-run approach to training. Train air mission commanders in their duties and responsibilities. Start with simpler missions and progress slowly to the more difficult. In several of the accident cases studied, individual aviators were trying to do too much to run a mission and not enough to help maintain aircraft control. Remember, first things first—control the aircraft.

• Accomplish missions in the daytime the same way you expect to do the mission at night. Each daytime iteration then becomes a rehearsal for the more complex night mission.

• Be willing to increase aviator and crew annual iteration requirements.

• Start with the higher ambient light levels when in the "crawl stage" of night operations. An AH-64 accident profile developed by the Safety Center shows more night accidents occur during darker nights. While FLIR is not illumination-dependent, additional illumination may assist crews when using their unaided vision.

• Start training again slowly as crewmembers turn over due to movements, retirements, and the effects of downsizing. You may need to temporarily return to the crawl mode and build from there. Additionally, consider any prolonged absences, family difficulties, or other distractions to crewmembers' ability to focus on the mission.



Wire strikes

Although wire strikes accounted for only 9 percent of the Class A through C accidents, this is where two-thirds of the fatalities occurred.

■ **Scenarios.** The following Class A scenarios are typical of wire-strike accidents:

• During a night vision systems mission, the lead aircraft descended into wires during an attempted under-wire crossing. The aircraft crashed and was consumed in a postcrash fire. Both pilots were killed on impact.

• Following a night low-level, deep-attack training mission using night vision systems, Chalk 4 in a flight of four struck a ¾-inch multistrand cable on the return route from the battle position. The aircraft crashed in a 36-degree nose-low, 34-degree right-roll attitude onto the top of a berm. Both

crewmembers were killed.

■ **Prevention measures.** Although the following wire strike avoidance techniques and procedures aren't new, they are still as valid as they were when they were originally developed and published in Flightfax:

• Post hazard maps and keep them up-to-date.

• Do a hazards reconnaissance to identify wire hazards if you're operating in a new area.

• Mark wires when possible. While wire markers may not be visible under all flight regimes, placing markers on wires is a cost-effective way to avoid the next wire strike.

• Minimize contour flight. Contour flight keeps the aircraft in striking range of many of the "monster wires" or multistrand wires that are most dangerous. If contour flight is necessary, careful and thorough mission planning can mitigate the risk of a wire strike.

• Go slower at lower altitudes.

• Remain oriented on the map. Most wire strikes occur when the aircrew isn't where they think they are. Ask for help if you become misoriented. Everyone has been lost at some time.

• Do not assume the other aviator sees the wires. If a sister ship is getting close to wires, don't assume the crew sees the wires. Say something—even if operating under radio silence.

Flying into the ground

The next most frequently occurring kind of accident is described as flying into the ground, which usually results in the total loss of the aircraft. Fortunately, accidents of this kind make up only a small percentage of the total.

■ **Scenarios.** The following scenarios may not seem related, but the causal factors are very similar:

• While attempting a night visual flight rules (VFR) departure and climbout from an unattended airfield, the aircraft entered into instrument meteorological conditions (IMC). The maintenance test pilot (MP) on the controls in the back seat experienced spatial disorientation while in a climbing right turn. The aircraft descended while in the right turn and crashed through large pine trees approximately 0.6 miles east of the point of departure. The pilot in the front seat was killed.

• While on a day VFR tactical training flight, the pilot-in-command (PC) of Chalk 3 in a flight of three AH-64s in free cruise formation initiated a descending right turn to reposition behind Chalk 2. The aircraft descended into trees, traveling 334 feet before coming to rest on its right side. The aircraft was destroyed, and the pilot, flying in the front seat, sustained head and chest injuries.

■ **Prevention measures.**

• In these as in other incidents where an aircraft was flown into the ground, the crew had a breakdown in their scanning. Cross-checking flight instruments as well as avoiding fixation on any one point of reference can allow the crew to detect an unwanted rate of descent before it is too late to recover.

• Crew coordination is also important, especially when one crewmember becomes spatially disoriented. In the first scenario, the back-seat pilot announced that he was experiencing vertigo, but the front-seat pilot did not take control of the aircraft or give assistance in transitioning to instrument flight. The front-seat pilot had the cyclic in the stowed position, which limited his ability to assist in recovering once the aircraft entered IMC.

• Maintain situational awareness.

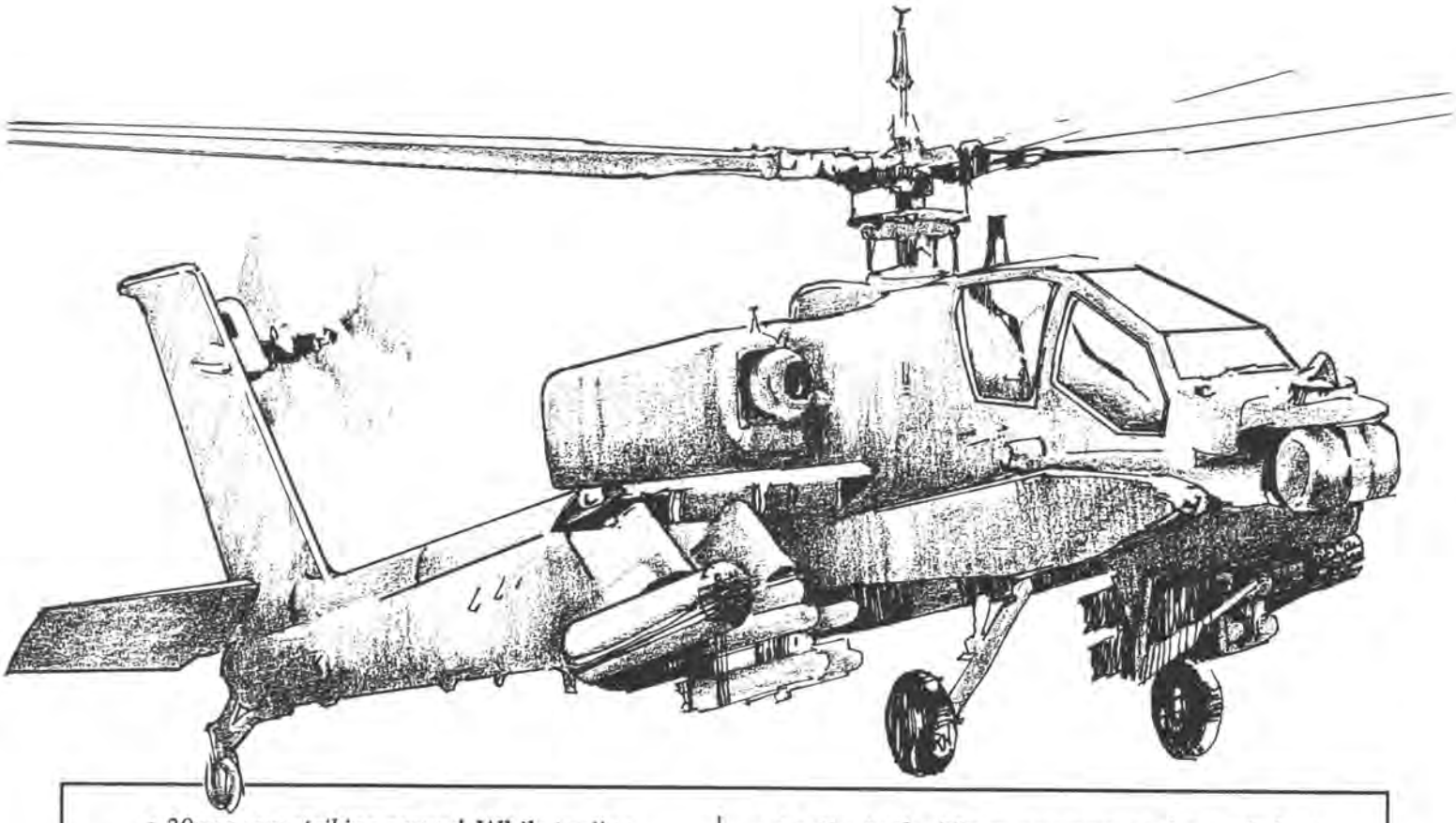
• Never stop flying the aircraft.

Object strikes

Object strikes accounted for 9 of the 69 Class A through C accidents from FY 88 to 1 March 1993. The three major categories are main rotor blade strikes to the PNVS, which caused two Class B and two Class C accidents; the 30mm gun flexing downward and digging into the ground, which caused three Class C accidents; and FOD, which caused one Class A and one Class C accident.

■ **Scenarios.** Although we haven't had a huge number of accidents involving PNVS strikes, crews sticking the 30mm gun into the ground, and FOD, the following are typical examples:

• *PNVS strike.* The crew was preparing for a running takeoff when the rated student pilot (RSP) noted a flickering master caution light accompanied by a flickering accessory oil PSI segment light. The IP took the controls, returned to the parking area, and instructed the RSP to start the APU. When the APU was engaged, smoke billowed from the aircraft. During the emergency egress, the RSP kicked the cyclic from the IP's hand, resulting in the main rotor striking the PNVS turret. The smoke emanated from a shaft-driven compressor that dumped oil onto the catwalk area. The damage was caused by the RSP knocking the cyclic out of the IP's hand.



• *30mm gun striking ground.* While taxiing, the CPG actioned the 30mm gun. The barrel dropped and struck the taxiway. The oil-low utility hydraulic caution light came on. Once the gun was stowed, the aircraft was parked and shut down. Inspection revealed that the squat switch was not adjusted properly, which allowed the 30mm gun to flex past the limiting feature.

• *FOD.* During a training flight, the aircraft experienced a loss of directional control due to the loss of the tail rotor assembly. The IP, flying from the back seat, autorotated into a grove of pine trees. The front-seat pilot was killed, and the IP was seriously injured. Inspection revealed that the door-locking device was not secured and subsequently departed the aircraft. It struck a tail rotor blade, causing an imbalance and complete loss of the tail rotor assembly.

■ **Prevention measures.**

• The Apache community has already taken some actions to remedy the PNVS-strike problem, such as instituting egress training as part of the aircraft qualification course at the Army Aviation Center at Fort Rucker, AL, and changing the dash 10 to require the battery power and force trim remain on in the case of emergency egress.

• For the 30mm gun problem, a squat switch gap clearance check is being added to the -238-PM. A message was sent to the field and a caution is being added in the dash 10 stating "Do not activate the 30mm weapons action switch at altitudes below 10 feet AGL (radar altimeter reading) or during ground taxi operations because a system malfunction may allow the gun to depress past the limiting feature and strike the ground."

• To correct the door-locking device FOD problem, "Remove Before Flight" streamers are now required to be attached to door-locking devices. This should be viewed as a bandage fix to the root problem of fixing the lock already on the aircraft. Until a systemic fix is emplaced, be very cautious of these local door-locking devices and make sure they are properly stowed before flight.

Multiaircraft accidents

Accidents involving multiaircraft accounted for only 3 percent of the Class A through C accidents. However, there were no Class C multiaircraft accidents, which clearly reminds us that when multiaircraft accidents do occur, the results are costly.

Normally, we think of multiaircraft accidents as midairs—a frightening thought to all aviators. But we must remember that not all multiaircraft accidents occur at altitude; some happen even after the aircraft are back on the ground. Crews sometimes forget that the mission isn't over until the aircraft stops moving and the engines are shut down.

■ **Scenarios.** The following examples illustrate a typical midair multiaircraft accident and a multiaircraft accident that occurred on the ground.

• A group of four AH-64s had been conducting simulated attacks and had returned to a holding area. The flight lead and Chalks 3 and 4 landed while Chalk 2 orbited the three aircraft in order to provide radio contact with the controller. After a short time, the three aircraft on the ground took off from the field location. Chalk 2 was at the flight's 3 o'clock position and began to maneuver into the normal No. 2 position of an echelon right formation. At an altitude of approximately 75 feet and 40 knots, Chalk 2 started to approach the lead aircraft from lead's right rear and above. Chalk 2 continued to close with Chalk 1 until the CPG of Chalk 1 saw Chalk 2 and ordered the pilot to turn left. In the attempt to avoid contacting Chalk 2, the pilot of Chalk 1 rolled the aircraft left and the main rotor system of Chalk 1 contacted the left side of Chalk 2. Chalk 2's rear fuel cell ruptured and the fuel ignited, engulfing both aircraft in flames as they fell to the ground. Both aircraft were destroyed, but surprisingly, no one was killed.

• In another accident, an aircraft was making a night vision system approach to the rear assembly area. On short final, the crew extended their approach due to a foxhole to their front, then became distracted while looking for armament grounding stakes sticking out of the ground. The aircraft became enveloped in dust and began drifting left where it impacted with another aircraft on the ground. Both aircraft sustained major damage; however, there were no injuries to any of the crewmembers.

■ **Prevention measures.** In the first scenario, the obvious lesson learned is that crews shouldn't try to make in-flight joinups during the takeoff phase. Further, any in-flight joinup requires a thorough understanding by all participating aircrews of how the maneuver is to be done. If at any time during the joinup, visual contact is lost with the formation aircraft or things just don't feel right, back out and start over.

In the second scenario, the result was the collision of two helicopters, but the cause was brownout.

• Don't begin an approach to an area conducive to brownout or whiteout until the crew has discussed go-around procedures. Be willing to go around.

• Don't rely solely on symbology during any phase of flight, particularly an approach.

• Use FLIR-compatible landing area markings whenever possible.

Class D and E accidents

In addition to reviewing the Class A through C accidents, the team also looked at D and E reports to see if any trends could be identified.

■ By far, the most frequent cause of Class D mishaps was unsecured engine cowlings.

■ Unplanned jettison of external stores was next and seemed to happen most when a crewmember punched a button without confirming that it was the correct switch.

■ And finally, our old nemesis the tree strike. There were lots of Class D tree strikes—cases where small twigs or branches were hit.

Human error

Human error remains the principal cause of aircraft accidents. The problem areas identified aren't new; they are the same ones identified in previous studies:

■ Scanning and crew coordination failures account for more than 50 percent of the problem areas encountered. Scanning and crew coordination are closely related. For example, crewmembers often fail to announce that they are leaving a sector of scanning responsibility to perform other crew duties rather than monitoring aircraft clearance. This is especially true during firing position operations.

■ Failure to detect hazards and properly estimate distance or closure rates are responsible for 24 percent of the Apache crew-error accidents. Crewmembers typically fail to detect inadvertent drifting or loss of altitude during hovering operations or fail to estimate aircraft clearance with obstacles in the area of operation.

■ Pre-mission and mission planning failures account for another 18 percent of our AH-64 crew-error accidents. These failures are closely linked with insufficient or poor risk management. Risk management cannot stop with risk assessment.

■ Maintaining or recovering orientation specifically refers to problems with brownout. And crews often try to fly their symbology to the ground without any outside references rather than executing a go-around.

■ Diagnosing or responding to emergencies refers to in-flight engine failures and executing emergency descents to the ground.

ATM tasks

Crews most often encountered the problem areas identified when performing the following ATM tasks:

- *Task 1119. Perform firing position operations.*
- *Task 1035. Perform terrain flight.*
- *Task 1037. Perform NOE deceleration.*
- *Task 1017. Perform hovering flight.*
- *Task 1031. Perform confined area operations.*
- *TC 1-210. Perform mission risk management.*

Scanning and crew coordination are critical during most tasks. They are especially important during firing position operations, terrain flight, NOE deceleration, hovering flight, and confined area operations. Inadvertent drift and loss of altitude are common problems in firing position operations, hovering flight, and confined area operations. Difficulty estimating distance or closure rates is also a common problem during terrain flight tasks.

Currency versus proficiency

An issue that has been examined and reexamined for some time is currency versus proficiency. How do you quantify proficiency? It's a tough question that we in aviation have been wrestling with for some time. We have been able to quantify currency, but currency does not always equal proficiency. An experienced aviator with a lot of time in the AH-64 *may be* able to remain proficient in all tasks by flying 1 hour every 60 days. Then again, maybe not. And as our resources continue to be reduced, the definition of "experienced aviator" may change.

Although Army guidance requires that aviators fly once every 60 days to retain aircraft currency, commanders should consider reducing the time between flights based on aviator experience and capability. For example, new aviators could be required to fly once every 45 days while more experienced aviators may be able to wait the full 60 days. IPs and PCs are good sources of information regarding an aviator's proficiency; ask for their advice. But ultimately, commanders must make the call on an aviator's proficiency. And just because the aviator is a high-time rotary-wing pilot with low AH-64 hours doesn't mean his currency should be stretched to its limits.

Risk management

Present doctrine requires risk management at all levels and during all phases of a mission. Risk management involves more than just risk assessment. The process begins with the requirement to identify the hazards associated with a particular mission. And the five major AH-64 hazards addressed in this article aren't by any means the only ones.

Risks are usually identified as high, medium, or low with the higher risks requiring a higher-level commander or supervisor to approve the mission. Each individual has a responsibility to always reduce the risks as much as possible at his or her level of authority. For example, if you are authorized to approve only low-risk missions and a crewmember brings to you an assessment indicating a low-risk mission that you know is very close to being a medium-risk mission, try to reduce the risks to a medium-low or low-low. However, if the risks cannot be further reduced, then it is also your responsibility to elevate the risk decision to the next higher approving level.

While in flight, crewmembers make many risk decisions. Don't take shortcuts. Make sure decisions are made based on accomplishing the task to standard. Try to reduce the task to the simplest level.

During mission debriefs, try to capture the "what went wrongs" of each mission. No mission is perfect. Be honest, and if necessary, be blunt to ensure the lessons learned are captured and shared with others in the unit.

The goal of every crewmember should be to learn, understand, and be able to apply the risk management process and principles to every task. Smart risk decisions coupled with performance to standard every time is the best way to avoid becoming an accident statistic. Even one fatality, injury, or damaged aircraft is unacceptable. We simply can't afford to lose a single crew or aircraft.

Points of contact

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- CW4 Dave Adams, Aviation Training Brigade, DSN 558-4630, commercial 205-255-4630.
- Mr. Jerry Smith, Aviation Branch Safety Office, DSN 558-2301, commercial 205-255-2301.
- MW4 Gary Kilker, Directorate of Evaluation and Standardization, DSN 558-2532, commercial 205-255-2532.
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Information based on preliminary reports of aircraft accidents

Utility

UH-1 Class C

V series - During counterdrug operations, aircraft struck tree, damaging both main rotor blades. Crew felt no unusual vibrations but found damage during postflight inspection.

UH-60 Class B

A series - During maintenance test flight, crew noted vibrations while hovering. Pilot attempted hovering turn, realized he had no directional control, and executed hovering autorotation. Aircraft came to rest partially on pad with damage to tail boom and drive train. 9334

A series - During air taxi, crew experienced uncommanded right cyclic input. Aircraft contacted ground on right main gear. 9335

UH-60 Class C

A series - IP applied power to start forward rolling motion. As he glanced inside cockpit to determine status of tail wheel, aircraft continued to roll 15 to 20 feet and main rotor struck tail rotor of parked UH-1. IP initiated 45-degree turn and allowed aircraft to roll about 200 feet to a complete stop.

A series - During contour flight, crew placed aircraft in left bank over dirt road and rotor blades struck trees on left side of road. Aircraft began to vibrate, and PC took controls and landed aircraft in open field.

Attack

AH-1 Class C

F series - IP executed evasive maneuver by placing aircraft in right bank. Pilot observed torque reaching 122 percent, and IP immediately placed aircraft in left bank.

F series - While on final unaided approach to level terrain with no obstructions, pilot misjudged speed and distance to ground and failed to recognize excessive rate of descent. Aircraft struck ground and came to rest upright on right pylon stores.

AH-64 Class B

A series - While executing 60-degree banking turn during low-level training, pilot allowed aircraft to descend. PC (who was looking inside cockpit) noted descent, looked up, and verified descent but elected not to take controls. Realizing that pilot was not correcting descent, PC took controls but was unable to recover before aircraft struck ground. 9336

Cargo

CH-47 Class C

D series - As aircraft was taxiing into parking at civilian airfield, rotor blades struck hangar.

Observation

OH-58 Class C

A series - During daily inspection following cross-country flight, crew discovered ½-inch puncture in leading edge of red tail rotor blade. Crew inspected tail rotor driveshaft area for evidence of FOD and found driveshaft coupling bolt. Further investigation revealed that this bolt and L-4 nut had been left in driveshaft area after tail rotor driveshaft maintenance. During flight, nut worked its way out of driveshaft cover and struck tail rotor.

C series - While hovering out-of-ground-effect in masked observation position, both crewmembers heard loud thump as rotors struck tree. Pilot increased collective and applied forward cyclic to clear tree line. Aircraft accelerated to about 5 knots and began to vibrate but remained controllable. Maintaining airspeed, pilot entered shallow descending right turn and landed in large open area.

Fixed wing

C-12 Class C

C series - While at 18,000 feet AGL in light rain, aircraft was struck by lightning. Crew landed aircraft without further incident. Inspection revealed that left engine must be replaced.

For more information on selected accident briefs, call DSN 558-3262, commercial 205-255-3262.

Class A Accidents through June

	Month	Class A Flight Accidents		Army Military Fatalities	
		FY92	FY93	FY92	FY93
1st Qtr	October	1	6	0	2
	November	3	2	4	6
	December	1	1	0	0
2d Qtr	January	3	1	0	0
	February	1	5	0	8
	March	4	1	2	5
3d Qtr	April	1	5	0	0
	May	1	2	1	1
	June	2	0	2	0
4th Qtr	July	2		1	
	August	1		0	
	September	2		0	
	Total	22	23	10	22

U.S. ARMY SAFETY CENTER

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