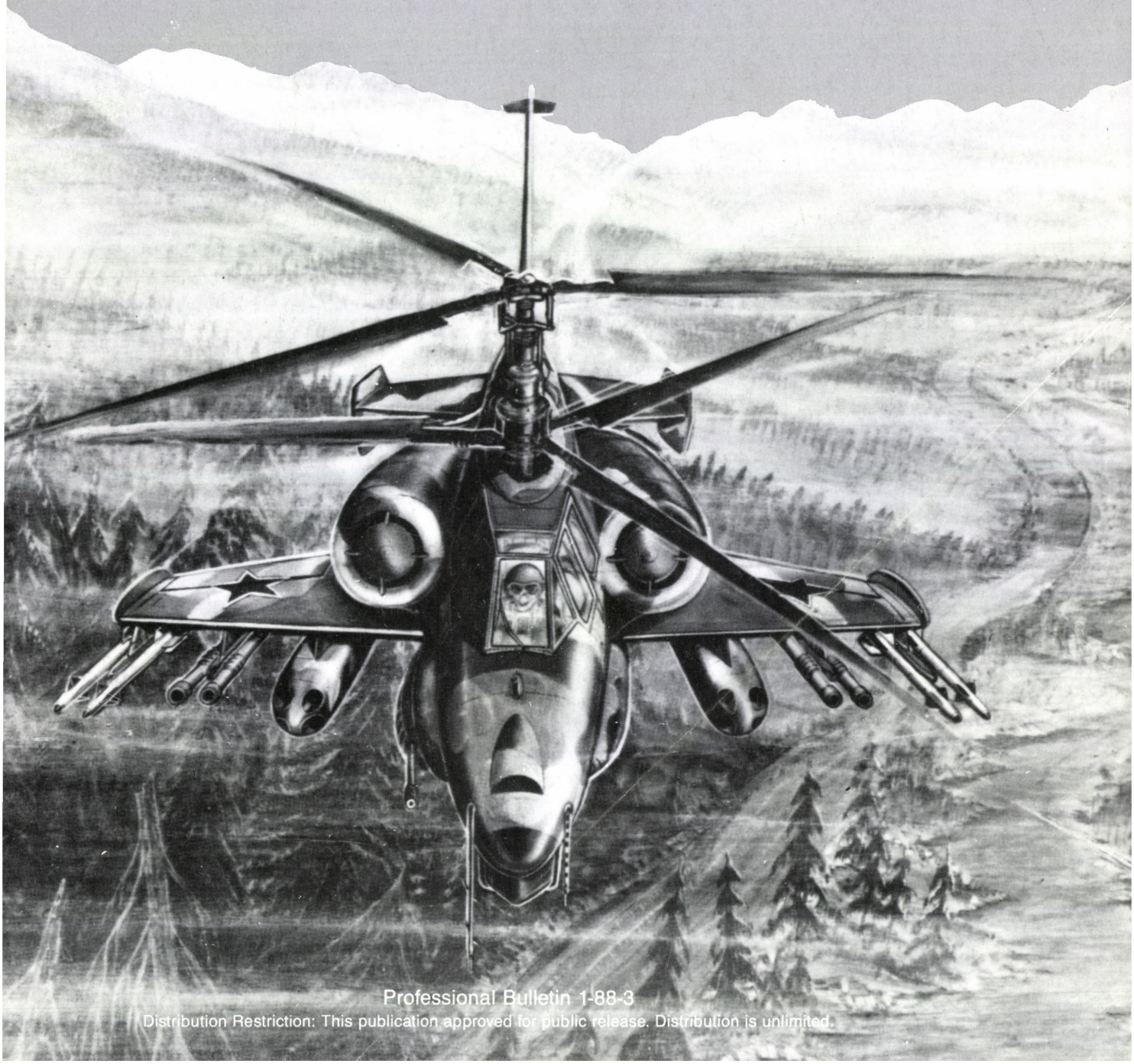
UNITED STATES ARMY

AVIATION DIGEST

MARCH 1988



Professional Bulletin 1-88-3

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PROFESSIONAL BULLETIN

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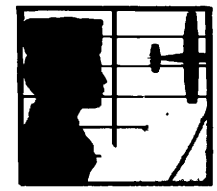
Cover: **Fielding of the Hokem, the Soviets' newest defense helicopter, presents Army Aviation with yet another challenge. Have we lost in our quest to rule the air-to-air battle? This month's lead article, beginning on page 2, answers this question and addresses some startling issues about the "Soviet Helicopter Air-to-Air."**



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RESCUE

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Major General Ellis D. Parker
Chief, Army Aviation Branch

Air Combat Operations

THE REALIZATION of AirLand Battle doctrine will depend greatly upon preserving the maneuver rights of the battlefield's vertical dimension. We realize this as does the Threat. As a consequence the U.S. Army Aviation Center, in concert with the combined arms team, is working to develop the Army's air combat initiative. The groundwork we've laid is beginning to pay dividends.

We've recently released for worldwide staffing the new Field Manual 1-107, "Air Combat Operations," which aligns our air-to-air tactics, techniques and procedures with the combined arms team, the forward area air defense system initiative and AirLand Battle doctrine. This new publication is the result of lessons learned from the Army's air-to-air combat test, phase I (ATAC I) as well as studies conducted by other North Atlantic Treaty Organization countries in a joint effort to doctrinally address the Threat.

What is professed in our doctrine must be practiced. Realistic training is an absolute requirement if we're to be successful in air combat operations. This is progressing now, as we are forwarding an air combat exportable training package (ETP) to the field through the auspices of the Directorate of Evaluation and Standardization. First stop will be U.S. Army, Europe (USAREUR) based units, followed quickly by continental United States organizations, then U.S. Army Reserve and National Guard organizations. The goal is to train and qualify instructor pilots at corps and division levels to permit each organization to train and qualify its aviators consistent with specific mission requirements and resource availability.

To support aviation's air combat training requirement as well as that of other members of the combined arms team, we've recently requested from Army leadership permission to form several opposing forces helicopter detachments. Our goal is to provide the Army combat training centers with a realistic helicopter threat force to foster an awareness of and to facilitate means of killing threat helicopters.

Air combat materiel initiatives are progressing, as evidenced by the planned fielding late next year of the air-to-air Stinger (ATAS) on the OH-58C Kiowa in attack helicopter units in USAREUR. We're also completing the testing and validation of an improved 20 mm cannon fire control and ammunition that will enhance our ability to conduct close-in engagements. Last, we're in concert with the Air Defense Branch in establishing the means of providing the air battle picture to every ATAS equipped helicopter on the battlefield.

With the good news also comes some bad, and that involves the slippage of ATAC II to fiscal year 1989. Because of a number of concerns, we've decided to delay it to provide the most realistic test environment possible. We are absolutely convinced that ATAC II will have the same effect on Army Aviation for air combat that the Ansbach tests of the 1970s had in regard to antiarmor operations.

Air combat operations are no longer fiction and words; they are now a reality. The Aviation Center is working to ensure the means and doctrine are in place to provide the Army a credible air combat capability.

Illustration courtesy of Department of Defense.

Soviet Helicopter

AIR TO AIR

THE SOVIETS, in the near future, will be fielding the Hokum helicopter. When the Hokum does appear, the Soviets will have scooped the West by fielding a helicopter that will give them a significant rotary wing superiority capability. This is not to say that the Soviets have seized the lead in terms of helicopter superiority. It does indicate, however, an initiative that is uncharacteristic for them. We generally think of them as great imitators. We think of them as masters of the reverse engineering method of military hardware development. Why then are

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MONTHLY WRITING AWARD

the Soviets going to be the first to field a dedicated counterair helicopter?

Lessons Learned

The October 1973 Mideast War or Yom Kippur War (YKW), as it so often is referred to, pitted the Israeli Defense Forces against the combined might of the Syrians and Egyptians, who initiated the hostilities. That short, intense conflict, provided us all a preview of what a mid- to high-intensity war would be like.

The Soviet-equipped and Soviet-trained Syrian and Egyptian forces, among other things, provided us a vivid picture of what the high-threat air defense (AD) environment could look like. These forces demonstrated the type of sophisticated AD system that North Atlantic Treaty Organization (NATO) forces could face elsewhere on an even grander scale. As far as the helicopter is concerned, the YKW revealed several facts about combat helicopters with varying implications around the world.

Many countries have tinkered with helicopter military applications for some time. However, the effort has been more pronounced and with more direction since the YKW. In that war, helicopters flew a variety of missions and proved *not* to be the death traps many detractors claimed. Helicopters have been used in air assault, electronic monitoring and detection, jamming, medical evacuation, radio-relay, troop transport, supply and other missions.

The greatest revelation of the war, in terms of helicopters, was that helicopters can do valuable jobs and perform vital functions on the modern battlefield. How they are employed and the techniques for survivability are what make the difference. A good example of how not to employ helicopters occurred in the Middle East when one of the contending factions in a battle attempted an aerial resupply mission. Six helicopters were flying at altitude, in formation, were shot down, in formation, and burned on the ground, in formation.

For the U.S. Army components that were then Army Aviation, the YKW made us refocus our thinking from the complacent smugness and self-satisfaction of our Vietnam experience to the high-intensity conflict. Instead of the ongoing rehashing and reheralding of our exploits during those Republic of South Vietnam years, seemingly overnight we became concerned with aviation roles in combined arms operations in a high-threat environment.

Army aviators have always known they could make a valuable contribution on the modern battlefield. Furthermore, the process of reaffirmation in the days after the YKW, besides purging ourselves of the Vietnam malaise, gave us a golden opportunity to convert the naysayers to Army Aviation. The most attractive part of selling Army Aviation was the antiarmor capability of the attack helicopter. The opportunities for antiarmor attack helicopters, in such a target-rich environment of a future European or Middle East battlefield, were obvious and far too attractive to let pass. Not many countries have let the opportunity pass. Most countries today feature the attack helicopter in their military arsenals, the Soviet Union included.

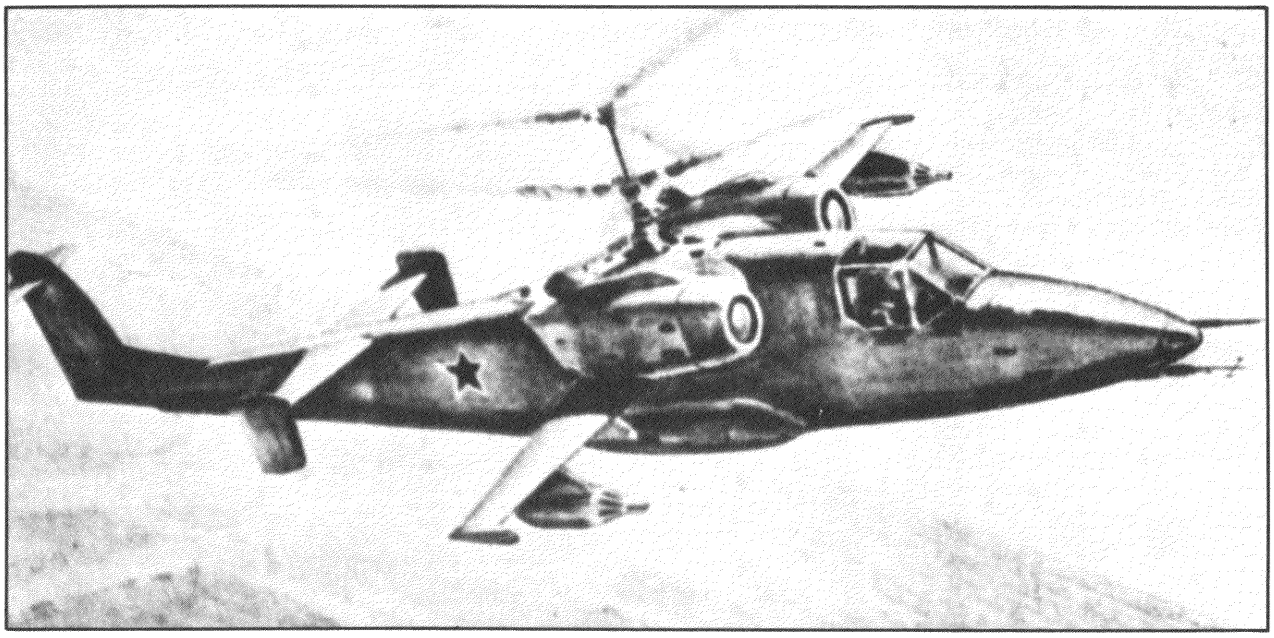
A significant advantage of the aerial delivery of antitank guided missiles is that the target presents a greater silhouette from the air than it does from ground level. This is true even if the aircraft is only hovering at tree-top level. More important, helicopters can engage tanks from a variety of aspects and angles while outside the range of the tanks' guns. Those advantages, combined with the inherent speed and response of helicopters, equate to a flexible and excellent combat multiplier of a kind otherwise unavailable to the ground commander.

During those soul-searching days right after the YKW, a perceptive few articulated the likely possibility of helicopters confronting helicopters on the battlefield. These few did so, noting the proximate employment of helicopters by both the Israelis and the Arabs. But the subject of helicopters in air-to-air (ATA) engagements was an extremely sensitive subject, in the least, the discussion of which was "discouraged." Worse yet was the rekindling of the old "white scarf syndrome" that long had plagued Army aviators—the view by the leg Army that aviators are a bunch of frustrated fighter pilots. (Heck, next thing ya know, these guys are gonna want their own branch of the Army.) So, the issue of helicopter ATA was tabled as far as Army Aviation was concerned. Others, however, were not similarly inhibited—others, such as the U.S. Marine Corps and the Soviet Union.

The Writing on the Wall

During the 1960s, the Soviets exhibited a growing interest in helicopters. That was no secret. They closely monitored the various nations of the west, especially our activities in Vietnam, using the helicopter more and more in military roles. During the early 1960s, the Soviets perceived that helicopters were too vulnerable to operate near the forward line of own troops (FLOT) exposed to hostile fire. Helicopters were fine for rear area logistical support, in other words shuffling people and supplies. The arming of the Mi-4 Hound and later the Mi-8 Hip C/E and their employment in heliborne operations and air assaults seemed a logical progression in the military adaptation of the helicopter. But the Soviets were going to go further with helicopters by including helicopters in ATA roles. The signs were there for us to read, literally. We should have paid greater heed to Soviet military writings, particularly to our old friend Colonel Belov—the leading Soviet helicopter theoretician. We have since come to learn that not all Soviet writing is a product of "DEZINFORMATSIYA," a program of calculated disinformation (curve balls).

As an obscure colonel, Belov wrote an article in the official military publication, *Red Star*, in December 1970,



The Hokum, the newest Soviet dedicated counterair helicopter, will be fielded in the not-too-distant future.

titled, "Aircraft Against Tanks." In the article, he discussed the antiarmor roles of Western attack helicopters. He suggested that, just maybe, the tank may be reaching obsolescence, referring to the tank as a "diesel dinosaur." Imagine that—a Soviet Army officer insinuating that the tank may be obsolete and calling it a dinosaur! Is any army in the world more wedded to the tank than the Soviet Army? One would reasonably expect that such blasphemy should be rewarded with a long tour in far Siberia. But nothing happened. COL Belov and others continued writing articles about helicopters and getting them published. In COL Belov's next article, "Areas for Improvement of the Combat Efficiency of Helicopters," he wrote of the advantage of multipurpose helicopters, their practical suitability for solving a variety of combat problems and their high economy. Now this is interesting, if not remarkable, because of his subsequent position favoring special purpose, dedicated aircraft. He may very well have been responding to some admonishment. This article smacks of the party line regarding development of general purpose helicopters.

COL Belov continued with his articles on the roles and missions of helicopters and on the general impact airmobility was having on modern armies. His articles were inoffensive and created no waves. Then came 1976, the year that saw the appearance, coincidently, of the Mi-24 Hind-D.

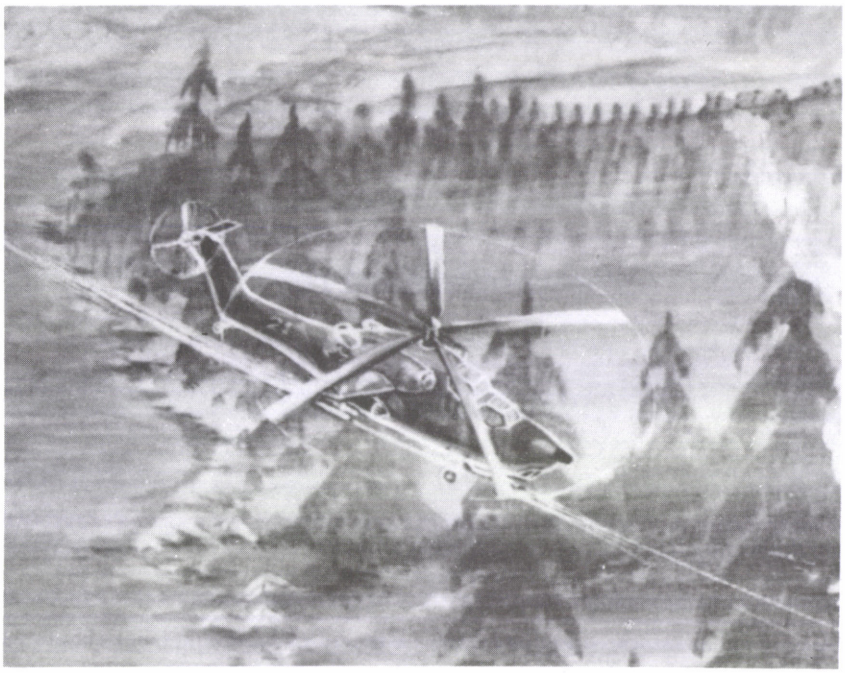
In 1976, COL Belov, in his article, "Helicopters Used by Ground Forces," writes about suitably armed helicopters as being the most effective way of dealing with enemy attack helicopters. Thus, he broaches the issue of helicopter counterair in his writings for the first time. Western nations were moving swiftly at that time, developing attack helicopters capable of operating day and night and during adverse weather. COL Belov obviously perceived that Soviet attack helicopters would be increasingly forced into antihelicopter operations. Remember, if you will, that the United States was well underway with developing a new scout or scout/attack helicopter and a new attack helicopter. The extended range TOW missile was onboard. The HELLFIRE proposal was being discussed. COL Belov did not as yet espouse the "fighter helicopter"—the dedicated helicopter killer idea. The

new Hind-D, an excellent close air support (CAS) platform, might not have been exposed as an unsatisfactory ATA platform at that time. But as the magnitude of the counterair requirement became clearer and, quite possibly with the realization that the Hind, lacking any agility, was not adequate as an ATA aircraft, the most famous and cited COL Belov article appeared.

In 1979, COL Belov's "How to Fight Helicopters" article appeared in the *Soviet Military Review*. In this article, he contended "... helicopters are practically invulnerable to ground antiaircraft weapons ... therefore, it has become vital to get a weapon which could compete with the helicopter in respect to combat power, tactical possibilities, etc. Logic and historical experience suggest that such a weapon is the helicopter itself."

He then reviewed the two viewpoints on developing combat helicopters—general purpose versus special purpose. COL Belov, who just a few years earlier favored the general purpose approach, now spoke the case for the special purpose aircraft. He envisioned a one-man combat helicopter, a lightweight, high-speed aircraft with good maneuverability, armed with cannon and ATA guided missiles. The special purpose aircraft would open up vast possibilities for achieving optimal armament systems. It would allow development of the most effective tactics.

The next year COL Belov was promoted to major general (equivalent to our one-star rank). The 1985 issue of *Soviet Military Power* states on page 65 that, "the new Hokum helicopter will give the Soviets a significant rotary wing *air* superiority capability. This system has *no* Western counterpart." It says much for the Soviets' regard for the tank and their desire to protect tanks that the unique special purpose approach was chosen for the counterair aircraft. So, while MG Belov had really caught the eye of the Soviet movers and shakers, he had not convinced them that the tank was obsolete and a modern day dinosaur. But then, it is doubtful that he ever truly believed that either.



Does being the first to field a dedicated counterair helicopter (the Hokum) indicate the Soviets have taken the lead in terms of rotary wing superiority capability?

Air-To-Air

In an earlier *Aviation Digest* article (November 1984), the Soviets were discussed as being one of the last (of the major powers) to field a dedicated attack helicopter. But when they did, with the appearance of the Hind-D in 1976, they scored an impressive hit. The Hind-D was by far the best attack helicopter in the world at that time. Nowadays, it is popular to refer to the Hind in such terms that it appears as a lumbering Clydesdale in comparison to the sleek stallions like the Apache, Agusta, BO-105 and other emerging attack helicopters.

The degree of derision to the Hind apparently is proportional to its ATA unsuitability. In terms of its ATA application, the Hind is castigated mainly for its lack of agility. What we lose sight of is the fact that the Hind was intended for CAS to ground forces—a helicopter platform of searing firepower and durability that can work effectively in a combined arms role with troops. With more than a ton of armor plate protection and its versatility and dependability, the Soviets have developed great affection for the Hind. They have come to refer to it (and attack helicopters in general) as a "flying tank."

Because of the Hind, helicopters have virtually replaced fixed wing in providing CAS to Soviet ground forces. Helicopters have proven effective, reliable, and more responsive. They have done so because of forward basing, compared to fixed wing, and by being added as organic assets of the divisions. They have the ability to operate in marginal weather (weather that would deny the ground commander CAS from fixed wing aircraft). Helicopter pilots have demonstrated an enhanced capability to more rapidly and correctly evaluate battlefield conditions.

There has been much written and said by both sides—NATO and Soviet

Bloc—on future helicopter confrontations. With the Soviets advancing on the materiel end of the issue, with the development of the Hokum, one can presume something is being done on the human end by practicing ATA in training. Army Aviation is often accused of going overboard on possible Soviet ATA training.

On the other hand, how much ATA training are our attack helicopter aircrews practicing? You may be surprised at what you discover. What must be remembered is that the newer generation of Soviet helicopters will not be similarly handicapped for the ATA role, as is the Hind. If Soviet crews are practicing ATA maneuvering at all today, just think how proficient they will be flying Hokums or Havoks for that matter. They will know the necessary maneuvers. With these newer aircraft, instead of the lumbering Hind, they will have the right tools to do the job. Is the United States losing ground here? Could it be that the initiative and commitment for counterair helicopters *are* shifting eastward? As indicated in the 1985 and 1986 issues of *Soviet Military Power,* the Hokum will give the Soviets a significant air superiority in rotary wing capability, meaning that *initially* they will have a distinct advantage in helicopter-to-helicopter confrontations.

The light helicopter family, if and when it arrives, will have been designed to include the ATA requirement. Until then, the United States will have to adapt its current inventory to meet the ATA requirement by applying some add-on capability. The question is whether our reputed advantage in helicopter technology, including subsystem technology, will provide us the fix so that parity or better accrues to our aircrews.

The issue of ATA superiority is not an insignificant consideration. In our approach to combined arms operations, the attack helicopter as a participant is a vital factor, especially in its antiarmor function. The dilutation of that function, by any means, would have grave consequences for any force operating against a superior adversary having tank-heavy forces. There are many potential means of reducing the effectiveness of attack helicopters.

Helicopters, particularly dedicated helicopters (like MG Belov's "fighter helicopter"), show promise for achieving the greatest success. The fighter helicopter poses a different challenge from most other threats to attack helicopters. Attack helicopters capitalize on their speed and maneuverability to achieve engagement range and line-of-sight (LOS) with potential targets; likewise, the fighter helicopter in ATA operations. The other air defense threat to our attack helicopters *cannot* always maneuver far and/or fast enough to achieve a targeting solution for engagement (range or LOS or both). The exception to this is artillery, which does not necessarily need LOS and can fire over-the-horizon. Thus, with the exception of the fighter helicopter, threat systems must be given LOS and range by the intended target helicopter. Therefore, it appears that MG Belov was correct when he said helicopters are the best means of combating helicopters.

The Soviets will field Hokum and Havoc, each having a designed capability, in some degree, for the ATA role and each being piloted by aircrews who have been rehearsing to perfect the techniques for counterair engagements. The challenge is clear. Our attack helicopters will have to contend with an added dimension to the AD threat.

A forward air controller (FAC) is assigned to ground force regiments. Among his various tasks, an important one is the directing of attacking aircraft to their targets. The FAC in his vehicle has the communications to request and/or direct air assets. The increasing numbers of Soviet combat helicopters deployed enable them to play a greater role in support of ground forces, freeing fixed wing aircraft for other missions. Similar to the manner in which fixed wing aircraft were used, the counterair helicopters' availability would be either as preplanned or on-call assets. In conducting the counterair mission, these aircraft would not stray far over the FLOT, thereby gaining some protection from their own AD systems.

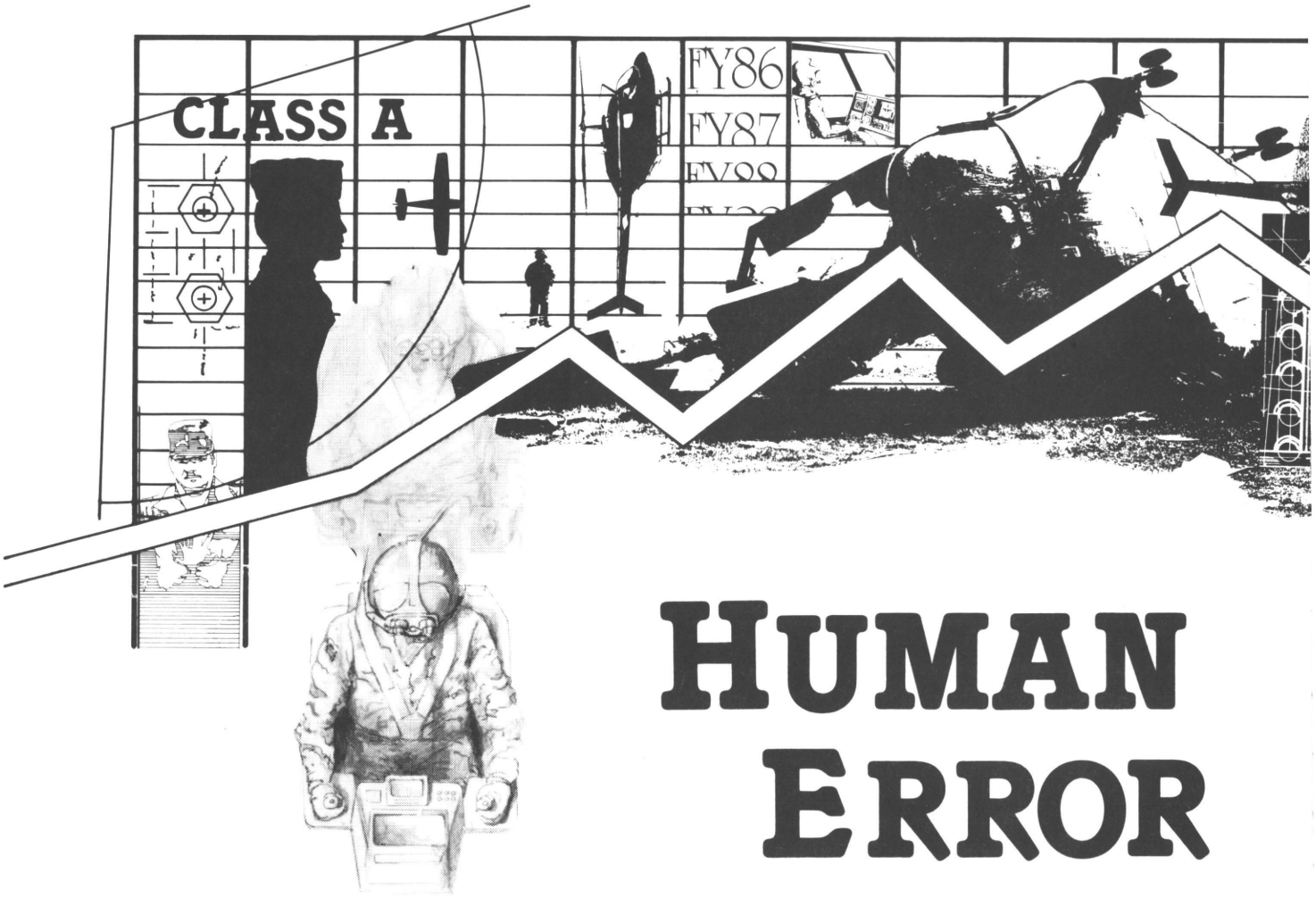
Counterair helicopters will be a factor in the full spectrum of combat—the close-in battle, the deep battle and the rear battle.

LTC Charles B. Cook in "An Assessment of the Soviet Combat Helicopter Threat," an article he authored while attending the U.S. Command and General Staff College in June 1982, stated that the Soviets were producing 15 Hind-E per month. If that production rate applies to the Havoc and Hokum when they are fielded, then it will be some time before they are available in the kind of numbers the Soviets would like.

As scarce but valued assets, the counterair aircraft will be used judiciously—employed more in reaction to measured threats. The numbers for some time will simply not support the Soviet's urge to employ these assets in proactive missions. That rare circumstance of proactive use of Hokum aircraft will be the result of a well-considered decision in which they have weighed the potential gains and found that the gains far surpass the potential losses.

In conclusion, the Soviets are not smarter than we are in addressing the ATA requirement. They simply have a greater need to preclude our helicopters from operating effectively in antiarmor roles against their forces. They have done their homework and determined that the helicopter threat to their scheme of operations, which depends greatly on fast-moving tanks, is so significant extraordinary measures are needed. The Soviet's challenge is to maintain the viability of the tank—to protect the tank enough so that it can continue its traditional and exalted role with their ground forces. Army Aviation's challenge is to maintain the viability of the attack helicopter, protecting its importance to combined arms operations. Our country has been successful in meeting these impediments and the challenges that keep arising, and in turning them into opportunities to be used to our advantage.

U.S. ARMY SAFETY CENTER



HUMAN ERROR

Major Cause of Army Aviation Accidents

THE ACCIDENT was caused by human error. Many times, even in accidents where materiel failure or environmental conditions are listed as causes, we find human error also was involved.

In fiscal year (FY) 1986, Army Aviation had its safest year ever with a Class A accident rate of 2.04 per 100,000

flying hours. The momentum carried over into FY 1987 when we had the lowest number of Class A-C aviation accidents in 10 years and the third best Class A rate in history—2.22 per 100,000 flying hours. The credit for that belongs to the aviation family—commanders, safety officers, operations officers, aviators, maintenance, and all ground support personnel and safety specialists.

From FY 1982 through FY 1986, human error was a cause in 81 to 91 percent of the Class A aviation accidents. In FY 1987 we experienced the lowest percentage, 78 percent, in the past 6 years.

When we look at human-error involvement in aviation accidents, we must be careful not to think solely in terms of aircrewmembers. No doubt a mistake made in the cockpit can have immediate and disastrous results, but human error goes far beyond the aircraft crew. Human error can and does occur in the design of equipment, from a lack of training or supervision, during maintenance, and at the highest levels of planning and operation. The result is the same regardless of where the error takes place: injured or dead soldiers and damaged or destroyed equipment.

Although pilot error was definitely a cause in most of the following accidents, other human errors also contributed to what happened.

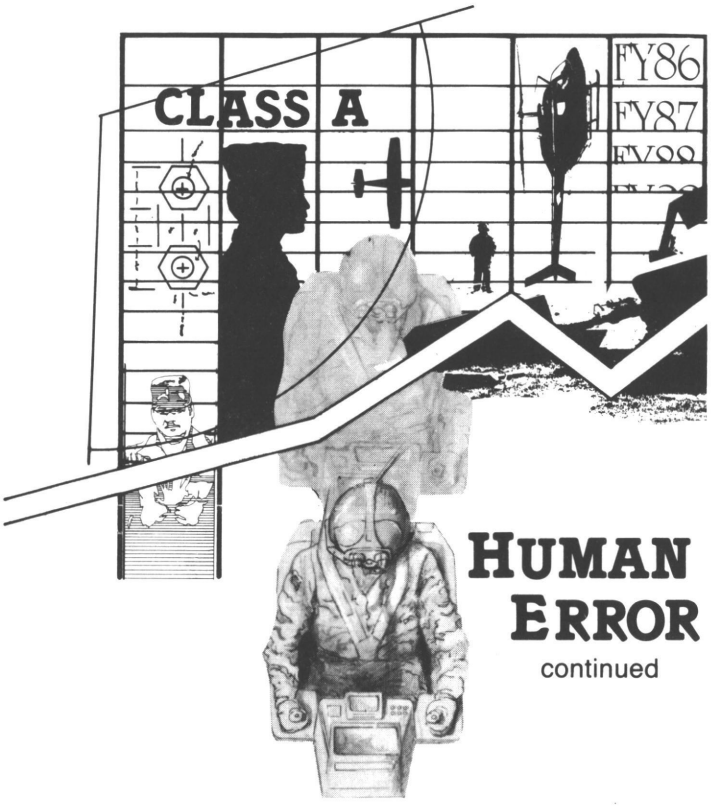
Equipment limitations

After conducting night vision goggles (NVG) proficiency and qualification training, two UH-60 Black Hawks joined up for the flight back to the airfield. The instructor pilot (IP) of the lead aircraft asked the crew of the second aircraft to assume the lead to give the pilot of the lead aircraft some training in formation flying. The crew of the second aircraft agreed, but as they attempted to pass the lead aircraft on the right side, their aircraft drifted to the left and collided with the lead aircraft. When the IP of the lead aircraft saw the other Black Hawk drifting toward him, he turned left in a futile attempt to avoid the collision. He was able to autorotate his damaged aircraft to the ground, but the other aircraft began breaking up in the air and crashed, killing all three crewmembers.

The human error that caused this accident occurred in the cockpit when the crew of the second aircraft failed to recognize their aircraft was drifting toward the lead aircraft. The following factors may have contributed to the pilot's and IP's inability to detect that the helicopter was drifting:

- The low NVG experience level of the crew, which may have resulted in their being less alert than they should have been.
- The relaxed mood of the crew as they were heading home with the airfield in sight.
- The IP's burden of personal problems that may have occupied his thoughts.
- The IP's overconfidence in the pilot's flying abilities, which may have caused him not to monitor the pilot as closely as he should have.

In addition to the pilot error, however, other factors contributed to what happened. One of them was equipment limitations associated with the AN/PVS-5 NVG, coupled with the obstructions to vision and noncompatible NVG lighting in the UH-60. Also involved were inadequate written procedures for NVG multiship operations addressing lead changes, minimum crew requirements, separation distances, appropriate NVG formations and which crewmembers should be "goggled up."



HUMAN ERROR
continued

climb until the aircraft was clear of the antenna, he was not following instructions in the aircrew training manual (ATM). The pilot's choice of takeoff direction resulted from extreme apprehension about loss of tail rotor effectiveness (LTE). He estimated the wind direction at 160 degrees, at 10 to 12 knots, and decided his takeoff direction would have to be 160 degrees because of the danger of loss of LTE. His concern over LTE caused him not to give proper attention to other factors that determine takeoff direction. His apprehension resulted from lack of training in the capabilities of the OH-58. The unit had not had an OH-58 IP assigned for 13 months, and during this time the problem of LTE had been much publicized. Because discussions in the unit about LTE were not supervised by a knowledgeable IP, confusion and misunderstanding resulted.

The pilot also failed to brief his copilot and coordinate crew duties, with the exception of asking the copilot to monitor the engine instruments during takeoff. If he had communicated his intentions to the copilot, the copilot could have assisted in maintaining terrain and obstacle clearance, and the accident might have been prevented in spite of the pilot's decision to take off over the highest obstacle. The aircraft had sufficient power to complete the takeoff if it had been executed as stipulated in the ATM.

The pilot had been flying out of the same field site as a single pilot for the 3 days preceding the accident. This could have contributed to his overconfidence and failure to properly use his copilot.

Training

When aviators are assigned missions for which they lack proper training, a human-error accident may result, but the error isn't limited to the pilots. Since 1981, 58 accidents in which inadequate unit training was a cause have cost the Army $30.5 million in money alone.

During a service mission from a desert field site, an OH-58 Kiowa pilot took off over the highest obstacle and failed to maintain a constant angle of climb. The helicopter had reached 30 knots and was turning right when its main rotor struck an aluminum antenna support pole about 36 feet above the ground. The aircraft picked up the ½-inch nylon ropes that had been supporting the pole, and the ropes became entangled in the flight controls. This restricted the pilot's control inputs, and the aircraft began an uncommanded right descending turn. It struck the ground, rolled over and came to rest on its right side. Neither crewmember was injured.

The pilot was not following prescribed procedures when he initiated a takeoff over the highest obstacle and terrain; and when he failed to maintain a constant angle of

Maintenance

A human error made in the maintenance shop or on the flight line can cause an aircraft to crash just as surely as an error made in the cockpit.

The crew of a UH-60 had made several uneventful flights while practicing slingload operations. The aircraft was on short final to pick up a load when the master caution light came on and the chip detector light flickered. The pilot in command (PIC) recycled the main module chip detector circuit breaker, and the lights went out. The copilot continued the approach, stabilizing the aircraft in a hover about 5 feet above the slingload. Without any warning, the aircraft began a rapid spin to the right. The copilot attempted to stop the spin by applying full left antitorque pedal, but the aircraft continued to spin. The riggers were perched on top of the slingload, and the pilot increased altitude to about 40 feet to avoid hitting them. The aircraft spun around about four times as it moved to the rear of the slingload, and the pilots realized they

had lost tail rotor control. The PIC, who was in the left seat, tried to place the power control levers in the fuel cutoff position to stop the spin, but the aircraft was spinning so rapidly that the centrifugal force made it hard for him to reach the levers. He managed to cut No. 1 engine off, but before he could do the same on No. 2, the aircraft hit the ground left-side-low, missing the riggers on the slingload. The crew and passenger were able to leave the aircraft under their own power.

The tail rotor gearbox seizure was caused by excessive heat produced by lack of lubrication. Following replacement of an input seal, which required the gearbox to be drained, the gearbox had not been refilled with oil. The mechanic who drained the gearbox had not recorded what he had done. The technical inspector didn't do an adequate inspection after the input seal was replaced, and the aircraft was released. The aircrew checked the gearbox sight gauge, but they were on the ground, 12 feet from the gauge. The sight gauge was stained with oil, and it looked like it was full. It wasn't—it was empty.

Operations

The following accident was caused by a pilot conducting a flight in a mountainous area although he was not qualified for such a mode of flight. But someone else could have prevented the flight—the operations officer.

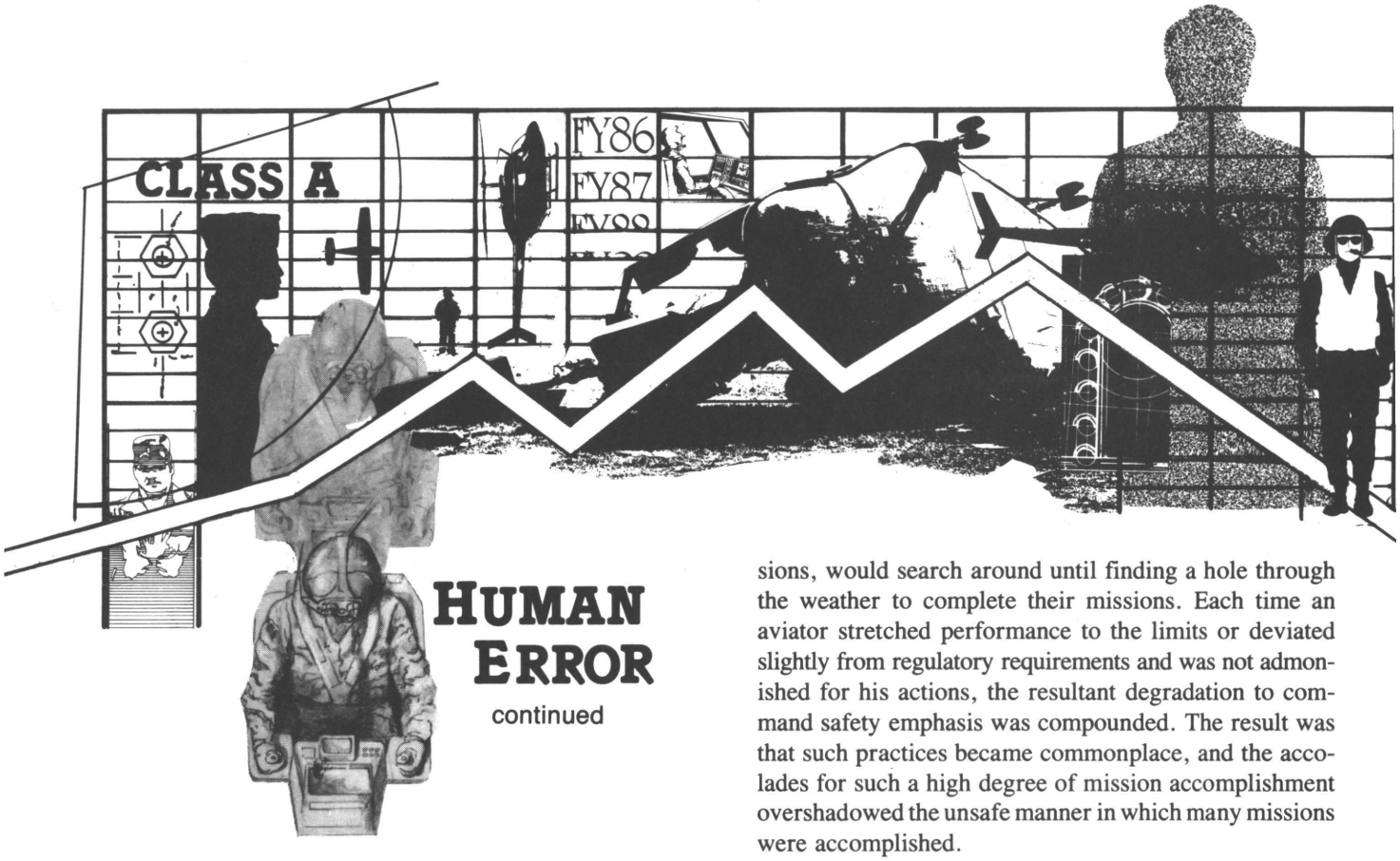
The crew of the UH-1H Huey was conducting orientation rides for a group of cadets. They made a stop at a point 7,200 feet mean sea level (MSL), and the pilot performed an out-of-ground-effect (OGE) hover before continuing to a base camp at 9,050 feet. After conducting several low-level flights, the aircraft took off with seven people onboard for a short nap-of-the-earth flight. The PIC picked the aircraft up to a 5-foot hover for a power check, which required about 35 pounds of torque. That was actually the maximum power available for the UH-1 in this mountainous area, but neither the PIC nor the copilot knew that. The aircraft turned east over about 150 meters of open terrain before reaching the tree line at the edge of a forest. It continued on for about 250 meters above the trees and up a small draw, then the PIC slowed the aircraft to demonstrate an unmasking and remasking maneuver. During remasking, the aircraft descended to about 20 feet above the trees and began an uncommanded right yaw. The low revolutions per minute (rpm) warning light and audio came on, and engine noise decreased. The PIC called out "engine failure" as he followed the right turn with cyclic and leveled the aircraft. The copilot moved the governor switch to the emergency position, but there was no response from the engine. The aircraft rotated about 360 degrees to the right in a level attitude. The PIC applied full collective to decrease rotor rpm before the aircraft entered the trees. The helicopter crashed through the trees and struck the ground in a nose-low attitude. The tail of the helicopter caught and hung on a tree as the aircraft came to rest at the bottom of a small draw. No one was seriously injured.

The PIC made an improper decision to conduct the flight because he was overconfident in his abilities and in the aircraft's capabilities to operate in the high-altitude environment. He was relying on past mountain flying experience during a previous assignment in an area up to 6,000 feet MSL. The unit to which he was currently assigned did not have a mountain support mission, and the PICs were not evaluated in performance of mountain flight operations or in the planning for such flight. Not having been qualified or mountain oriented in his current flying area, the PIC lacked an appreciation for the increased criticality of performance planning for operating in elevations at the 9,000-foot level, which always significantly affects UH-1 performance. As a result, while attempting an OGE maneuver at high-density altitude under high-pressure-altitude conditions, he lost control of the aircraft and crashed.

The operations officer improperly approved the mission because of overconfidence in the PIC. He was on full PIC orders, had previously been a UH-1H IP and was reputed to have performed well above average on all previous evaluation rides. Knowing all this, the operations officer felt no need to question the route of flight, destination, capabilities and qualifications before approving the mission.

Although he was the mission approving authority, he did not request additional information on the exact location of the training area because of his overconfidence and trust in the PIC. The PIC was fully aware that the training area where the base camp was located was in a mountainous region, but he did not request a "mountain flight." He only asked if the training area was an approved flying area. The operations officer told him that if the training area was within the boundaries of the military reservation, it was an approved area. The fact was, while the training area was located on land leased by the government, it was outside the military reservation boundaries.

The operations officer assumed that the training area being discussed was one that he knew to be located on the cantonment area. He based his decision to approve the flight on this assumption. He also knew the unit did not presently have, nor had they recently had, a mountain flying mission. There were no pilots qualified for mountain flying, and the unit IP was not current. This



HUMAN ERROR

continued

may explain why he did not consider the area under discussion being in a mountainous area.

Command/supervision

By not acting decisively when faced with minor variences in policy, commanders and supervisors in effect promote deviations in practice that eventually become "unwritten policy" or "the way we do it here." In some cases, deviations in practice are even encouraged by commanders and supervisors for the sake of mission accomplishment. Soon the approval to "do it this time" in order to get the mission accomplished, or whatever pressure seems important at the moment, becomes standard practice. Allowed to do it once, the individual figures it must be all right to do it again in other areas. In short, we reward the individual for being able to get the job done, and no one questions procedures.

For instance, a helicopter participating in a field training exercise encountered marginal weather. The pilot decided to try to make it over a ridgeline into a valley. The aircraft hit trees on a slope and crashed.

The aviators in the unit had been operating in similar weather conditions for some time and, on numerous occasions, would search around until finding a hole through the weather to complete their missions. Each time an aviator stretched performance to the limits or deviated slightly from regulatory requirements and was not admonished for his actions, the resultant degradation to command safety emphasis was compounded. The result was that such practices became commonplace, and the accolades for such a high degree of mission accomplishment overshadowed the unsafe manner in which many missions were accomplished.

What have we learned?

Human-error accidents are nothing new. Since World War II, the search for higher performance military equipment has led to greater sophistication of Army equipment systems. That isn't going to change. Faced with potential enemies with overpowering odds in manpower, we have got to have equipment that can do the job and do it better. That means we have to concentrate on the other part of the problem: the human in the human-error accident.

Experience has shown that when the Army's top leadership and its commanders at every level are personally involved in safety, and make it a part of their units' everyday operations, accident rates fall. This is the reason Lieutenant General Claude M. Kicklighter, director of the Army Staff, has designated 1988 as the year of the "Leaders' Crusade Against Human-Error Accidents." It worked with accident rates—and it will work with human-error accidents. The Leaders' Crusade is designed to increase commanders' involvement in reducing human-error accidents and to provide them with the already-existing prevention tools they need to get the job done. The goal is to reduce human-error accidents and make 1988 the Army's safest year yet.

AVIATION PERSONNEL NOTES

Air Traffic Control (ATC) Consolidation

The consolidation of MOS 93H ATC tower operator and 93J ATC radar controller as 93C ATC operator is now in full swing. Training for the new MOS is through a correspondence course transitional program, with a completion date of April 1989 for Active Duty personnel and April 1990 for those in Reserve Components. Soldiers not required to take this qualification training are those who have been awarded MOS 93H or 93J and in the grade of SFC(P) or above; controllers who are dual-rated (tower and radar); controllers enrolled in a cross-training program that will result in a dual-rating (tower and radar); and controllers who have completed AIT for former ATC MOS 93B or 93K. The consolidation means greater efficiency in manpower use, which is welcomed news considering the shortage of controllers in the Army today. To further relieve the shortage, there has been an increase of student input to 659 in fiscal year (FY) 1988 for 93C, compared to more than 500 last FY for 93H and J. For additional information on this topic, contact Mr. Jim Jones, Army ATC Activity, Ft. Rucker, AL; AUTOVON 558-5340 or Commercial 205-255-5340.

Aviation Regimental System

At the recent regimental activation ceremonies held at Ft. Rucker, AL, Major General Ellis D. Parker, Aviation Branch chief, made some comments of particular note. MG Parker captured the essence of the regimental system's impact on the Aviation Branch when he stated the following:

"In 1981, the Chief of Staff of the Army approved the concept of the U.S. Army Regimental System. This concept was envisioned as a means of providing each soldier with continuous identification with a single regiment and a personnel system that would include the probability of soldiers serving recurring assignments with his or her regiment.

"The regimental affiliation program enhances the combat effectiveness of our aviation units through a framework that provides the opportunity for recurring assignments within the same regiment. These regimental assignments help develop a sense of belonging, as well as a sense of commitment and loyalty to Army Aviation and the mission of our Armed Forces. The pride we have always had in ourselves as aviators now is manifested within the traditions of the regiments and their history.

"The regiment is a personal commitment to the affiliated soldier and his family. Through the midst of turbulence that is the nature of our commitment to the Army, our families will become more closely tied to each other due to the renewal of old acquaintances within their spouse's regiments. It is through the regiment program that we will strengthen our pride of belonging and our unit's esprit."

The implementation of the Aviation Regimental System is on schedule, with 26 of the 32 designated aviation regiments already activated. Included in that total number are 3 cavalry regiments, 21 tables of organization and equipment aviation regiments, and 8 tables of distribution and allowances training regiments—7 at Ft. Rucker and 1 at Ft. Eustis, VA. Aviation soldiers have begun to affiliate with the regiment of their choice as their respective military personnel offices receive official implementation instructions. Regiments chosen must have documented positions for soldiers' primary MOS and special qualifications identifiers/additional skill identifiers. Regimental affiliation will become a primary consideration for assignments.

Aviation Warrant Officers

The future of aviation warrant officers continues to look bright. Accessions are on the rise to meet the increase in warrant officer requirements, with new training courses forthcoming. The Aviation Senior Warrant Officer Training Course comes online this October (1988), replacing the present Aviation Warrant Officer Advanced Course. About May 1988, the Master Warrant Officer Course (MWOC) will start, which is branch immaterial training that replaces the current Warrant Officer Senior Course. The first MWOC attendees are senior CW4s selected by the December 1987 Master Warrant Officer (MWO) Selection Board to fill MWO positions. All these plans have one purpose—to ensure the professional development of aviation warrant officers.

At the grass roots of the Army's warrant officer force is the Warrant Officer Entry Course (WOEC), for which changes are also scheduled. The WOEC for Active Components will be consolidated at Ft. Rucker by August 1988, replacing the courses now at Ft. Sill, OK, and Aberdeen Proving Ground, MD. A Reserve Component WOEC at Ft. McCoy, WI, will continue to operate. Ft. Sill's WOEC is scheduled for deactivation in April 1988 and Aberdeen's in July 1988. Then, in August, our WOEC will be redesignated as the Warrant Officer Candidate School with the possibility of having a senior CW4 as commander.

Mr. Wendell W. Shivers

Mr. Jeffrey W. Van Rope

AH-64

A TOTAL SYSTEM FOR BATTLE

This article is the ninth in a series on the AH-64A Apache aircraft and weapons systems. The systems addressed include the target acquisition and designation sight and the pilot night vision sensor. The information contained here should familiarize the reader with the AH-64A; however, it must not *be used to operate or maintain the aircraft.*

Target Acquisition and Designation Sight (TADS) System

AH-64 A TOTAL SYSTEM FOR BATTLE

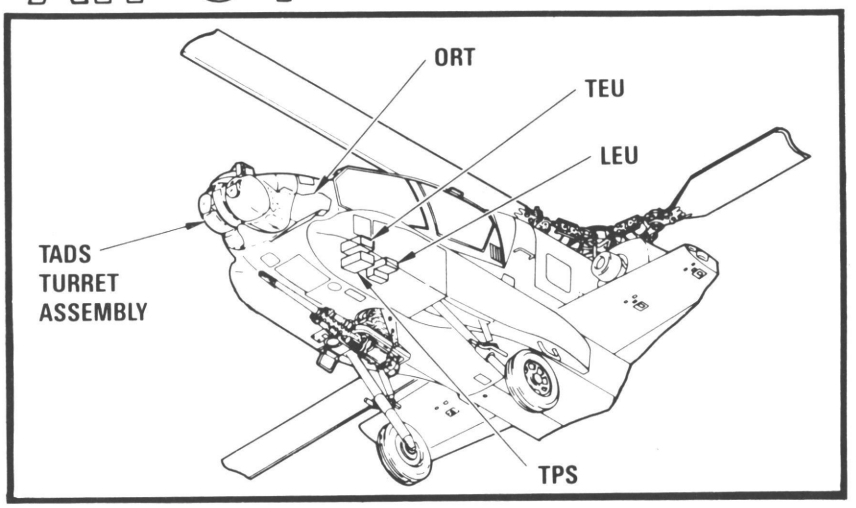


FIGURE 1: TADS system component locations.

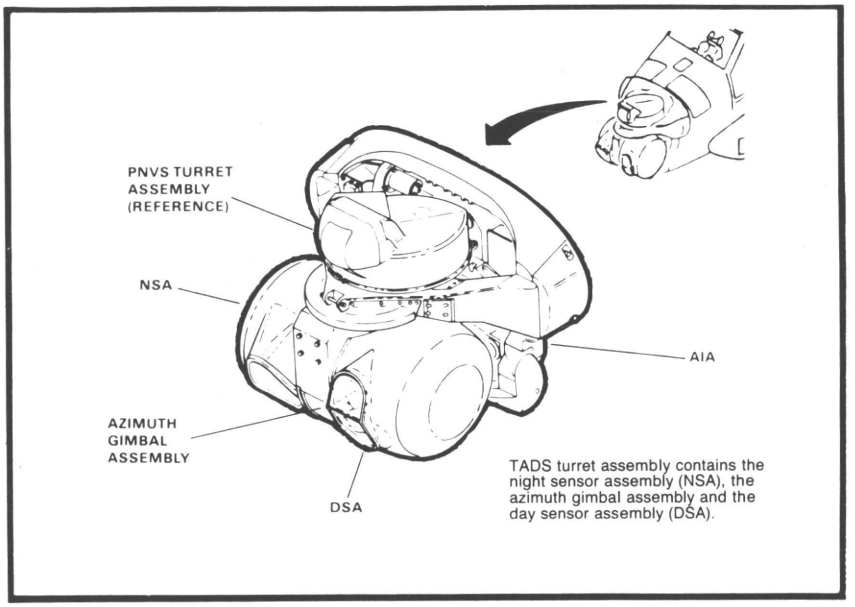


FIGURE 2: Major TADS components.

TADS capabilities

The capabilities of the TADS are listed as:

- Automatic and manual tracking, using the forward looking infrared (FLIR) sensor (four fields of view) in day, night and adverse weather conditions.
- Automatic and manual tracking by day, using the day television (DTV) (three fields of view) or the direct view optics (DVO) (two fields of view).
- Automatic tracking of laser designated targets, designated by an external designator (ground laser locator designator, scout).
- Designation of targets, using coded laser energy.
- Accurate ranging of targets, using laser energy.
- Backup night vision sensor, using the FLIR (in case the PNVS fails) for the pilot or copilot gunner (CPG).

The TADS system component locations

The component parts of the TADS system and their locations (figure l) are discussed below.

The TADS turret assembly is a rotating turret assembly mounted on the aircraft interface assembly (AIA) that is attached to the nose of the helicopter.

Two electronic units, the TADS electronics unit (TEU) and laser electronics unit (LEU), are both located in the left forward avionics bay (FAB).

An optical relay tube (ORT) is tube mounted to the back side of the AIA that extends upward into the CPG's crewstation.

The TADS power supply (TPS) provides power to the TADS system located in the left FAB.

Major TADS components

Major assemblies making up the component parts of TADS (figure 2) are:

The aircraft interface assembly that supports the TADS and pilot night vision sensor (PNVS) turrets. It contains

electronic components and electrical wiring and hardware for electrical interface between the TADS/PNVS and the helicopter.

The TADS turret assembly that contains the day sensor assembly (DSA), azimuth gimbal assembly and night sensor assembly (NSA). It provides azimuth and elevation positioning of the TADS turret.

The day sensor assembly that contains DVO, DTV camera, laser spot tracker (LST) and the laser rangefinder/designator (LRF/D). It is used for direct viewing, day TV viewing and laser tracking, designation and rangefinding.

The azimuth gimbal assembly that contains part of the DVO optical path and mechanical azimuth and elevation drive equipment. It mechanically positions the TADS turret in response to line of sight (LOS) commands (outer servo loop).

The night sensor assembly that contains the FLIR sensor. Used for night target acquisition/tracking, it is available as a backup for the PNVS.

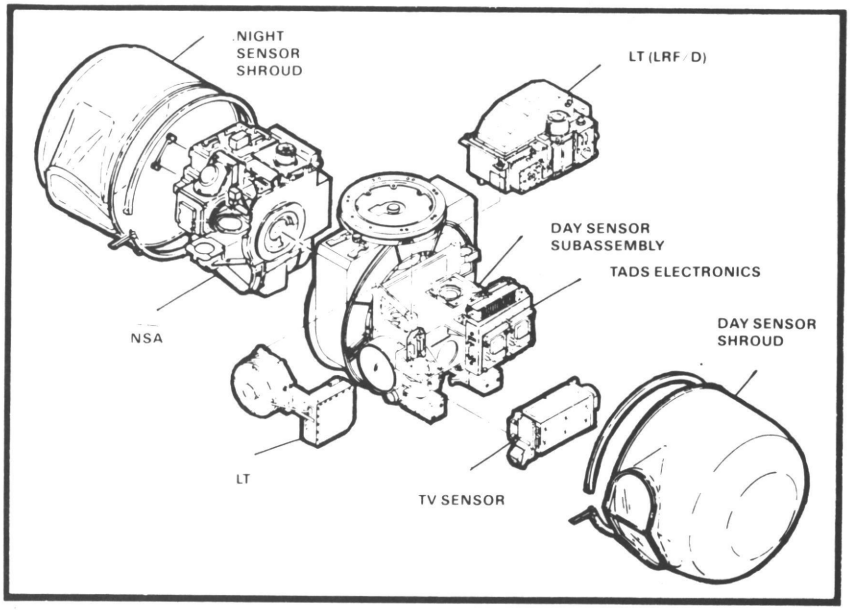


FIGURE 3: Major TADS turret assembly components.

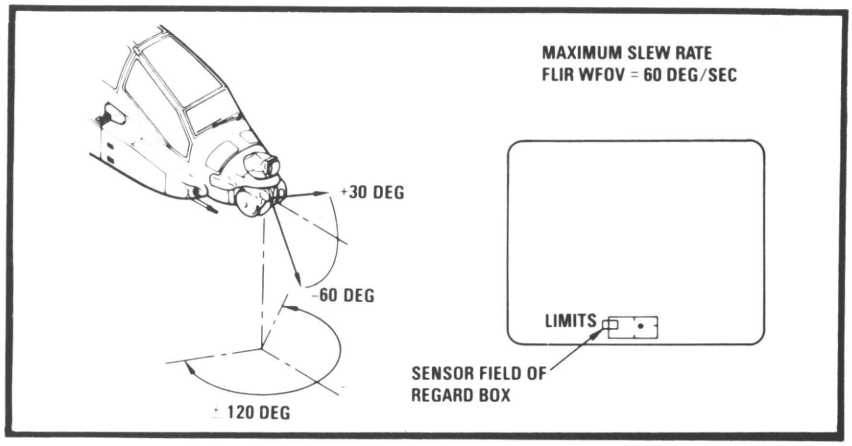


FIGURE 4: TADS gimbal limits.

Major TADS turret assembly components

The major TADS turret assembly components (figure 3) are:

The day sensor shroud that is the airtight and waterproof cover for components in the DSA. This window provides the optical, laser and television (TV) viewing port.

The TV sensor (EO-MUX) that provides conversion of near infrared (IR) energy to a video signal, which is routed through the TEU and symbol generator for display.

The laser tracker (LT) that detects and locks on to correctly coded laser energy, providing signals that drive the TADS turret to track the laser spot.

The TADS electronics that processes the gyro and resolver information for positioning the TADS turret (inner servo loop).

The laser transceiver unit (LTU) that works in conjunction with the LEU and provides laser designation and/or ranging of targets. It is also referred to as the LRF/D.

The night sensor shroud that is the airtight and waterproof cover for components in the NSA. The germanium window provides viewing port for the FLIR.

The night sensor assembly (NSA) that provides TADS FLIR viewing.

The day sensor subassembly (DSS) that contains casting and optics less associated line replaceable units (LRUs). It provides support and mounting interface for the TV sensor, the laser tracker and the laser transceiver unit.

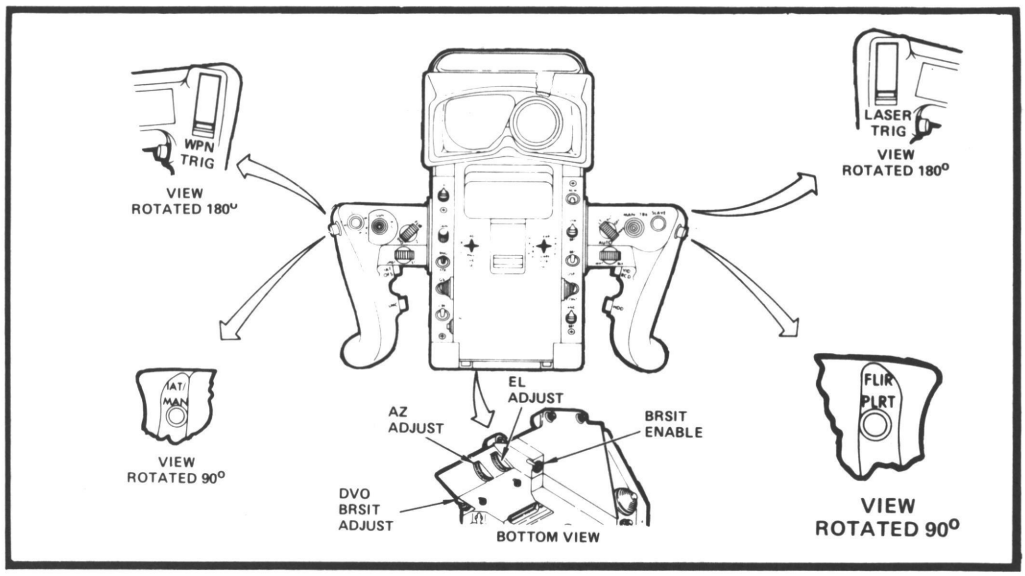


FIGURE 5: Optical relay tube controls.

Both DSA and NSA windows have anti-icing capabilities.

TADS gimbal limits

The TADS gimbal limits (figure 4) are discussed below.

The TADS is capable of slewing ±120 degrees in azimuth and plus 30 minus 60 degrees in elevation or depression. The TADS gimbal limits are represented by the sensor field of regard symbology in the high-action display. The message "LIMITS" will be displayed in the helmet and display sight status when the TADS is at a gimbal limit. The maximum slew rate of the TADS is achieved in the FLIR wide field of view (WFOV), 60 degrees per second. Slew rates are correspondingly slower as the FOV narrows within a sensor.

Optical relay tube (ORT) controls

The ORT controls (figure 5), both left handgrip and right handgrip, are described as:

Left handgrip:

- *The linear motion compensator (LMC) (momentary ON/OFF)* control automatically compensates for aircraft (a/c) and/or target motion.
- *The image auto tracker (IAT) offset (OFS) (momentary ON/OFF)* control enables offset tracking/designation when IAT is engaged.
- *The update/stores (UPDT/ST) (momentary center OFF)* control rapidly stores target locations in the fire control computer (FCC) or update of the a/c present position using FCC data.
- *The sensor select (discrete) (FLIR/TV/DVO)* control is used to select any one of the three sensors.
- *The weapons action switch (WAS) (discrete) (RKT/GUN/MSL)* is used to select (action) the weapon to be fired.
- *The field of view (FOV) (N/M/W/Z) (momentary center OFF)* control is used to select the sensor FOV.
- *The IAT MAN (momentary ON/OFF)* control allows manual or automatic tracking of a target.
- *The weapons trigger (momentary)* control is used to fire the selected weapon.

Right handgrip:

- *The heads down display (HDD) (momentary ON/OFF)* control is used to select the heads out display (HOD) or HDD video presentation.
- *The video recorder (VID RCD) (momentary ON/OFF)* control is used to start/stop recording of the TADS video when the video recorder is in the record mode.
- *The IAT polarity (discrete) (WHT/BLK)* switch is used to select polarity of IAT.
- *The laser track (LT) (discrete) (AUTO/OFF/MAN)* switch is used

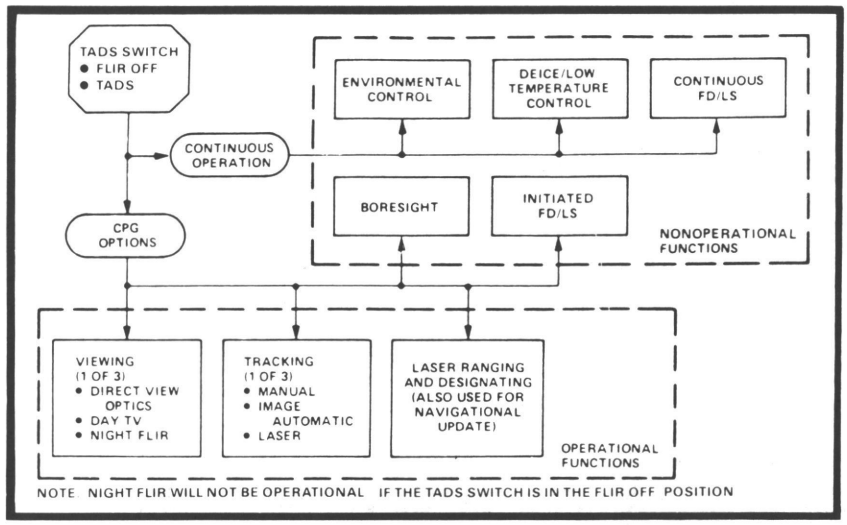


FIGURE 6: TADS principles of operation.

to select laser tracker operational modes.

- *The MAN TRK* switch is used to manually control the movement of the TADS with the force controller.
- *The SLAVE (momentary ON/OFF)* switch is used to enable/disable the TADS slaving or cueing functions.
- *The forward looking infrared polarity (PLRT) (momentary ON/OFF)* switch is used to change the polarity of FLIR presentation.
- *The laser trigger (momentary)* switch is used to fire the TADS laser.

The ORT also has boresight controls and ORT display adjustment panel controls (face of ORT) for TADS display adjustment.

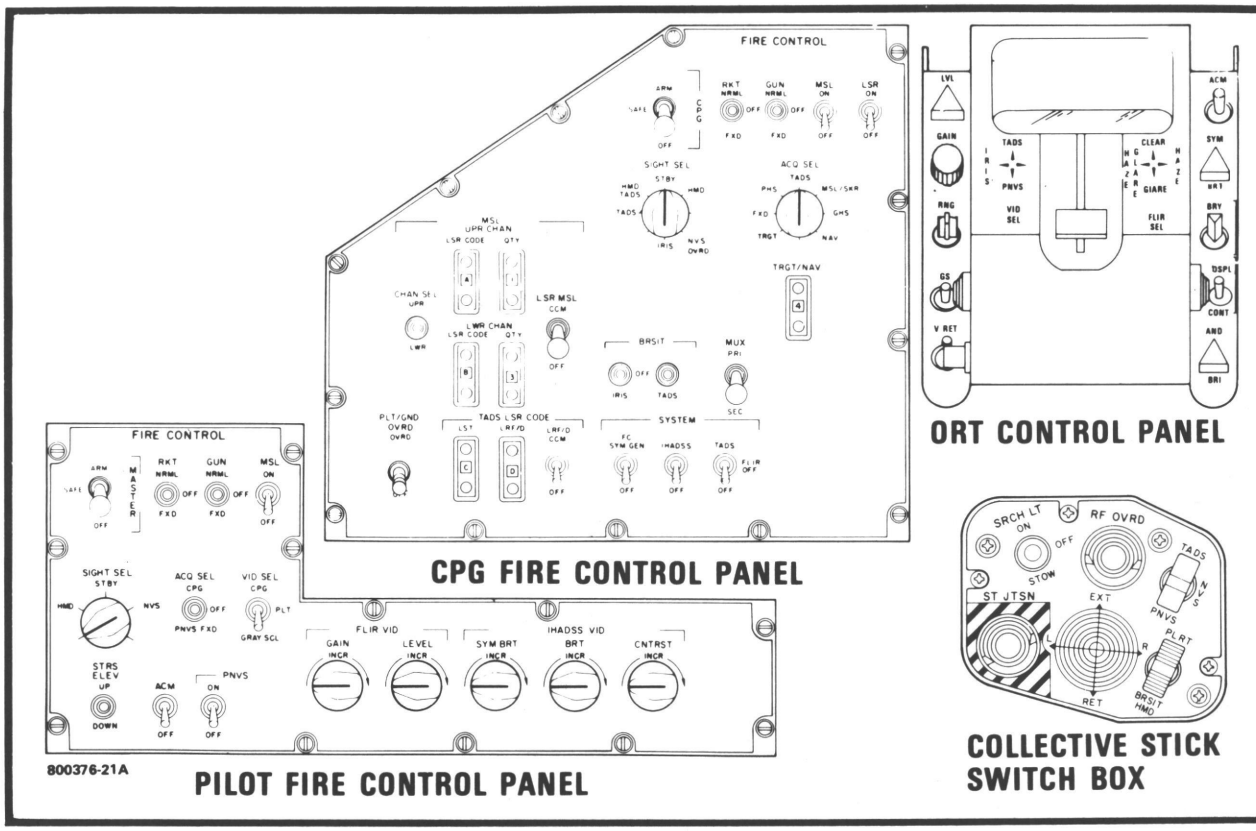


FIGURE 7: Boresight controls.

TADS principles of operational functions

The TADS principles of operational functions (figure 6) are:

• *Tracking (manual and automatic)* functions are used to search for and detect, acquire, identify and track a target. Tracking can be accomplished manually, IAT or LT.

• *Viewing* of targets can be by DVO (2 FOV), DTV (3 FOV) or FLIR (4 FOV).

• *Laser ranging and designation* functions use laser energy to range and/or designate a target. The laser also may be used to store target locations or update the present position of aircraft.

TADS principles of nonoperational functions

The TADS principles of nonoperational functions (figure 6) are:

• *The environmental control* is a nonoperational, automatic function of the environmental control system (ECS) that keeps the system from getting too hot or too cold.

• *The fault detection/location system (FD/LS)* operates automatically (continuous monitor) or can be initiated by the CPG through the data entry keyboard (DEK) (maintenance).

• *The deicing* function is selected when required by the CPG TADS or PNVS.

• *The boresight* function can be performed on the ground or while the aircraft is airborne.

TADS switch functions

How the TADS switch functions work (figure 7) is explained in the following paragraphs:

• TADS is enabled by placing the TADS switch to FLIR OFF or TADS position. The TADS operation is selected by the SIGHT SELECT switch. The TADS is the commanding LOS. In this position, the TADS may be manually controlled by the MAN TKR thumbforce controller or slaved to the LOS selected on the ACQ SEL switch.

• When the TADS is slaved by depressing the SLAVE pushbutton, it will slave to the LOS selected on the ACQ SEL switch (valid LOS) or to fixed forward (invalid LOS).

• A message in the alphanumeric display (AND) sight status will indicate either slaved to a valid LOS, or will indicate the LOS is invalid.

Helmet mounted display target acquisition and designation sight (HMD TADS)

The integrated helmet and display sight system (IHADSS) is the commanding LOS. In this position, the TADS may be manually controlled by the MAN TKR thumbforce controller or slaved to the CPG's IHADSS LOS.

When the TADS is being manually controlled, the cued LOS dot will indicate the LOS of the TADS.

When the TADS is slaved by depressing the SLAVE pushbutton, it will slave to the CPG's IHADSS LOS (valid LOS) or fixed forward (invalid LOS).

The ACQ SEL switch now will enable the CPG to select a LOS for cueing. When the TADS is slaved, cueing will be provided to cue the CPG to the LOS selected by the ACQ SEL switch (LOS valid) or to fixed forward (LOS invalid).

Night vision sensor (NVS)

The IHADSS is the commanding LOS. In this position, the TADS may be used as an NVS, and all TADS controls except FLIR and video adjustments are disabled. The TADS operation depends on the pilot's SIGHT SEL and NVS switches, the CPG's collective stick NVS switch and the PLT/GND ORIDE switch.

The TADS FLIR is enabled when the TADS/FLIR OFF/OFF switch is in the TADS position. In the FLIR OFF position, all functions except FLIR are enabled.

The FLIR converts IR energy to a video signal and routes this signal through the TADS TEU and symbol generator for display. The TADS TEU provides a direct video to the indirect

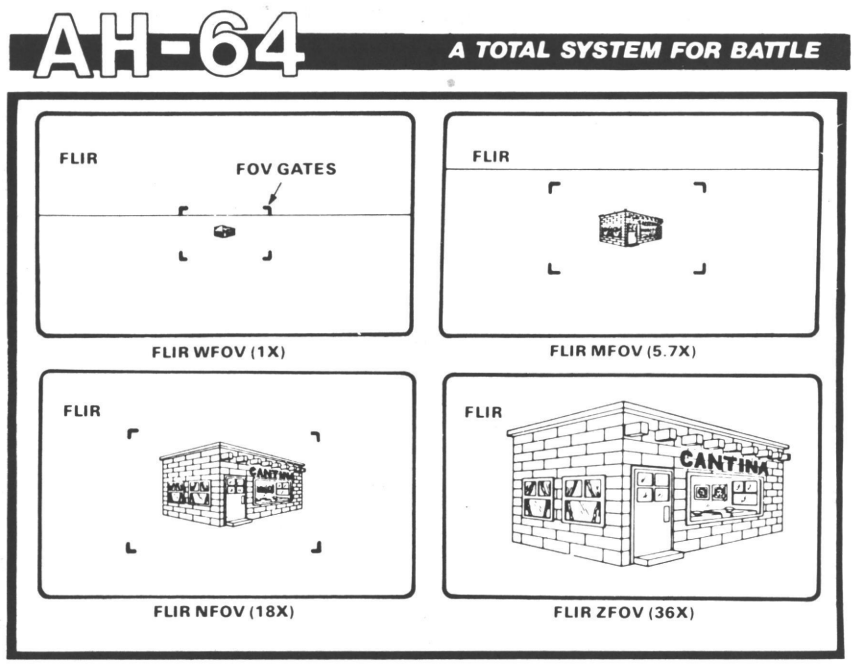


FIGURE 8: TADS forward looking infrared capabilities.

view display/heads down display (IVD/HDD) electronics unit, for display on the HDD or HOD if the symbol generator fails.

Operation of TADS FLIR and PNVS FLIR is very similar. The detector/cooler unit is interchangeable between the two FLIRs. The PNVS FLIR has only one FOV and no optics, while the TADS FLIR has an afocal assembly and three FOVs, plus a zoom FOV.

The day TV (DTV) converts near IR energy to a video signal and routes this signal through the TADS TEU and symbol generator for display.

The DVO is an optical path through the TADS to the ORT. The ORT selects either the DVO or the indirect view video (IDV), as selected by the CPG, for presentation in the heads down mode.

An IAT works with both the FLIR and DTV to lock onto and track a contrast. When locked on, the IAT drives the turret through the TADS servo system. If DVO is selected, IAT will track using DTV.

An LT can be employed to search for and lock onto laser energy of the proper code. Once locked on, the LT will drive the TADS through the servo system.

The LTU, in conjunction with the LEU (or LRF/D), is used for two purposes: to determine range to an object and to designate an object for terminal guidance of laser-seeking ordnance. Range data are sent through the fire control system for display and tracking computations.

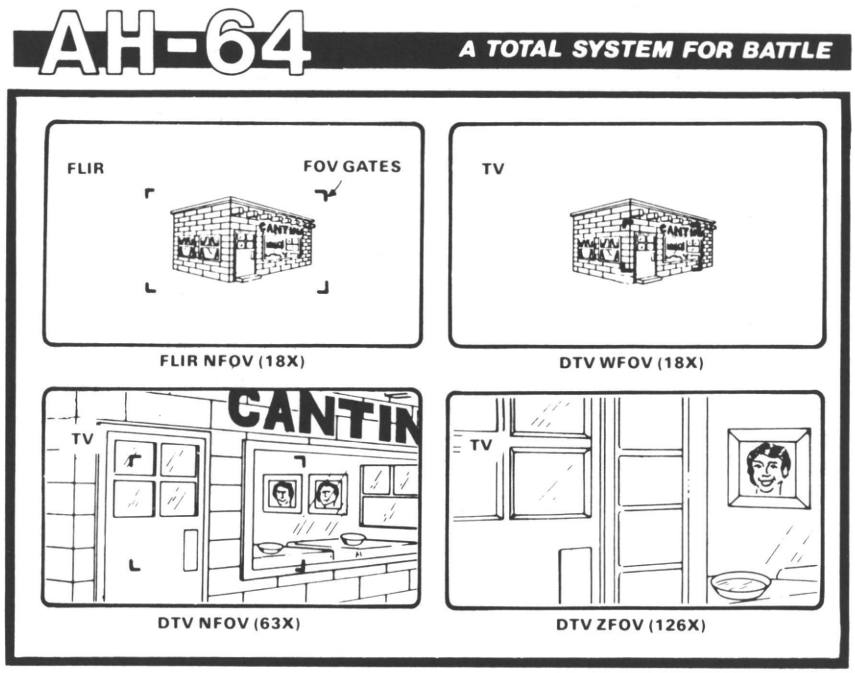


FIGURE 9: Day television capabilities.

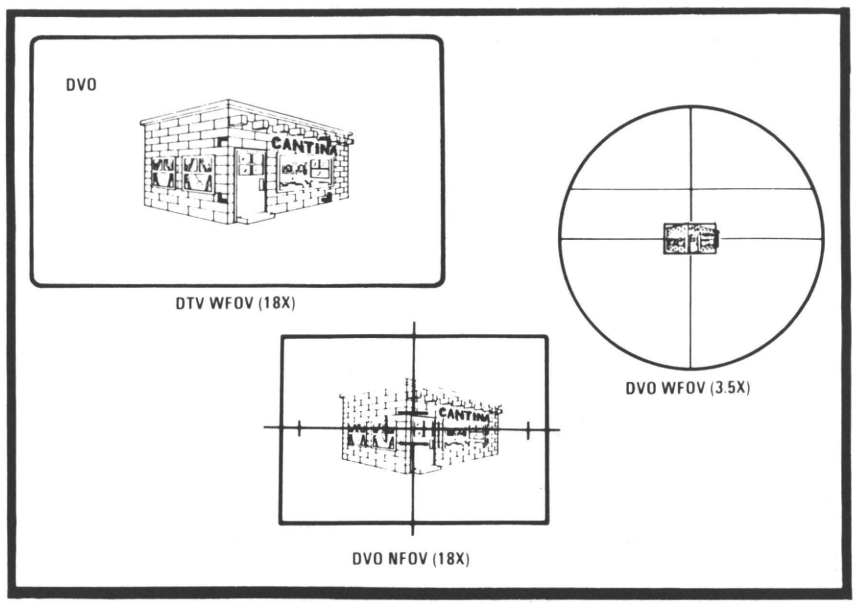


FIGURE 10: Direct view optics capabilities.

TADS forward looking infrared (FLIR) capabilities

TADS FLIR (figure 8, page 19) has four FOVs. They are as follows:

- Wide (W) 50.0 degrees
- Medium (M) 10.0 degrees
- Narrow (N) 3.1 degrees
- Zoom (Z) 1.6 degrees

The W, M and N FOVs are true optical FOVs using mirrors and lenses. The ZFOV is actually a 50-percent electronic underscan of the NFOV video. When underscanning the NFOV, some resolution is lost.

The FOV gates indicate the area that will be displayed in the narrower FOV. No gates are in the ZFOV.

The message "FLIR" will be displayed in the upper left portion of the display to indicate that the FLIR is the selected sensor.

Day television capabilities

The TADS DTV (figure 9) has three FOVs. They are as follows:

- Wide (W) 4.0 degrees
- Narrow (N) 0.9 degree
- Zoom (Z) 0.45 degree

The message "TV" will be displayed in the upper left portion of the display to indicate that the DTV is the selected sensor.

Direct view optics capabilities

The DVO (figure 10) has two FOVs. They are as follows:

- Wide (W) 18.0 degrees
- Narrow (N) 4.0 degrees

The message "DVO" will be displayed on the HOD and helmet display unit (HDU) when the direct view optics DVO is selected. DTV video ALSO will be displayed on the HOD and HMD when DVO is selected. If the CPG uses the IAT when DTV is selected, the IAT will use the TV video.

Image autotracker (IAT)

The IAT (figure 11) is an area-balanced contrast tracker. It will digitize the input video and track (lock-on) the center of the contrast under the LOS reticle when the IAT MAN pushbutton is depressed.

When engaged, the tracking gates expand from the center of the display and attempt to "capture" the target, or contrast. While the IAT is attempting to lock-on, the MAN TKR force controller is enabled.

Once the IAT locks-on to the contrast, the manual tracker is disabled. At this time, the IAT will control the TADS LOS through the TADS servo system. When the IAT is tracking, the message "IAT TRACKING" will be displayed in the AND tracker status.

Manual tracking procedures

Initial TADS may be accomplished by slaving the TADS to either the CPG's IHADSS LOS or to a LOS/ position as defined on the ACQ SEL switch.

To slave the TADS to the IHADSS LOS, the CPG positions the SIGHT SEL switch to the HMD/TADS position and momentarily presses the SLAVE pushbutton on the right handgrip. The IHADSS remains the sight for weapons pointing/target engagement.

To slave the TADS to an acquisition source, the CPG positions the SIGHT SEL switch to the TADS position, selects the acquisition source on the ACQ SEL switch and momentarily presses the SLAVE pushbutton on the right handgrip.

When the TADS is slaved as defined above, the MAN TKR controller is disabled. To unslave the TADS, the CPG again momentarily depresses the SLAVE pushbutton. The TADS will unslave and inertially stabilize at the last commanded position. The MAN TKR controller will be enabled.

Image autotracking procedures

The CPG tracking workload can be further reduced and tracking accuracy increased by use of the IAT (figure 11).

The IAT polarity switch is on the right handgrip and enables the CPG to select white (W/B), black (B/W) or automatic (AUTO).

To engage the IAT while tracking the target, the CPG momentarily presses the IAT/MAN pushbutton on his left handgrip. This disables the MAN TKR controller.

Once the IAT locks-on the target, the tracking gates will remain stationary around the area of highest contrast. The message 'IAT TRACKING' will be displayed in the AND tracker status.

If the target moves behind an obscuration, the IAT will continue to coast in the same direction at the same

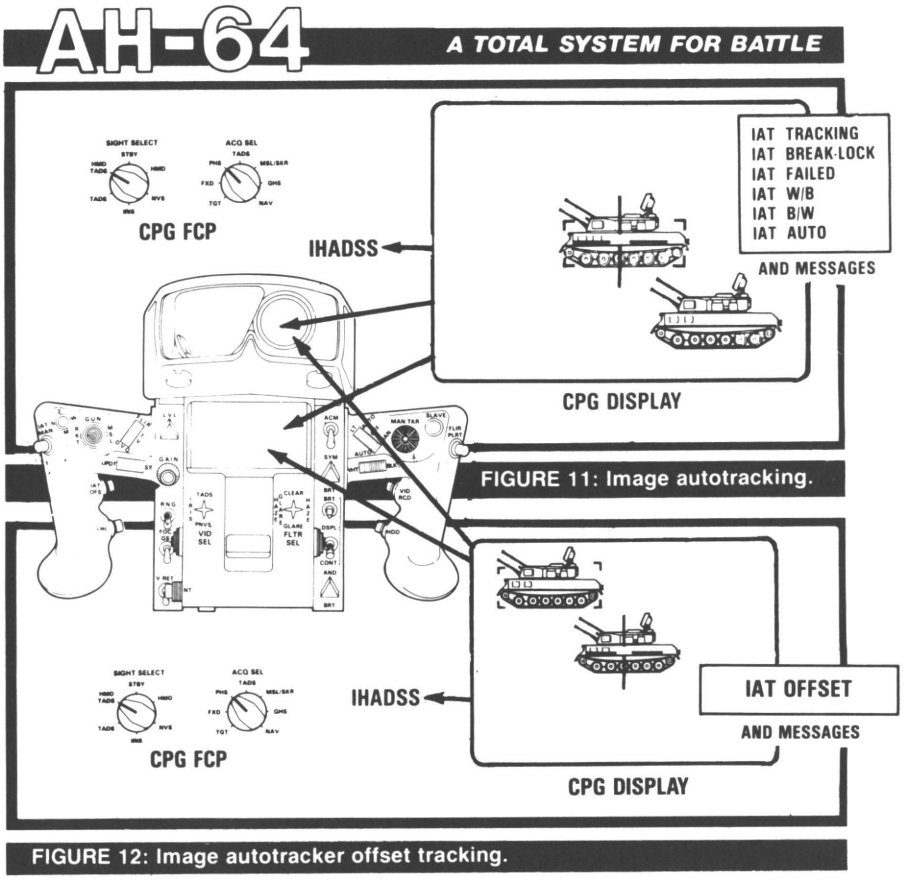


FIGURE 11: Image autotracking.

FIGURE 12: Image autotracker offset tracking.

rate for 0.6 second before it will break-lock.

The IAT may also break-lock if the target gets too big in the selected FOV. The IAT may break-lock under certain conditions when sensors or FOVs are changed.

To disengage IAT, the CPG again presses the IAT/MAN pushbutton. The IAT messages and tracking gates will go blank and the MAN TKR controller will again be enabled.

IAT offset tracking procedures

While image auto tracking a target, the CPG may desire to offset the target (figure 12). He may want to:

- Track the first target and engage the second target. This will enable him to rapidly reacquire the first target.
- Designate an object close to the target, denying the target time to detect that it is being designated.

To offset track, the CPG momentarily depresses the IAT OFS pushbutton on his left handgrip. The following will occur when this is done:

- The MAN TKR controller will be enabled, and the CPG may move the LOS reticle to another object.
- Tracking gates will remain locked-on to the first target.
- During offset tracking, "IAT OFFSET" will be displayed in the AND tracker status section.

To disengage offset tracking, the CPG presses the IAT OFS pushbutton a second time.

Laser tracking procedures

To enable the LT, the SIGHT SEL switch must be in the TADS or HMD TADS position, the TADS not slaved to either IHADSS LOS or to an ACQ SEL switch function and the TADS IAT not selected.

The LST has two operational search modes, manual and automatic. These modes are discussed in the following paragraphs:

- When the CPG positions the LT switch in the MAN position, the TADS will respond to MAN TKR controller inputs. The message "LST SEARCH" will be displayed in the AND.
- If the switch is placed in the AUTO position, the MAN TKR controller will be disabled. The signal processor will drive the TADS in a four-box search pattern centered about the point of engagement. The messages "LST AUTO SEARCH" and the LT code will be displayed in the AND.

To select the operational code for the LT, the CPG uses the LST indexer on the fire control panel (FCP), setting it to the index (A-H) representative of the code storage location within the bus controller.

Laser rangefinder designator (LRF/D)

The LRF/D provides coded pulsed laser energy for designating targets and range-to-target data for the fire control system. The LRF/D generates the laser energy of a specific code on command. Reflected laser energy is used to generate range-to-target data.

To range an object, the laser trigger is pulled to the first dent. The laser fires three laser pulses; then it stops firing. The calculated range is then displayed, and will increase/decrease at the rate the helicopter was moving when the range

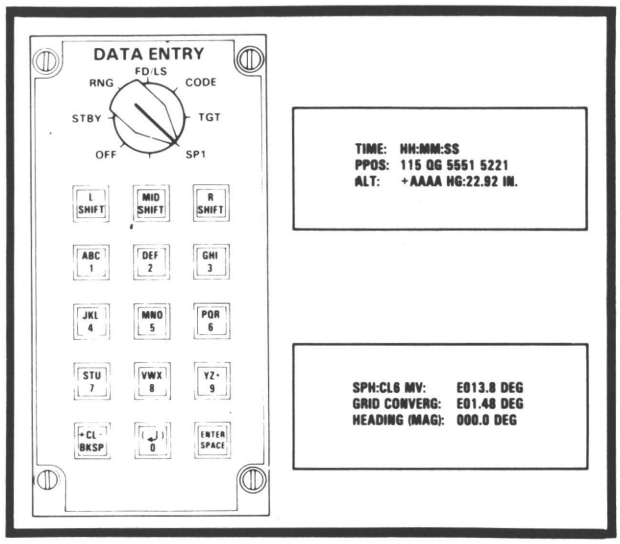


FIGURE 13: Waypoint/targeting procedures 1.

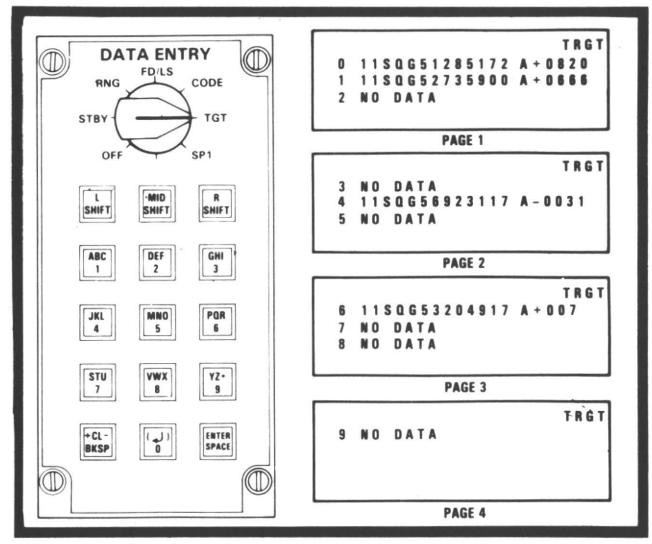


FIGURE 14: Waypoint/targeting procedures 2.

was calculated for about 7 seconds after the laser stops firing.

To designate a target, the laser trigger is pulled and held in the second detent. The LRF/D will then continuously fire the laser on the code selected by the LRF/D laser code indexer until the trigger is released.

Waypoint targeting procedure 1

Waypoint/targeting data are input using both the target (TGT) and SP1 positions on the data entry keyboard (DEK) rotary switch (figure 13). The data entered under SP1 are displayed as a menu with two pages.

To input data, input the first character of the desired parameter. (The curser will jump to the first digit position of the data.) Then input the full data. On completion, the data will be automatically entered, and the curser will return to the home position.

TIME:

The TIME display functions only when the FCC is controlling the bus; the backup bus controller (BBC) does not have the TIME function in its software.

The TIME display will increment from whatever time value is entered. The TIME display will function as a 24-hour clock if present time is entered, with an accuracy of ± 1 second while running.

PPOS:

The PPOS data are used only for the initial alignment of the heading and altitude reference set (HARS) while the helicopter is on the ground, and must be entered before HARS alignment.

ALT:

Altitude above mean sea level (MSL) will be entered while the aircraft is on the ground. The FCC will compute the corresponding altimeter setting.

HG:

If an error exists between the dynamic altitude display and the barometric altitude, the altimeter setting should be entered.

SPH:

For the spheroid, use the same codes as are used by the doppler.

GRID CONVERG:

For grid convergence, use E for east and W for west. Data may be obtained from G through M angle diagram on Universal Traverse Mercator (UTM) maps.

HEADING (MAG):

The magnetic heading of the helicopter in degrees and tenths of a degree. This heading is entered only if the HARS has tumbled in flight and, during its align cycle, one wishes to servo the gyro compass platform.

Waypoint targeting procedure 2

Up to 10 sets of coordinate data may be stored in the FCC at any time. Two methods can be used to store the coordinate data. These are by using DEK or the STORE position of the UPDT/ST switch on the optical relay tube left handgrip (ORT LHG) (figure 14).

Data entered under TGT on the DEK rotary switch are displayed as four pages of coordinate data.

The various pages may be scrolled for display by use of the DEK SPACE key.

Waypoint targeting storing procedures

During a mission, targets of opportunity may be encountered. The CPG may desire to store the location of these targets for later engagement or for reporting to higher headquarters or other airborne elements. Since these sightings may be rapid and for short periods of time, using a map to pinpoint their coordinates would not be very effective.

Using the TADS, the helicopter can calculate these target locations based on its present position. To store data, proceed as follows (figure 15):

- Select the storage location by using the TGT/NAV indexer.
- Enter the range to the target/waypoint.

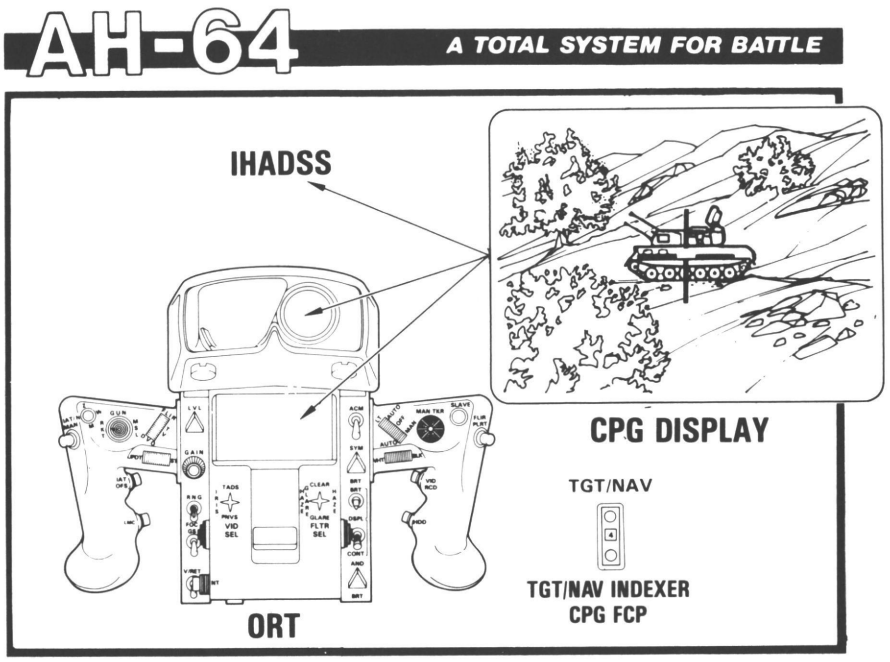


FIGURE 15: Waypoint/targeting storing procedures 2.

• Enter the manual range by using the DEK with the selector switch in range (RNG) position.

• Automatically calculate using the selected LOS.

• For laser range, place the LOS reticle on the target/waypoint and fire the laser.

Place the LOS reticle of the selected sight on the target/waypoint and momentarily position the UPDT/ST switch on the ORT left handgrip to the ST position. The FCC will calculate coordinates and store them in the selected location.

The coordinates may be recalled by placing the DEK selector switch in the TGT position and scrolling the menu until the desired position is displayed.

Waypoint targeting slaving procedures

Once waypoint/targeting data have been stored, sightline cueing or TADS slaving to the stored coordinates can be accomplished as follows (figure 16):

• Position the SIGHT SEL switch to the TADS position.

• Position the ACQ SEL switch to either the TGT or navigation (NAV) position.

• Select stored coordinates to be slaved to, using the TGT/NAV indexer. The cued LOS dot will indicate LOS to coordinate data.

• Press the SLAVE pushbutton on the ORT right handgrip. The TADS LOS reticle will be on the coordinates if they are within the TADS gimbal limits.

Waypoint target cueing procedures

Waypoint target cueing procedures are accomplished as follows (figure 16):

• Position the SIGHT SEL switch in any position except TADS or infrared imaging seeker (IRIS).

• Position the ACQ SEL switch to the TGT or NAV position.

• Select stored coordinates to be cued to using the TGT/NAV indexer.

• Press the ORT right handgrip SLAVE pushbutton. Cueing symbology will be displayed to cue the CPG's LOS to the coordinate sightline.

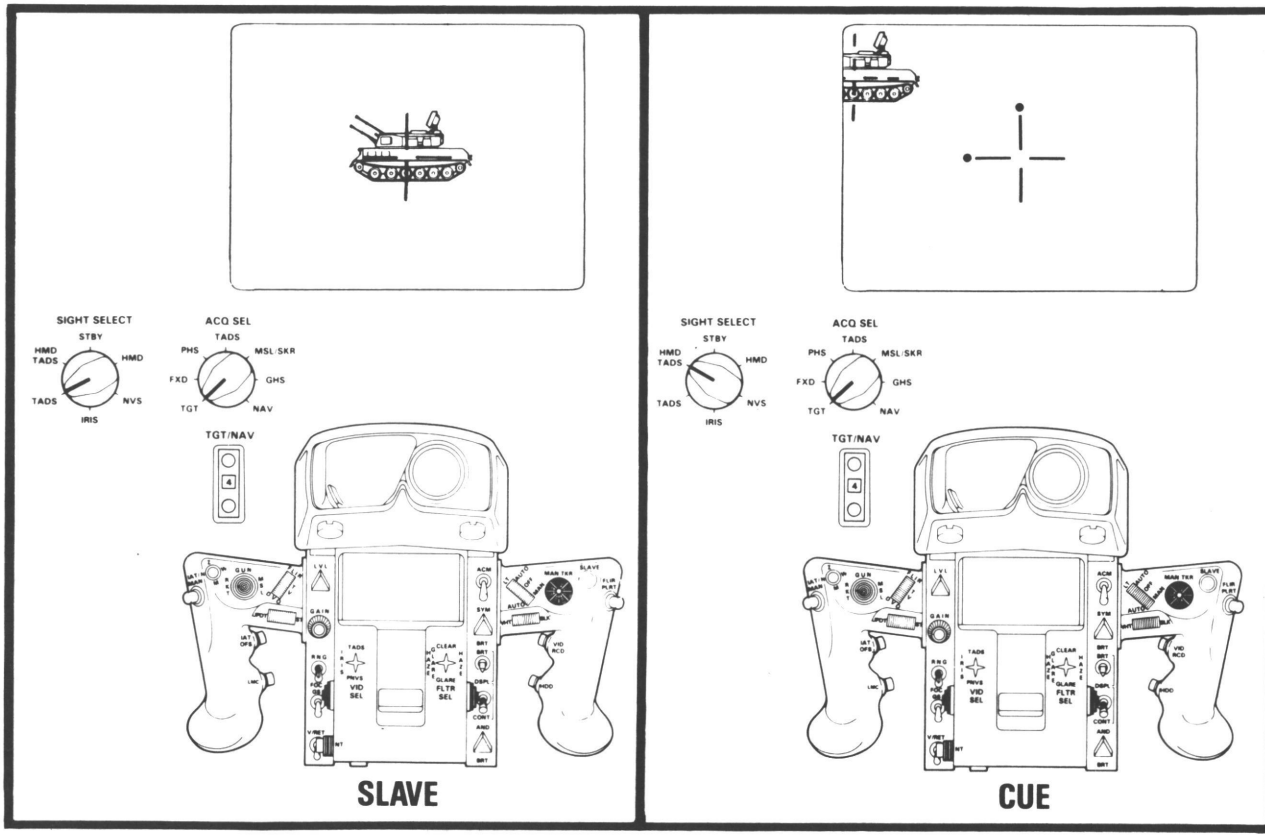


FIGURE 16: Waypoint targeting—cueing.

Pilot Night Vision Sensor (PNVS) System

The PNVS provides the pilot (or CPG) with a high-resolution FLIR video presentation. This allows for nap-of-the-earth (NOE) pilotage and/or weapons sighting during night operations and adverse weather conditions.

Major PNVS components

The PNVS is composed of the following component assemblies (figure 17):

- *The PNVS stabilized turret assembly* is mounted on the aircraft interface assembly above the TADS turret assembly.
- *The azimuth gimbal assembly* is mounted to the top of the aircraft interface assembly below the PNVS stabilized turret.
- *The PNVS electronic control assembly* is mounted within the aircraft interface assembly.
- *The PNVS electronic unit (PEU)* is located in the right FAB.

PNVS capabilities

The capabilities of the PNVS (figure 18) are as follows (TEU control):

- Azimuth range: ±90 degrees
- Elevation range: +20 -45 degrees
- Field of view
  vertical: 30 degrees
  horizontal: 40 degrees
- Maximum slew rate: 120 degrees/second

When the TEU is detected as NO-GO by the FD/LS, the azimuth range is reduced to ±75 degrees, as the pilot night vision sensor electric unit PEU is driving the turret.

PNVS controls

The PNVS is turned on by placing the PNVS switch in the PNVS position (figure 19). This will enable the PNVS and start the IR detector cool-down process. The cool-down process should not exceed 15 minutes. Until the detectors are sufficiently cooled for optimum performance, the message "PNVS NOT . . . COOLED" will be displayed.

To select the PNVS as a sensor, the pilot places his SIGHT SEL switch in the NVS position and his collective NVS switch in the PNVS position.

With the SIGHT SEL switch in the NVS position, positioning the ACQ SEL switch to the NVS FXD position will cause the PNVS to slave to the fixed forward position and display the message "FORWARD."

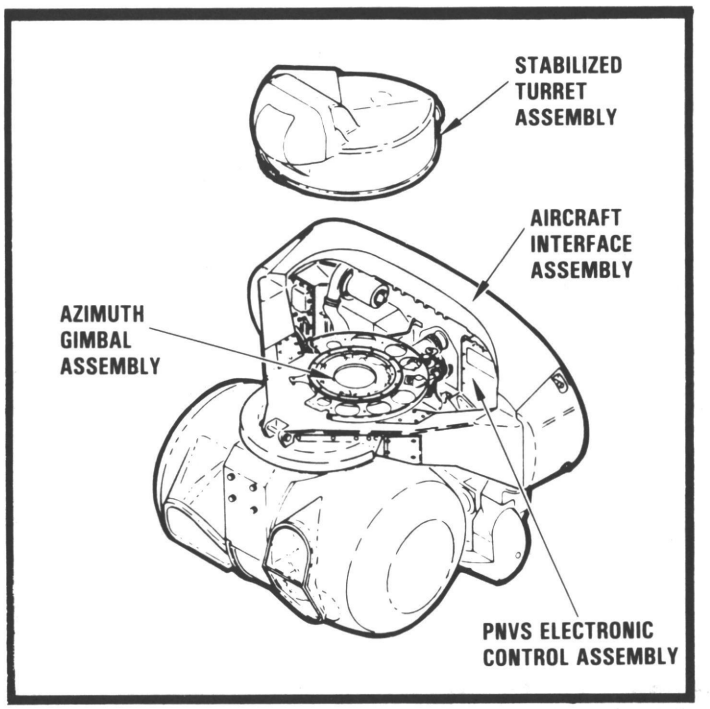


FIGURE 17: Major PNVS components.

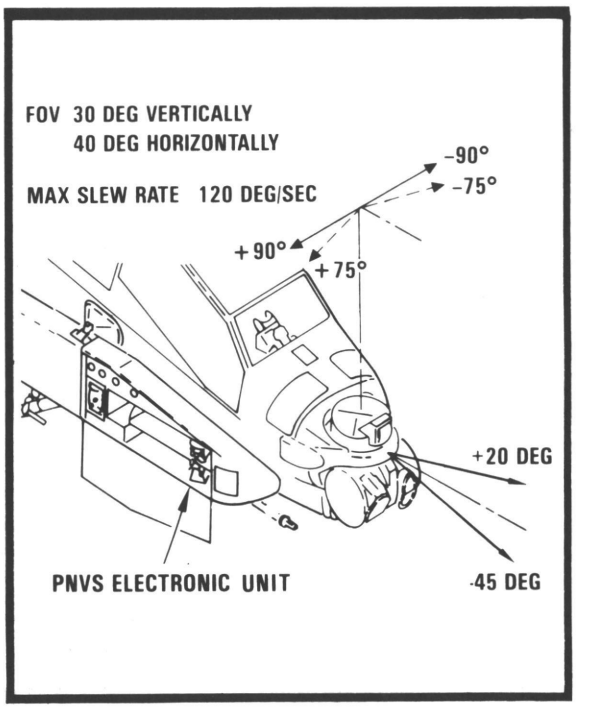


FIGURE 18: PNVS capabilities.

If the PNVS is enabled and the pilot is not using it, the CPG may control the PNVS by positioning his SIGHT SEL switch to the NVS position and his collective NVS switch to the PNVS position. If the pilot is controlling the PNVS, the CPG may override the pilot's control of the PNVS and slave it to his IHADSS LOS by placing the PLT/GND ORIDE switch to the ORIDE position with his SIGHT SEL switch in the PNVS. When the CPG is controlling the PNVS, he may adjust gain and level using his ORT GAIN and LVL controls.

The article has addressed capabilities and characteristics of the AH-64A Apache weapons system in the subsystems of TADS and PNVS. The next article in the Apache series will address the external stores system and the aerial rocket control system.

Mr. Jeffrey W. Van Rope has been responsible for the design, development and presentation of aircrew training programs for the AH-64A. Since joining McDonnel Douglas Helicopter Company in 1979, Mr. Van Rope has traveled worldwide, developing and presenting AH-64A staff and aviator courses to U.S. and North Atlantic Treaty Organization aviators and soldiers.

He has more than 21 years' experience in Army Aviation, with more than 2,500 hours in rotary wing aircraft, and is a maintenance test pilot.

Mr. Wendell W. Shivers is responsible for manpower personnel integration implementation for the AH-64 and LHX programs. Since joining McDonnell Douglas Helicopter Company in 1983, he has held positions in Apache aircrew training, LHX integrated logistics support projects and U.S. Military Marketing.

Mr. Shivers has more than 10 years' experience in Army Aviation.

About The Authors

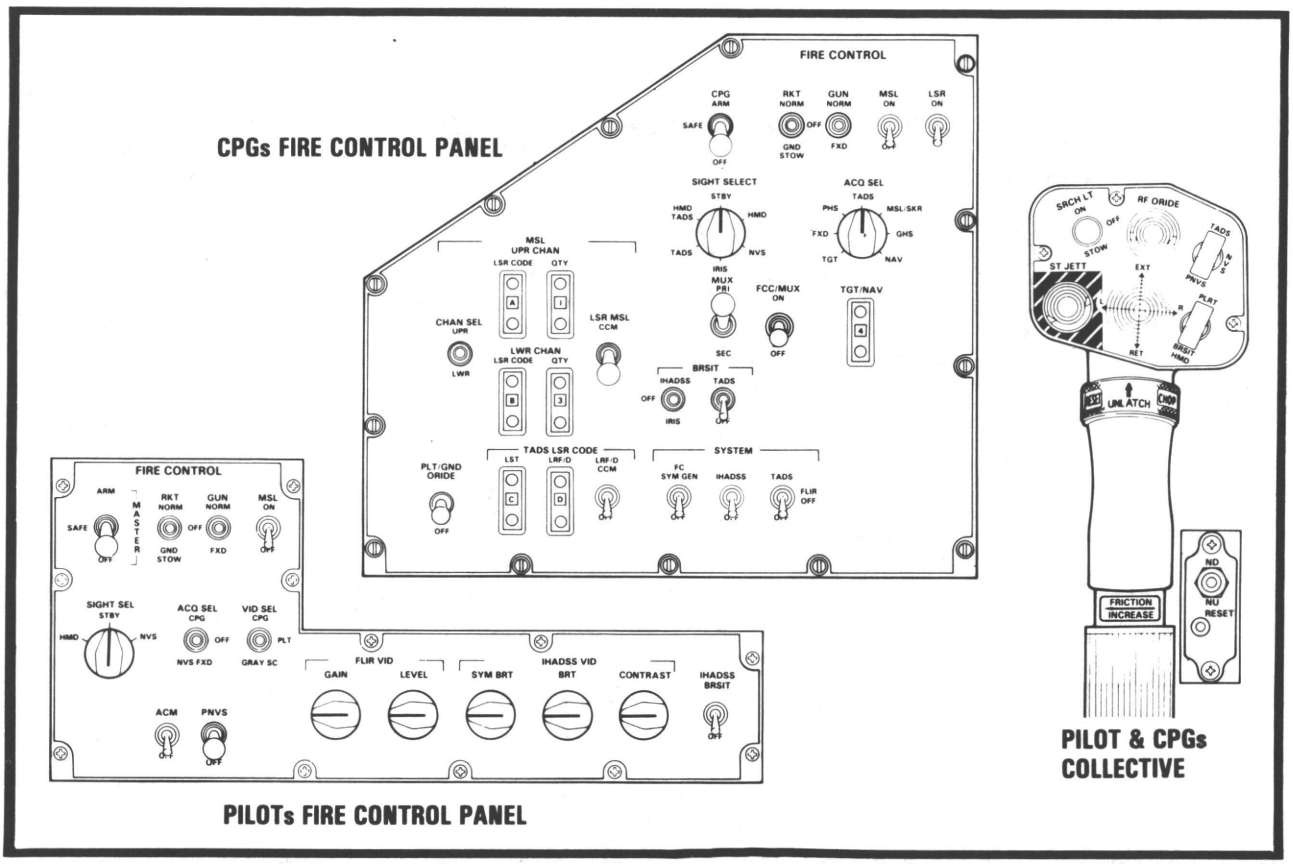


FIGURE 19: PNVS controls.

Recently one of our students in the 67H10 OV-1 airplane repairer course committed a safety violation in the hangar. Since this and all aviation-related courses stress safety, the soldier was required to write this essay to make him think more about safety. The essay "hits home" to all aviation maintenance trades. It also may give aviators something to think about the next time they strap themselves into one of the Army's many flying machines.

WARNING

Aviation is Inherently Dangerous

SGT Frederic T. Lyons
PV1 Michael Porter
Department of Observation Systems Training
U.S. Army Aviation Logistics School
Fort Eustis, VA

WE'VE ALL HEARD that quote before, even non-aviation types. We can see the slogan hanging in just about every hangar that the Army owns. It is true of the jobs all of us in aviation have, whether we are stationed in the continental United States, Germany or Korea, or work with a commercial airline or the space shuttle. If it flies, it demands an extra effort of safety because, if it is not safe, money, time, effort and lives are lost.

Safety in aviation is the first thing ever taught and considered by any aviation vocationalist. The thought of falling helplessly in a piece of machinery does not do a lot for our egos or pride, not to mention the safety record. Therefore, some of the most stringent regulations and standards ever imposed on an industry are in aviation.

Let's consider hangar and flight line safety. It is a true fact that, when a pilot straps into an aircraft, he is placing his life in the hands of the mechanic who makes sure the aircraft is safe to fly and the technical inspector who doublechecks the mechanic's work. (Two pair of eyes are always better than one.)

We, as aviation maintenance personnel, must take our jobs seriously. We are responsible for the lives of other human beings and our own. To be responsible for a mishap that takes the life of another person would be very hard to live with indeed.

One of the most important ways to avoid this is to be aware of what's going on around us at all times. This is no easy task. As we get familiar with something, we do it without really thinking. Something simple like taking a shower, something we do every day. We get in and out of the shower and never really think about the dangers involved like slipping and falling or getting soap in our eyes. We would sound pretty stupid if we reminded everyone of these dangers every time we saw them getting ready to take a shower.

There are many maintenance tasks we probably could do with our eyes closed, but do we really think about what we are doing and what the final outcome would be if we don't follow written procedures 100 percent or dedicate ourselves to the task at hand.

We are all human, and it is a proven fact that humans make mistakes. That is why we have written procedures to tell us how to do the job and technical inspectors to check our work. Pilots are required to perform preflight inspections to ensure mistakes are discovered before they become catastrophies.

Enough can never be said about aviation safety. But, if we all commit ourselves to 100 percent dedication to our work, we will all be happy and secure, knowing that the aircraft we launch daily will return safely because "aviation is inherently dangerous."

AVIATION STANDARDIZATION AND TRAINING SEMINARS

Captain Thomas M. Bagot
Directorate of Evaluation/Standardization
U.S. Army Aviation Center
Fort Rucker, AL

SINCE JULY 1983, the Directorate of Evaluation and Standardization (DES) has been conducting Aviation Standardization and Training Seminars (ASTS). During this timeframe, the ASTS team has visited virtually every Army Aviation unit in the world. The team has surfaced and resolved many issues that were brought to its attention by the participating unit. Until recently, there was no way of answering similar questions raised by other units before the ASTS team assistance visit. However, now this problem has been eliminated through the *Aviation Digest.* Periodically, new issues selected from recent ASTS visits will be addressed in the DES Report to the Field. This will enhance the information exchange between the Aviation Center and the field. The DES staff is here to serve Army Aviation and you, the Army aviator.

Because of severe budget cuts, the ASTS teams cannot visit units as frequently as in the past. For this reason, written correspondence addressing unit questions or problems is encouraged. If you have any questions about these issues and their responses, or if you have issues or questions for which you need answers, please contact the Evaluation Division of the Directorate of Evaluation and Standardization, ATTN: ATZQ-ESE, Ft. Rucker, AL 36362-5216, or call AUTOVON 558-4691/6571.

Does Ft. Eustis, VA, have a mobile training team that provides instruction on corrosion control?

The Department of Aviation Trades Training (DATT) instructs an 18-hour block of instruction (311-138-18) in corrosion control during the 68G10 course. This is not a mobile training team, per se, for corrosion control. The DATT may send its corrosion control instructors to units when requested and paid for by the unit, and when student load permits. Requests should be directed to: Commandant, USAALS, ATTN: ATSQ-TD, Ft. Eustis, VA 23604.

Numerous questions and comments have surfaced concerning the aerial observer course. What is its intent? Was it to assist the pilot in cockpit tasks and to fly in an emergency situation? Task conditions and standards for hovering are more stringent for the aerial observer than they are for the pilot. Are these standards too stringent for its intent?

The intent of task 0047, Perform Emergency Aircraft Handling, in the Enlisted Aerial Observer Course (EAOC) Flight Training Guide (FTG), July 1987, is to ensure that the observer can take control of an aircraft if a pilot becomes incapacitated and cannot perform aircraft handling.

Task 0047.8 in the EAOC FTG requires the aerial observer to maintain hover altitude plus or minus 2 feet and aircraft heading at plus or minus 20 degrees.

The Initial Entry Rotary Wing OH-58 Kiowa Transition FTG, July 1987, requires the pilot to maintain hover altitude of 3 feet or as directed plus or minus 1 foot and aircraft heading at plus or minus 10 degrees.

The FTGs reflect that the task conditions and standards for hovering are not as stringent for the aerial observer as they are for the pilot.

How will students be selected for specific aircraft within the new multitrack program?

The Army Research Institute and the Directorate of Training and Doctrine are jointly conducting a study to determine an algorithm to select students for each aircraft in the multitrack program. Specific guidance from the Aviation Branch Chief provides each aircraft track with a proportionate share of the "top-of-the-class" students. It is recognized and accepted by Army Aviation leadership that we must avoid the creation of a "fourth-class aviator."

The only impact of the multitrack implementation on UH-1 Huey pilots will be an increase of total UH-1 flight hours. Instead of training in the TH-55 Osage as they currently do, they will be training in the UH-1 during that phase of flight school that should, upon completion of flight school, give them more time and experience in the UH-1. The selection of which aviators go into a particular track (AH-1 Cobra, UH-1, etc.) during flight school will be based on criteria that will be determined from the ongoing multitrack algorithm study.

In Army Regulation (AR) 95-1, "General Provisions and Flight Regulation," December 1986, the system for identifying changes is confusing. It is often difficult to determine if a horizontal line goes through or under a word. Can a system be designed with diagonal hash marks or shading to clarify a change?

In June 1987, a recommendation to change the current method of identifying changes was disapproved by the U.S. Army Publications and Printing Agency. Future changes will be developed on a computer at Ft. Rucker and can be controlled to the extent that "line-throughs" and "underlines" will not appear on more than one line of text in any one paragraph. The upcoming revision of AR 95-1 will have no line-throughs or underlines.

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362-5000; or call us at AUTOVON 558-3504 or Commercial 205-255-3504. After duty hours call Ft. Rucker Hotline, AUTOVON 558-6487 or Commercial 205-255-6487 and leave a message.

U.S. Army Class A Aviation Flight Mishaps

	Number	Flying Hours	Rate	Army Fatalities	Total Cost (in millions)
FY87 (through 28 February)	12	632,592	1.90	17	$34.2
FY88 (through 29 February)	7	692,136*	1.01	10	$17.2

*estimated

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Egress Procedures

If an aircraft accident occurs, certain steps must be followed to minimize injury and increase chances for a successful rescue. The following outline, based on the UH-1 Huey, is a guide to assist crewmembers when an aircraft accident happens.

1. After an emergency landing becomes imminent, the following must be accomplished (figure 1) to increase chances for survival:
   a. Place both feet firmly on the floor.
   b. In a forward facing seat, place your head between your knees and interlock your arms under your thighs.
   c. In a rear facing seat, remain in the upright position firmly braced against the back of the seat.
   d. Remain in this position until the aircraft has stopped.

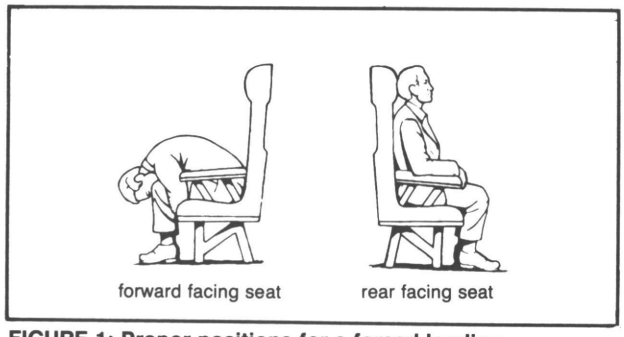


FIGURE 1: Proper positions for a forced landing.

2. Post crash evacuation of personnel:
   a. Remain inside the aircraft until it has come to a complete stop (to include the rotors with the exception of a fire).
   b. Before exiting the aircraft, evaluate the aircraft's surroundings for:
      (1) Position of aircraft in reference to attitude.
      (2) Position of aircraft on the terrain.
      (3) Condition of the aircraft.
      (4) Main fuel and battery off.
   c. Exiting the aircraft (figure 2):
      (1) If cargo doors are closed, pull handle on window and pull window inward.

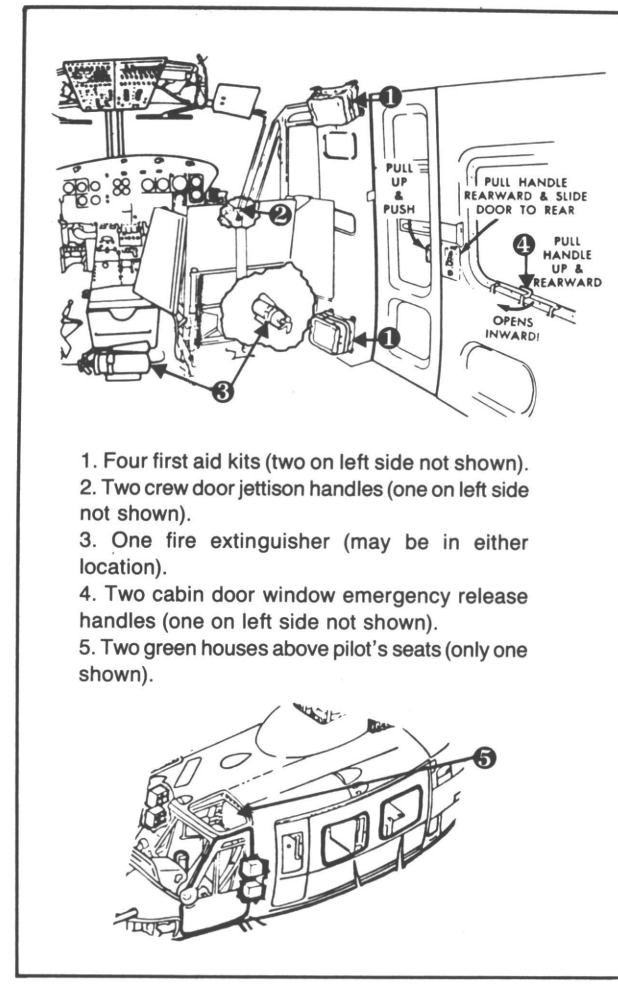


FIGURE 2: Emergency exits and equipment on the UH-1H helicopter.

      (2) If unable, exit from either pilot or copilot door.
      (3) If still unable, exit through green house above pilots' seats.
   d. After exiting the aircraft, go to the 12:00 position a safe distance from the aircraft and wait for others. If unable to position yourself at the 12:00 position because of obstructions, proceed to the 3:00 position. If still unable, proceed to the 6:00 or 9:00 position.

(NOTE: Every attempt should be made to evacuate the injured from the aircraft after you are safe.)

e. If more than one person has successfully escaped the aircraft, the highest ranking survivor will take charge and organize the situation to:
   (1) Administer first aid.
      (a) If there is no possibility of the aircraft catching on fire, the injured individuals should not be moved because of the possibility of further injuring the individuals.
      (b) If there is a fire hazard, attempt to evacuate the injured person as quickly and carefully as possible. Check for degree of injury before moving (if time permits).
   (2) Build shelters.
   (3) Radio for assistance.

f. Do not leave the crash site unless positive contact has been made with a house, highway with traffic or individuals.

U.S. Army Aviation Digest PEARL'S Articles

The PEARL'S articles that are in each issue of the *Army Aviation Digest* can be a source of valuable information. Keeping this information handy can be a distinct benefit to you as the users. Typical is the following question we recently received:

What is the proper adhesive to use for the SPH-4 helmet liner material?

In the January 1987 issue of the *Digest* on page 27, it lists national stock number (NSN) 8040-00-833-9563 as the correct silicon adhesive to use for the SPH-4 helmet liner.

Should you have articles for PEARL'S, the address is located on the bottom page at the end of the PEARL'S articles in each *Army Aviation Digest.* We would like to hear from you.

Rescission of FM 1-508-2

Department of Army Pamphlet 25-30, dated September 1987, has rescinded Field Manual (FM) 1-508-2, "Maintaining Aviation Life Support Equipment (ALSE)." This was the culmination of an action that was taken more than 1½ years ago. Recent discussion with the Ft. Eustis, VA, ALSE training school has resulted in their recommendation to retain FM 1-508-2 and use it for reference only until a new draft publication FM is available. Additional information about this action will appear in a followup article. In any case, retain FM 1-508-2 and continue to use it as reference material. Action officer is "PEARL'S."

Final Draft, Manpower Requirements Criteria Study (MARC)

Finally, the ALSE military occupational specialty (MOS) is beginning to see the light. The U. S. Army Training and Doctrine Command has identified a "new criteria" and a "dedicated position" for ALSE functions and has stated in the MOS study that an unmeasurable cost savings will be realized in the ALSE training program once this MARC has been approved. The MARC study will definitely result in what has been justified for some time. It has taken a long time, but we will all benefit from this "long-time" effort. We cannot give you the timetable for the completed action, but we will keep you updated on this action.

Protective Clothing for Groundcrew Personnel

Groundcrew personnel encounter many hazards when working at "hot" refueling and rearming points. In accordance with AR 385-42, and CTA 50-900, and using Supply Bulletin 700-20 as additional authority, aviation units are authorized to procure the following items of safety and protective equipment:

Goggles, LIN J71304, NSN 8465-00-161-4068
Gloves, LIN J69434, NSN
Helmet, LIN 83491N, NSN
Trousers, Safety, LIN 88265N, NSN
Apron Impermeable, LIN A86590, NSN

NOTE: The items listed above without NSNs will require NSNs and NSNs will be provided as they become available.

PRC-112 Survival Radio

Initial operational test and evaluation (IOTE) on the new PRC-112 survival radio has begun. The lack of sufficient production funds is the main issue at this time. Some production funds remain, but more funds will be needed to support all requirements. It appears that the primary user of this radio will be the U.S. Army, with the U.S. Air Force Special Operations (SPO) Forces as the secondary user. The Air Force SPO recommended that the program be transferred to the Army after the completion of the IOTE. The PRC-112 order of magnitude quantities justifies management of the program being transferred to the Army.

If you have a question about personal equipment or rescue/survival gear, write PEARL'S, AMC Product Management Office, ATTN: AMCPM-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798 or call AUTOVON 693-3817 or Commercial 314-263-3817.

RESCUE

AROUND MIDNIGHT on a September night, during Return of Forces to Germany (REFORGER) 87, an AH-64 Apache helicopter crashed into a hill in the German countryside. The two-man crew, blinded by a wall of fog thousands of feet high, had no warning of their impending crash. No one knew they had crashed and were injured.

The downed AH-64 was one of several Apaches from Ft. Hood, TX, doing cross-forward line of own troops (cross-FLOT) training. By crossing the FLOT, the Apaches were to penetrate enemy lines, and the crews were to attack enemy forces and gather intelligence on their positions.

It was all part of the REFORGER exercise Certain Strike. The enemy was the "orange force" comprised of units from the Belgian, Dutch and British armies. The Apaches were flown by aviators from the 6th Cavalry Brigade (Air Combat), a "blue force" unit from III Corps, which had come from Ft. Hood, to participate in the exercise.

Up until the Apache crashed, everything was routine. The helicopter's crew had practiced cross-FLOT training numerous times. This was, however, the first time an Apache aircraft had participated in an exercise in Germany. The dense fog and darkness, along with the unfamiliar terrain, added an element of the unknown to the training. For the two experienced pilots, however, it was still an ordinary mission, one they were trained to do.

But then everything changed.

Flying in and out of dense fog, one of the Apaches crashed into a hill without warning. There was no opportunity for a mayday call. The helicopter and crew went down and no one knew it.

The injured crew did the only thing they could do. Using their personal survival radios, they sent out a mayday signal and hoped that the limited, short-ranged signal would be heard.

Mayday, Mayday

Overhead, Major Ted Girouard, the executive officer of the lst Military Intelligence (MI) Battalion, was also flying an exercise-support mission. He was in an RC-12D, a fixed wing aircraft carrying electronic reconnaissance equipment.

The battalion is an aerial exploitation battalion, one of two such battalions in Germany. Although normally a V Corps asset, the MI battalion had been tasked to support III Corps during the REFORGER exercise by performing aerial intelligence gathering missions.

In fact, aircraft from the battalion had been in the air for 35 hours straight. On his third mission, MAJ Girouard was monitoring a track 60 miles long at an altitude of 28,000 feet. He was nearing the end of a 6-hour mission when he intercepted the mayday signal from the downed Apache.

"Aircraft, this is Eric Whiskey one-golf X-ray. Can I help you?" asked MAJ Girouard. The beeping signal continued to ask for help.

Hearing no answer, MAJ Girouard, whose own plane was running low on fuel, reported the mayday call to Wesser, the German air traffic control for the exercise area, and returned to base.

His surveillance duties were taken over by Chief Warrant Officer, CW4, Carter Higginbotham and Captain Mike Fant who also were flying their third mission.

"Part of our business is to listen to other radios and pinpoint their location," said CW4 Higginbotham, the pilot in command of the RC-12D that had relieved MAJ Girouard. "We started picking up the rescue beacon from the downed Apache while in the southern portion of our track. I noticed that as we flew north, we lost the signal."

CW4 Higginbotham reported to Wesser that the emergency beacon was coming from the southern portion of their track. They also changed their orbit so they could continuously monitor the emergency signal.

"It wasn't long before the counterpart of the downed helicopter came up and asked if we knew anything about the crash," said CW4 Higginbotham. "We gave him the primary coordinates, and he flew low enough to make radio contact while we listened. It was at that time we learned of the condition of the crew."

They learned that both of the men were injured. One was bleeding pro-

Ms. Becky Gloriod
Public Affairs Office
Headquarters V Corps
APO New York

Illustration by Paul Fretts.

fusely from facial injuries. The fog that had moved in, however, was working with the clock to hamper rescue efforts. The other Apache tried to get in close enough to pinpoint their location, but they couldn't see the ground because of the fog. Next, a German CH-53, a large cargo helicopter, was launched but it too was turned back by the fog.

Meanwhile, on the ground a search party was headed to the general vicinity of the crash site. But their efforts, too, were overcome by dense fog, darkness and nondescript, rolling terrain.

Mindful that time was slipping away, CPT Fant and CW4 Higginbotham asked to leave their track to assist in the rescue efforts.

Working with Wesser Air Traffic Control, they changed tracks and descended from 28,000 feet to 2,000 feet in a matter of minutes.

The fog was so thick that, even at 2,000 feet, they couldn't see anything. They reduced engine power and flew as slowly as they could over the area of the crash. As CPT Fant flew the plane, CW4 Higginbotham maintained radio contact with the injured crew.

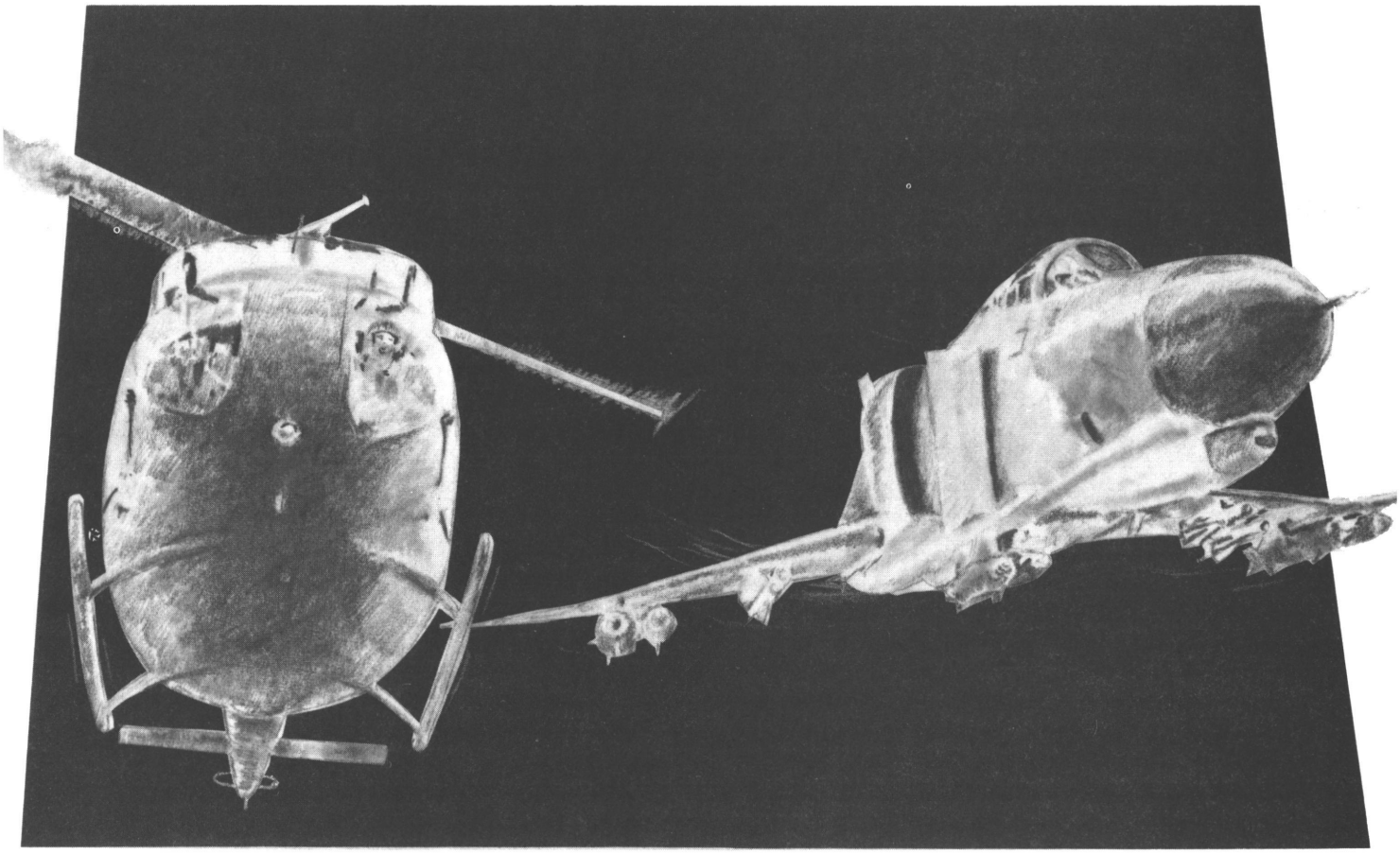
Finally, one of the crash victims radioed, "We can hear your plane."

Slowly, CPT Fant flew the plane in an ever-tightening circle. When he was immediately over the crash site, an excited voice came over the radio. "You're right above us, we can see the glow of your aircraft through the fog." Using his onboard inertial navigation system, CW4 Higginbotham immediately locked in the coordinates of the crash site.

"I'll stay with you until someone gets to you," assured CW4 Higginbotham. But, he had no idea just how long it would take. The injured men radioed back that they had heard the search party earlier, but it had gone off in a different direction.

For 3 hours CPT Fant flew the RC-12D in a 3-mile orbit immediately above the crash site, as CW4 Higginbotham maintained contact with the crash victims and Wesser control. Passing critical information from the downed crew, through Wesser control to the search party, the RC-12D crew guided the rescue party to the injured men. At 0415 hours, almost 5 hours after the accident, the crash victims were rescued.

The rescue mission for CW4 Higginbotham and CPT Fant was finished. They returned to the exercise and once again provided aerial surveillance to the blue force. They never did meet the two men they helped to save. Their reward was knowing that they had been successful and that their training mission had prepared them well for handling a real-life crisis.



AIRSPACE CONFLICT

Because of various uses of airways in limited airspace, airspace conflicts are not uncommon. Although unavoidable, can airspace conflicts be minimized? If so, how? Look for the answers to these questions and a chilling account of some unfortunate mishap occurrences in our densely populated airways in the following article.

Lieutenant Colonel Brian A. Dean

AS MORE AND more aircraft take to the skies each year, the potential for airspace conflict increases exponentially. This is especially true in the continental United States peacetime training environment—in the low-level airspace where most Army flights occur. Can we do anything to reduce the problems and inherent hazards?

Let's start by defining the problem. When we speak of airspace conflict, we mean situations contrary to our own best interests in accomplishing our missions. Therefore, any use of the airspace that results in an adverse impact upon our ability to work and accomplish the mission is rightly termed airspace conflict.

In the aviation business, anything that interferes with the necessary navigation and maneuvering of our machines through the air usually presents itself in one of two forms: something propelled upward from the surface or conflict with other civil and military aircraft operations. Because most of our tactical training takes place close to the earth's surface, our options as aviators are seriously reduced when it comes to avoiding a suddenly encountered hazard. Whether we are successful in avoiding a disaster, and returning to fly another day, depends largely on how well we planned for the event before we got into the aircraft.

You might argue that you are flying in a protected environment, on approved nap-of-the-earth training routes, usually on a military installation, within a military operations area or a restricted area, under strict scheduling and perhaps even under radar control. You're as safe as can be, right? Don't bet on it! If you didn't do your homework before the flight, you are a menace to yourself and perhaps to someone else. Keep in mind that you don't always fly within a protected environment. The "protection" is imaginary and depends upon you and everyone else knowing, understanding and following the rules. Let's look at a common visual flight rules flight...

This morning, the pilot is flying a UH-l Huey with a load of staff types to survey the proposed site for an upcoming training exercise. Flying at 50 feet above ground level, he is concerned with terrain features, navigation and maneuvering the aircraft so that his observers can gather their data. He completes a left turn, levels the aircraft, glances up and sees a military jet on a head-on collision course. Let's stop the action here and climb into the cockpit of that jet 1 minute earlier.

The tension is high. You are a highly proficient fighter pilot, well trained and able to do anything asked of you and your airplane. You are not uncomfortable at 40,000 feet in a dog fight, but this low-level target identification stuff makes a knot in your gut. Your mission is to fly the low-level training route below 200 feet at 500 knots, stay on a twisting course and identify potential enemy target sites. You will cover the 100-mile course in less than 13 minutes, and you must identify 10 checkpoints and 5 target sites en route. The weather is good, but it is bird season and you know that a goose going through one of your engines could ruin your day! There goes checkpoint four and target site two is coming up. Passing it in half a second, you note its position and start a hard right turn over checkpoint five. At wings level you spot a helicopter at 12 o'clock, same altitude.

Both pilots see each other at the same instant. Under the best of circumstances they make visual contact at a separation distance of 1 mile. What are their options? Consider that the helicopter is flying at 80 knots and the F-4 at 500 knots. They will close that 1 mile in 6.2 seconds. Because of their extremely low altitude and surface obstructions, both have already given up the option of descending. They can only turn or climb or both. Can they clear each other?

The Huey pilot slams the helicopter into a hard right turn, pulling all the power available to keep from falling through. The fighter pilot pulls back sharply on the stick beginning a hard, climbing right turn. The G forces are tremendous but he remains conscious. The aircraft pass belly-to-belly less than 200 feet apart. No midair collision! Two seconds later the wake turbulence of the 25-ton jet strikes the helicopter that is just beginning to recover from an unusual attitude and incipient blade stall. It's the worst possible case of wind shear. The helicopter simply is not flying anymore. The accident investigation will reveal that the helicopter crashed in an unusual attitude. No witnesses. Cause unknown. The fighter pilot will report the near collision, but the information will not come to the attention of the accident investigators. Close calls are rather common on these routes. When the aircraft turned away from each other, the pilots each lost sight of the other aircraft. The fighter pilot never knew that the helicopter crashed.

Dramatic? You bet! But no more dramatic than real life. Change the circumstances a little bit. Make the jet a B-52

AIRSPACE CONFLICT

on the same route. You cannot turn a 240-ton bomber with the same agility as a tactical fighter. The result? Tragedy for both aircraft. Do B-52s fly on routes like these? Yes! Low-level penetration is considered necessary for aircraft to survive in an armed conflict and flight crews must train accordingly.

What can we do? Who will help us? Where is the Federal Aviation Administration (FAA) when we need them? We can answer the last question first. The FAA states as policy:

> The navigable airspace is a limited natural resource, the use of which Congress has charged the FAA to administer in the public interest as necessary to ensure the safety of aircraft and the efficient use of such airspace. Full consideration shall be given to the requirements of national defense and of commercial and general aviation and to the public right of freedom of transit through the airspace. Accordingly, while a sincere effort shall be made to negotiate equitable solutions to conflicts over its use for nonaviation purposes, preservation of the navigable airspace for aviation must receive primary emphasis.[1]

From this you can see that the FAA must consider all users of the airspace. They have done this in relation to the military training routes by adopting the see-and-avoid philosophy for aircraft separation and by not restricting the airspace. To minimize the conflict you must know where the routes are, when they are in use and avoid them. Sectional aeronautical charts depict most of the routes but not their operational altitudes nor times of use. The routes are subject to frequent change, and the sectional charts may not have current information. The better and current information is published in the Area Planning (1B) Chart (Department of Defense Flight Information Publication). Pilots should contact flight service stations or military base operations within 100 nautical miles of a particular route for current information.

Flight dispatchers, flight coordinators, aviation managers and aviators all share a responsibility to maintain a safe distance from active military training routes, firing areas, concentrated training areas and other flight hazards not often encountered. Had he done his homework before the flight, our Huey pilot might have been around to fly tomorrow's mission.

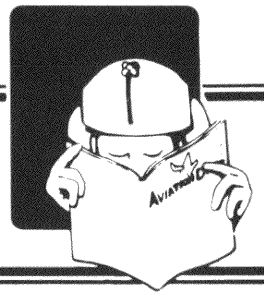
Know before you go!

[1]FAA Handbook 7400.2C, "Procedures for Handling Airspace Matters," paragraph 1000.

ABOUT THE AUTHOR

LTC Brian A. Dean, USAR, holds an individual mobilization augmentee position in the office of the Department of the Army Regional Representative, Southwest Region, Federal Aviation Administration, Ft. Worth, TX. In his other life, he is the National aviation safety manager, Bureau of Land Management, Department of Interior. He is the immediate past president of the International Association of Natural Resource Pilots.

VIEWS FROM READERS



Editor:

The 282d Aviation Company was inactivated on 17 September 1987. The unit was allotted to the Reserve in June 1975 at Knox AHP, Ft. Rucker, AL. The 282d Aviation Company, referred to as the Blackcats, was recently selected as the Outstanding Reserve Aviation Unit of the year and was the first Reserve unit to receive the UH-60 Black Hawk.

Members of the unit were reassigned to the 33d Combat Aviation Group, which was activated at Ft. Rucker on 17 September. The 136th Combat Aviation Battalion also was activated at Ft. Benning, GA. Within the battalion there are assigned two letter companies of UH-60 helicopters. Company A will remain at Ft. Benning while Company B will be located at Knox AHP. Each company will be organized under the new L series TOE.

Mr. Rush Wicker
Ft. Rucker, AL

Editor:

Thanks for mentioning our organization in the February 1986 issue of the *Aviation Digest*. We received many letters from active and retired Army Bird Dog enthusiasts. Some old friends have been reunited.

We had a great fly-in at Blackwell Airport in Ozark, AL, last June. There were 15 0-1 Bird Dogs on the ramp for the occasion. This may have been the largest gathering of Bird Dog aircraft since the war in Vietnam. We will definitely have another fly-in near Ft. Rucker, AL, in the future.

Our annual meeting for 1988 will be held the third weekend in June at Shangri-La, a fly-in aviation resort near Afton, OK. We expect as many as 25 Bird Dogs, many in Army colors and configurations, to be flown in for this event. Several award winning restorations will be on display.

Mr. Phil Phillips Jr
President, International Bird Dog Association
3939 C-8 San Pedro NE
Albuquerque, NM 87110

CALL FOR PAPERS

Aviation Pathology

The sixteenth biennial scientific session of the Joint Committee on Aviation Pathology will meet 15 to 17 November 1988 at the Defence and Civil Institute of Environmental Medicine, Canadian Forces, Toronto, Canada.

Papers are solicited for presentation. Abstracts must be received *no later than 15 June 1988.* Participation by nonmilitary individuals and organizations is invited. The sessions will be oriented toward progress in the various areas of aviation pathology. Specific topics will include but not be limited to:

- **Environmental hazards.**
- **Advances in toxicology.**
- **Accident investigation techniques.**
- **Mechanisms of injury.**

For more information about attending or submitting a paper call Commercial 202-576-3232, or AUTOVON 291-3232.

LEADERSHIP AND COMMAND AT SENIOR LEVELS

Field Manual (FM) 22-103, "Leadership and Command at Senior Levels," dated June 1987, is the Army's latest field manual published to complement FM 22-100, "Military Leadership."

FM 22-103 functions as an instructional text for developing professionals aspiring to lead and command at senior levels. It is useful as a ready resource for those already serving in senior positions and is a common reference point for the many leadership activities that are taking place at senior levels.

Organizations already on pinpoint distribution for FM 22-100 automatically will receive a copy of FM 22-103. However, other units or organizations that need a copy should forward completed DA Form 12-11A-R, Subscription for Unclassified Army Doctrinal and Training Publications, through normal publications request channels.

Additional information can be obtained by calling Lieutenant Colonel Hendricks, AUTOVON 552-2793/4696, or by writing the Center for Army Leadership, ATTN: ATZL-SWC, Ft. Leavenworth, KS 66027-6935.

Readers can obtain copies of material printed in any issue by writing to: Editor, U.S. Army Aviation Digest, *P.O. Box 699, Ft. Rucker, AL 36362-5042.*

Human Factors and Essentials of

DESERT and JUNGLE SURVIVAL

Major Kevin T. Mason, M.D.
U.S. Army School of Aviation Medicine
Fort Rucker, AL

Essentials of DESERT SURVIVAL

THE DISCIPLINE of tropical medicine conjures up images of steaming jungles. Actually, a great deal of the area known as the tropics is covered by desert habitat. Therefore, consideration should be given to the requirements for surviving in the desert in an emergency situation.

The desert is a fatiguing, dehydrating environment that can easily drain any human, both emotionally and physically. The body can partially become acclimatized to this hostile environment during a 2-week period, but this adaptation process is limited.

At first glance, the desert is an endless sea of sand, rock and sparse vegetation. But there are microhabitats within the total landscape that hold the elements for survival. The chances for survival can be enhanced by understanding the impact of special environmental hazards in the desert on the human factors for survival.

Water

Water discipline is essential. Having a source of water is the main key to desert survival. In the hot, dry, windy desert, it is easy to dehydrate without noticeable sweating. The body requires at least 1 to 2 gallons of water a day to survive in the desert. Water consumed in small amounts at regular intervals, but in adequate amounts to prevent dehydration, is preferred. Becoming dehydrated will impair the survivor's ability to forage for water and to think clearly. The sensation of thirst is a poor indicator of the degree of dehydration. A significant degree of dehydration usually exists before the sensation of thirst is felt. Therefore, it is dangerous to rely on the thirst mechanism as a signal to determine when it is time to drink water.

Finding water in the desert may seem to be a formidable task; however, the following discussion will help improve the chances for finding water.

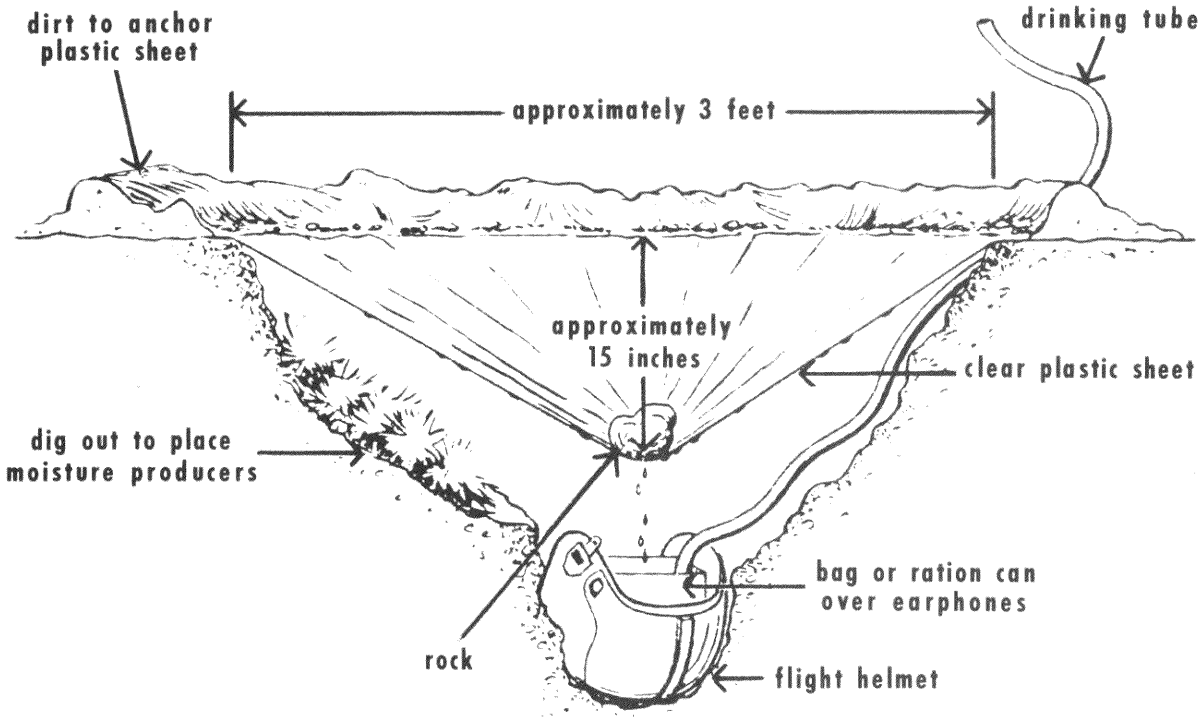
Watch out for game and cattle tracks since they may lead to a source of water, and mammals require a regular source of water. Birds may fly directly to water sources in the morning and evening hours. There are many stories from people stranded in the Australian deserts who claim their success in surviving was due solely to following a flight of birds to water. Vegetation can show the depth of the water table. Palm trees usually indicate water 3 feet below the surface. Salt grass suggests water 6 feet below the surface, and cottonwood or willow trees indicate water at a depth of 12 feet. Plants that seem to have adapted to the dry conditions by having small, waxy leaves or water storage mechanisms should not be used to indicate a source of nearby water. Dew forming on plants can be an important, though minor, source of water. The desert survivor should also be alert to the sudden appearance of rainstorms as a source for gathering water.

The desert survivor should seek out man-made features since these may lead to aqueducts, dwellings, or water storage devices and wells. Domestication of animals is now universally found in deserts. The support of these animals requires stock ponds, water tanks and water pumping devices. Water also can be found at cliff bases and in moist, sandy washes. Steep-walled canyons in deserts may contain pools of water or springs. These are called arroyos and tinajas in the New World and wadis in the Middle East.

The use of solar stills has been popularized, but the amount of effort and body water used in constructing the still often exceeds the water collected (see PEARL'S, *Aviation Digest*, page 20, February 1984). The acrid water can be obtained in small quantities from water storing plants, such as cacti. This water is usually not safe to drink and can cause diarrhea, which aggravates the survivor's dehydration. Also the ease with which water can be obtained from these plants is overestimated.

Once a source of water is found, it is then important to determine if the water is potable; that is, safe to drink. Animal tracks at the water's edge, green algae or small invertebrates in the water suggest the water is potable. Avoid water that appears alkaline, lifeless and edged with white crystals. The ingestion of alkaline water can cause diarrhea. Purify the water with two tablets of iodine per quart of water, and add one-quarter teaspoonful of salt per quart of water when possible. Filter the water through cloth-covered straw,

Solar Still



if available, to decrease sediment ingestion. Water should be consumed in regular, small amounts to ensure better absorption. Water consumed in irregular, large amounts is often lost through increased sweating and urination resulting from water overload.

Nonpotable water should not be discarded since it can be used as radiator water to cool engines. It also can be used to wet personal clothing, which enhances evaporative cooling of the body and decreases the need for sweating.

Temperatures

The desert is not well known for moderate temperatures. Summer temperatures vary from 90 to 120 degrees Fahrenheit in the day to 40 to 85 degrees Fahrenheit at night. Winter temperatures vary from 20 to 60 degrees Fahrenheit in the day to 0 to 30 degrees Fahrenheit at night. Hyperthermia and hypothermia in such extremes are real threats to survival in the desert, even during a 24-hour period. Adequate intake of water, restriction of daytime activities and proper sheltering from the sun will decrease the chances for heat injury. Cold injury can be decreased by removing wet clothing at night, by not discarding clothing removed in the heat of day, and by seeking shelter from the effects of wind chill. Hypothermia can occur in unprepared desert survivors in temperatures as high as 70 degrees Fahrenheit.

The Sun

The sun will affect desert survival. The sun and the radiant heat that it develops can elevate ground

LEFT: In September 1986, during desert survival training at Yuma Proving Grounds, AZ, participants show a typical example of how to purify water.

BELOW LEFT: Perhaps not as easy as conventional cooking, but being innovative in a survival situation has its rewards. Doesn't this "beef jerkey" look yummy?

BELOW: In a survival situation, meats and other foods can be cooked and stored in hollow bamboo sections.

photographs by Captain Alva Pendergrass

temperatures to 200 degrees Fahrenheit. Therefore, the desert survivor must not only seek shade from the direct and reflected sun rays, but must be elevated off the ground by at least 1 foot to avoid the additive heating effects of ground temperature elevation. Sunburn can cause disability, decrease sweat gland function and increase the risk for secondary bacterial infection. The intense direct and reflected ultraviolet radiation can injure the retina, leading to "sun blindness." The desert survivor should modify sunglasses or cover the eyes with shades to allow only a slit of light to enter the eyes.

Sand and Wind

The sand and wind work in unison to dehydrate and abrade the skin and mucous membranes, which result in conjunctivitis, corneal abrasions and increase the risk for secondary skin infections. Sand can contaminate food and water with abrasive materials. Sand storms are particularly dangerous. During these storms, injuries from sand blast dramatically increase. Members of a group of survivors can become separated. Dust devils, small vortices of wind and sand, can throw humans to the ground, resulting in disabling bone fractures and lacerations. The wind can produce wind chill at night or in the winter and increases the chances for cold injury. The desert survivor should seek shelter from these natural elements.

Thunderstorms

Although rain may be welcomed by the desert survivor as a source of potable water, sudden cloud bursts

can result in lethal lightening strikes and flash floods. The floods can travel miles away from the storm and suddenly flood desert areas where no rain is evident. Because of this, the desert survivor should not camp in dry washes.

Food

Desert survivors are more likely to die of dehydration than starvation since their survival situation is usually resolved, for better or for worse, in a short period of time. The large variety of desert plants and complexity of plant identification make the safe consumption of plants unlikely. Many desert plants are poisonous or will cause diarrhea when ingested. Cooked birds, bird eggs, snakes and mammals are generally the safest food to eat in the desert if the survivor's food supply is exhausted. Eating food without the simultaneous ingestion of water will increase dehydration since the body forces fluid into the digestive tract to aid digestion of dry food.

Animals

The safest policy is to avoid all animals in the desert since most desert survivors are unlikely to excel in animal identification and many animals carry infectious diseases. It is best to strictly avoid ants, wasps, bees, spiders, centipedes, scorpions, snakes and other reptiles since a majority of these can cause harm. Rodents and other mammals may harbor disease vectors such as lice, fleas, mites, ticks and flies. Mammals may be infected with diseases, such as rabies. The desert survivor should be cautious when stepping or placing hands around logs, cacti, bushes, grass and rocks, especially at night when most desert animals are more active.

Desert Illnesses

The following medical problems are likely to be aggrevated by the desert environment:

- Heat cramps, heat exhaustion, heat stroke and hypothermia, with associated dehydration and electrolyte imbalance. (Please refer to an excellent article, "Dehydration, Heat Illness and Army Aviation," *Aviation Digest*, July 1985, for further details.)
- Sunburn and sun blindness.
- Secondary bacterial or fungal skin infections due to abrasion and puncture of the skin by moisture, sunburn, wind chap, sand, plants, rocks and insect bites.
- Allergic reactions to plants and insect bites.
- Psychological stress secondary to fear of death or animal attacks, loneliness and excessive concern about minor injuries.

The following infectious diseases can develop in the desert environment:

- Viral: Hepatitis A, hepatitis B, rabies and certain mosquito-borne viral fevers.
- Rickettsial: Louse-borne typhus (Middle East and Asia) and Q-fever.
- Bacterial: Anthrax, brucellosis, enterotoxigenic *E. coli*, plague, salmonellosis, shigellosis, tetanus, trachoma, tuberculosis and typhoid/paratyphoid fever.
- Fungal: Coccidioidomycosis (Central and North America).
- Protozoal: Amebiasis, giardiasis and cutaneous and visceral leishmaniasis.
- Helminth: Ascariasis, echinococcosis, hookworm, schistosomiasis and taeniasis.

Additional Comments

The best way to increase the chances for survival is to plan for an emergency survival situation before it occurs. Ensure that immunizations, especially yellow fever, are current. Carry more food and water than is required. Learn navigation techniques and carry topographical maps, marking known water sources along the planned route of travel.

Should a survival situation occur, the single most important thing to develop is a positive attitude that survival is possible, no matter the odds or circumstances. Do not let phychological stress overwhelm common sense. Focus a majority of effort on maintaining adequate hydration. Dawn and early morning are the best times to forage and change locations. Travel at night should only be with the aid of a light to prevent injury and snakebites. Messages should be left for rescue teams stating intentions when changing locations and mark the trail used in the move, except when in a wartime escape and survival situation. Signal mirrors during the day, signal lights at night and signal fires during the day or night are highly effective in the desert for attracting the attention of rescue teams.

Essentials of Jungle Survival

MUCH OF THE tropics is covered by jungle habitat. Therefore, consideration should be given to the human factors involved in surviving in the jungle in an emergency situation.

Movies and television have imparted a dangerous, mystical quality to the jungle. At first glance, the jungle seems to be an impenetrable, hostile tangle of vegetation, stalked by man-eating animals. But these attributes have been magnified out of proportion to the reality that the elements for survival are readily available in the jungle. One can improve the probability for survival by understanding the effects of the jungle environment on the human factors for survival.

Water

Finding water is not difficult in the jungle when compared to the efforts the desert survivor must exert in his search for water. Rain water is the safest to drink and easy to obtain in the monsoon season. The jungle survivor should purify all water for consumption with two tablets of iodine per quart of water, and add one-quarter teaspoonful of salt per quart of water when possible. The water should be filtered through cloth-covered straw to decrease sediment ingestion. As with desert survival, ingestion of 1 to 2 gallons of water per day, in small amounts at regular intervals, is a major requirement for survival in the jungle.

Climate

The hallmarks of the jungle climate are moderate to high temperatures, high humidity and intermittent heavy rains. The rains are present throughout the year at the equator and are seasonal in the form of monsoons, alternating with dry seasons, away from the equator. In general, the climate is more moderate and predictable than in the temperate zones. The heat and humidity are often not worse than that encountered in the cities of the southern United States during the summer months; they are just more persistent. Chilly days and nights are common during the winter months in the jungle, putting the unprepared jungle survivor at risk for developing hypothermia. The body can become partially acclimatized to the jungle climate after 2 weeks of exposure; however, even then, the jungle climate can be mentally and physically oppressive.

Food

Food is abundant in the jungle. Bananas, coconuts, oranges, lemons, papaya and raspberries are recognizable and edible. Certain nuts, breadfruit, and mangoes are also edible; however, their appearance must be learned by the jungle survivor. Experience will also aid the jungle survivor in identifying and cooking the tubers of taro, yam and yucca. Palm hearts can be used to make a refreshing salad. Generally, other fruits and flowers eaten by monkeys or birds are safe to eat. Cooked fish, fowl, crawfish, mammals, birds and bird eggs are safe to eat and can be roasted inside banana leaves. Meat also can be cooked inside hollow bamboo sections. When the ends of the bamboo are sealed after cooking, the meat will not spoil for up to 3 days if the seal is not broken. The jungle survivor should not wash foods with contaminated water to prevent becoming infected with water-borne diseases.

Animals

Disease-carrying insects are the most significant health threat to the jungle survivor. Ticks, flies and midges are present at anytime, while mosquitos are most prevalent at dusk and dawn.

Sweat bees are bothersome in hot, dry weather, but will not bite. Ants, scorpions, spiders and centipedes should be avoided. The rice-borer moth of Southeast Asia is attracted to evening lights and can cause burning, slow-healing skin lesions when the small, barbed hairs on their bodies are ground into human skin.

Leeches are common in the tropical Pacific and Southeast Asia. The leech bite commonly becomes secondarily infected and ulcerated, opening a portal for water-borne diseases and increasing the jungle survivor's disability. The leech will release itself when touched by a burning cigarette, alcohol or insect repellent. The number of leech bites can be decreased

by tucking in the pant cuffs and applying a strap around the lower legs.

The probability of being bitten by a snake is no greater than in the southern United States, but the same precautions should be practiced. The jungle survivor should be careful where he steps or places his hands around bushes, trees and rocks. The most dangerous snakes in the jungle are cobra, coral snake, bushmaster, fer-de-lance, Malayan pit viper, rattlesnake and, in the salt water, the sea snake.

The large, meat-eating predators, such as lions, crocodiles, etc., are seldom seen and tend to avoid man. They will usually not attack unless provoked, wounded or cornered.

Jungle Illnesses

The following medical problems are likely to develop in the jungle environment:

- Heat cramps, heat exhaustion, heat stroke and hypothermia, with associated dehydration and electrolyte imbalance.
- Secondary bacterial or fungal skin infection due to abrasion and puncture of the skin by plants, moisture, insect bites and leech bites.
- Contact dermatitis similar to poison ivy, and allergic reactions to insect bites.
- Tree nettle stings.
- Trench (immersion) foot.
- Psychological stress secondary to the fear of animal attacks, loneliness, disorientation and excessive concern about minor injuries.

The following infectious diseases can develop in the jungle environment:

- Viral: Arthropod-borne fevers, hemorrhagic illnesses, and encephalitides; rabies and viral hepatitis.
- Rickettsial: Scrub typhus and Q-fever.
- Bacterial: Anthrax, brucellosis, cholera, enterotoxigenic *E. Coli*, Leprosy, Leptospirosis, relapsing fever, salmonellosis, shigellosis, tetanus, tuberculosis, typhoid/paratyphoid fever and yersiniosis.
- Fungal: Candidiasis, tinea corporis, tinea cruris, tinea pedis and tinea versicolor.
- Protozoal: Amebiasis, cutaneous and visceral leishmaniasis, giardiasis, malaria and toxoplasmosis.
- Helminthic: Ascariasis, filariasis, hookworm disease, loiasis (Africa), onchocerciasis, schistosomiasis, strongyloidiasis, taeniasis, trichinosis and trichuriasis.

Additional Comments

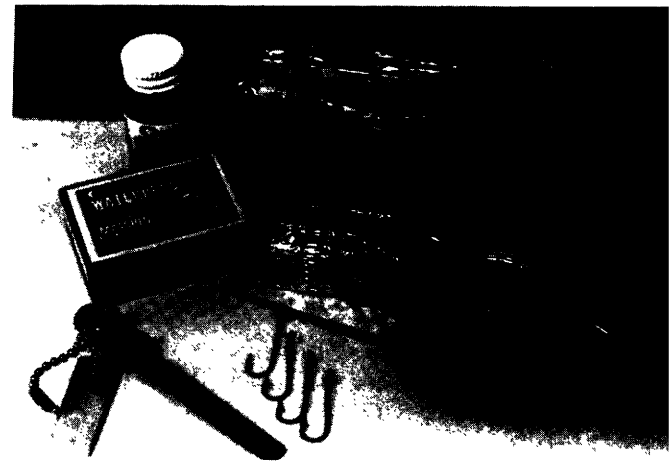
Jungle topographic maps are often inaccurate since the jungle tends to hide topographic features from aerial surveys, such as small streams and swamps. The jungle survivor should be prepared for these possible deceptions.

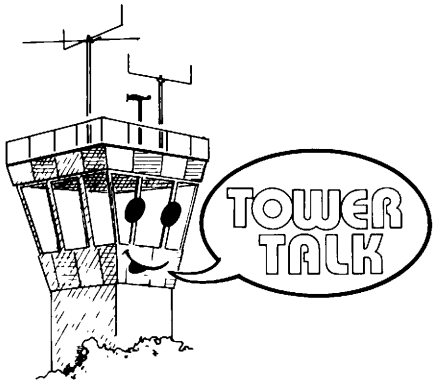
The additional comments outlined in the discussion on the essentials of desert survival are also valid for jungle survival.

Coming Next Month: Have you ever thought about what you'd do if you were stranded in the desert? "Dynamite in Small Packages," which will appear in the April 1988 issue, offers some helpful hints on using the contents in the survival vest, individual, aircrew, tropical kit to increase your chances of being a survivor instead of a statistic.

Shown here are possible items for your kit. Included are a "metal match (basically flint and steel) and water purification tablets.

photograph by Captain Byron L Howard





SPECIAL VISUAL FLIGHT RULES

FAA Handbook 7110.65E

Mr. Frank Dennis
U.S. Army Air Traffic Control Activity
U.S. Army Aviation Center
Fort Rucker, AL

1. Which of the following is not a requirement for authorizing special visual flight rules (SVFR)?
   A. A letter of agreement (LOA) with the using agency
   B. Procedure must be conducted within a control zone
   C. When the procedure is requested by the pilot
   D. On the basis of the weather conditions at the airport of intended landing/departure

2. What is the proper phraseology used to clear an aircraft into the control zone when SVFR procedures are in effect?
   A. CLEARED INTO THE CONTROL ZONE SOUTH OF TEMPLE AIRPORT VIA INTERSTATE 35 MAINTAIN SPECIAL VFR CONDITIONS WHILE IN THE CONTROL ZONE
   B. CLEARED TO ENTER CONTROL ZONE SOUTH OF TEMPLE AIRPORT VIA INTERSTATE 35 MAINTAIN SPECIAL VFR CONDITIONS WHILE IN THE CONTROL ZONE
   C. ENTRY INTO THE CONTROL ZONE IS APPROVED SOUTH OF TEMPLE AIRPORT VIA DIRECT MAINTAIN SVFR WHILE IN THE CONTROL ZONE
   D. CLEARANCE INTO THE CONTROL ZONE IS APPROVED SOUTH OF TEMPLE AIRPORT VIA DIRECT MAINTAIN SVFR WHILE IN THE CONTROL ZONE

3. In SVFR conditions, apply approved separation between—
   A. All flights
   B. Only instrument flight rules (IFR) flights
   C. SVFR, and SVFR and IFR flights
   D. Only SVFR flights

4. SVFR aircraft are not assigned a specific altitude because—
   A. They must maintain cloud clearance requirements
   B. They don't operate as well in the clouds
   C. The pilot must maintain visual reference to the surface
   D. They must maintain obstruction clearance requirements

5. Authorize local SVFR operations when—
   A. Necessary for training
   B. Considered necessary to fulfill the mission requirements
   C. Requested for a specific period and a means of recall is provided
   D. LOAs have been coordinated and are awaiting signatures

6. You may authorize a climb to VFR when—
   A. Requested by the pilot and approved by the air route traffic control center
   B. Requested and the only weather limitation is restricted ceiling
   C. Requested and the only weather limitation is restricted visibility
   D. Requested and the ceiling is reported as measured

7. Which of the responses is not authorized when ground visibility is below 1 mile?
   A. Inform departing aircraft that ground visibility is less than 1 mile and that a clearance cannot be issued
   B. Inform arriving aircraft operating outside of the control zone that ground visibility is less than 1 mile and issue clearance
   C. Inform arriving aircraft operating within the control zone that ground visibility is less than 1 mile; ask if the aircraft can depart the control zone with 1 mile flight visibility. Clearance depends on the pilot's answer.
   D. Authorize scheduled air carrier aircraft in the United States to conduct operations if ground visibility is not less than ½ statute mile.

ANSWERS
1. a, para 7-40a
2. b, para 7-40a
3. c, para 7-42
4. a, para 7-43, note 1
5. c, para 7-44a
6. c, para 7-45
7. b, para 7-46a-d

ATC ACTION LINE

FLIP Improvements

Mr. Forrest H. Helfenberger
U.S. Army Aeronautical Services Office
Cameron Station, Alexandria, VA

HAVE YOU EVER wondered how *YOUR* flight information publication (FLIP) gets changed or just who is responsible for format, content, etc.? Contrary to what some of you may think, there is a method to our madness. Here's a brief overview of how we do it.

FLIP is a Department of Defense product. Everything about FLIP is determined by a forum comprised of the three military services (Army, Navy and Air Force). This forum is referred to as the FLIP Coordinating Committee (FCC). All validated requirements, suggested improvements and cartographic solutions are referred to the FCC for action.

How does the FCC get its recommendations? About 90 percent are user generated.

What channels are available for aviators to submit their questions and comments? Direct access to U.S. Army Aeronautical Services Office (USAASO) or our field offices is available via COMM Cards, telephone, messages, letters or office visits. Army Regulation 95-14 provides a list of addresses and telephone numbers of appropriate offices.

Another channel available to you is through your intheater FLIP Maintenance Working Group (FMWG). The intheater FMWGs were established 2 years ago to review all FLIPs for their area of operations. Their reviews concern product format and utility. They also develop recommendations to improve currency, usability and standardization of FLIP.

Tri-Service representatives are members of the FMWG, and emphasis is placed on having aviators in attendance who use the products daily.

To further advertise the existence of the FMWG, we are considering revising FLIP General Planning, chapter 11, to identify Service representatives by theater. As an interim measure, intheater Army members are as follows:

CONUS, Alaska, Hawaii and all theaters
USAASO Aeronautical Information Division
CW4 Hanna
AUTOVON 284-7773

Europe, North Africa, Middle East
USA Aeronautical Services Detachment, Europe
Mr. Dick Johnson
AUTOVON 370-8079

Pacific
EUSA ATC Coordinators Office, Korea
SFC Danny Ledbetter
AUTOVON 723-6115/6462

USARJ Aviation Detachment, Japan
CW4 Ingham
AUTOVON 233-4243

WESTCOM—APOP-AV, Hawaii
AUTOVON 455-0822
Commercial 808-655-0864

Caribbean and South America
USARSO/SOCS-A, Panama
CW3 Phillips
AUTOVON 287-3569

Your input is essential to make FLIP serve YOU.

Coming Next Month: Beginning with the April issue, the ATC Action Line will be titled ATC Focus. An added feature will appear under the revised heading of USAASO SEZ.

Readers are encouraged to address matters concerning air traffic control to: Director, U.S. Army Aeronautical Services Office, Cameron Station, Alexandria, VA 22304-5050.