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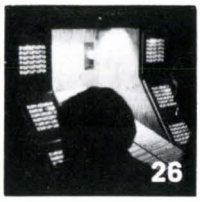
UNITED STATES ARMY

# AVIATION DIGEST

OCTOBER 1973

# UNITED STATES ARMY AVIATION DIGEST

OCTOBER 1973 VOLUME 19 NUMBER 10



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## ABOUT THE COVER

A flashlight reflector can be an emergency means of starting a fire in a survival situation (see page 7). Photo by CW3 Mike Lopez


The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of the Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted provided credit is given to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, AL 36360.

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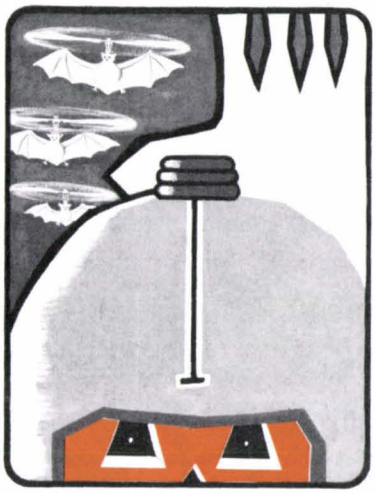
# VIEWS FROM READERS



Sir:

Request the following announcement be printed in the AVIATION DIGEST.

The Test Flight Branch, Aviation Maintenance Training Department, U. S. Army Transportation School, Ft. Eustis, VA, maintains a roster of UH-1/AH-1G, CH-47, OH-6/OH-58 and OV-1 Test Pilot Course graduates. A new CH-47 Test Flight Handbook has been published recently. This handbook has been updated and reflects the latest test flight procedures with much more detail. This book recently was mailed to course graduates in the field who have maintained a current address on file at the Test Flight Branch. If you are a graduate of the CH-47 course and have not received a new handbook, notify Test Flight Branch, AMTD, USATSCH, Ft. Eustis, VA 23604, as soon as possible. A letter or a phone call will be sufficient. The AUTOVON is 927-2605 or 927-4224. All the rosters are updated annually and it is requested that graduates contact Test Flight Branch annually and update their address cards.

MAJ Donald A. Couvillion
Chief, TFB, AMTD
USATSCH
Ft. Eustis, VA 23604

Sir:

I have just recently been assigned to the 52d Aviation Battalion as the battalion aviation safety officer and have found out that the units within the battalion are receiving copies of AVIATION DIGEST, but none are received here at battalion headquarters.

I don't know if it is due to a recent reorganization from 309th Aviation Battalion to 52d Aviation Battalion without an address change being forwarded. We have 14 rated aviators assigned to battalion headquarters and request that we be put on your distribution list for 7 copies. Please mail copies to:

Commander
52d Aviation Battalion
ATTN: Safety Officer
APO San Francisco 96301

CWO Robert N. Cooper
Aviation Safety Officer
HQ, 52d Avn Bn (Cbt)
APO San Francisco 96301

• **See the inside front cover and page 14 of July 1973 DIGEST for information concerning distribution.**

Sir:

. . . In your June 73 issue "Views From Readers" you presented a letter from CW2 Diuguid regarding light systems. These "night formation marking light kits" were initially installed on our aircraft in late '67 and early '68 and were initially just electro-luminescent panels. Many changes during R&D phase with lowered overlays prevent ground detections when 100+ feet, allow for following aircraft to align a definite angle and provided the pilots with range information for maintaining 200-250 feet in echelon. The addition of rotor tip lights gave the following pilot good visual clues for changes in speed and direction. These also were masked from ground detection at less than 30 degrees angle of bank and 100+ feet. Tests were conducted on 30 September 70, USATECOM Project No. 4-A1-19D-FML-001; USATECOM Project No. 4-9-5002-01 dated 14 Jul 69; and a VN incountry evaluation was made during this time. We still have several aircraft equipped and are doing follow-up R&D. ECOM Project Engineer was Mike Wilkins at Ft. Monmouth X-51998.

Walter D. Sabey
280 Silver Bay Road
Toms River, NJ 08753

Sir:

Recently I read a short transcript in the AVIATION DIGEST about a crash survivor. Until I reached the last few sentences I was sure he was talking about a mishap in the Republic of Vietnam. Boy, was I wrong! And, as I think back over my 5 years in Army aviation, I realize just how much dumb luck I have had. I really haven't flown much—1,700 hours total, 1,300 in CH-47s and almost 1,000 in the Republic of Vietnam. But, I do remember crossing this great country of ours twice—from New Cumberland Army Depot to Sharpe Army Depot, all in CH-47s. Believe me, 5 miles west of Ft. Sill, OK, to Bakersfield, CA, there's a whole lot of desolate countryside.

We did put one down 5 miles southeast of Gila Bend, AZ, on my first cross-country (Ft. Sill to Sharpe Army Depot) and if we had been one aircraft instead of a flight, well . . . 5 miles at 1400 hours on a desert is no picnic.

If you think this is isolated, think over the T-42 lost at the U. S. Army Aviation Center, Ft. Rucker, AL, on a

***Continued on page 20***

# Flight Tested And "Assumed" Serviceable

**Major James D. Campbell**
Australian Army Exchange Officer

**The author was prompted to write this story because of his past encounters with dangerous in-flight situations which he believes could have been averted if more thorough writeups had been made in aircraft forms**

I RECENTLY heard a gentleman explain never to assume anything because it makes an ASS out of U and ME. How right that saying can be at times.

Some years ago I had an unusual experience which I thought very little of at the time, and it wasn't until some 18 months later that I learned the true significance of the event. We were hovering in an OH-13 helicopter equipped with dual controls. I was an instructor pilot occupying the pilot's seat and briefing the pilot in the right seat on the sequence of training which I wanted him to perform when I exited the aircraft and he changed seats. We had a cargo sling attached and I asked him to take over the controls for a moment while I reset the release switches. He had no sooner taken over when the helicopter started an unusual violent swing which alarmed me, and I immediately regained control.

The helicopter hovered normally and I held it at a hover for a few minutes while we regained our composure, and I made a caustic remark about his magnificient reflexes and exquisite skill at the controls.

I checked the aircraft with left pedal, right pedal, up collective, down collective and everything ap-

peared normal. The aircraft was *flight tested* and *found serviceable.* I *assumed* he had not fully taken over the controls of the aircraft when I handed it over and this caused our gyration. The pilot completely accepted this explanation and the incident was forgotten for awhile. But later I learned that the anti-torque pedals on the right-hand side of the aircraft had been installed reversed (pedals on the left-hand side, or pilot's side, were installed correctly).

The purpose of this article is not to go into the reasons why this simple fault was not detected by the air crew, ground crew and others; the reasons are rather complicated and it would be difficult to present the full facts in anything but a lengthy document. But it is the purpose here to look into the fallacies which are at times in the statements *flight tested and found serviceable* and *ground checked and found serviceable.*

How many times have we heard or witnessed accidents or near-accidents where a pilot noticed some abnormality while flying and either:

• continued flying as the fault disappeared,

• turned the aircraft down to have someone else test fly it and find it serviceable,

• turned the aircraft down to have the maintenance personnel ground check it and find it serviceable

and the fault still remained hidden, waiting to provide a hair-raising experience for some unsuspecting aviator?

What about the pilot who after a caution light illuminates chooses to fly on to his destination, which is about 10 minutes away, when he has an excellent landing area directly below? If he has an engine failure on final, who is to blame for the accident? Is it the mechanic who overtorqued the broken oil line, or the pilot who failed to put the aircraft on the ground immediately when the light illuminated and while the engine was still running?

If the pilot chooses not to tell the accident board that the light had illuminated some 10 minutes prior to the accident, the accident could be categorized as maintenance error. From the time that caution light illuminated and the pilot chose to overfly a suitable landing area, he is accepting an unserviceable aircraft as serviceable, and if not accepting full responsibility for any subsequent incidents must share some of the responsibility.

There are two major systems on most aircraft which fall into the category of being prone to getting intermittent faults which can be difficult to detect on inspection. These are the hydraulic system and electrical system (including all systems using electricity as a source of power). Doesn't it feel great to walk out to your aircraft and read in the logbook an entry from the previous flight saying the pilot had a cyclic hard over or hydraulic failure and maintenance has signed it off "test flight completed," i.e., *test flown and found serviceable?* Or you are about to undertake an instrument flight with the weather at minimums and after a lengthy period of flight planning open the aircraft's logbook to read on two previous occasions in the last 2 days the attitude indicator has been written up as unserviceable and signed off "maintenance operational check O.K.," or "Moc O.K."? Though this did happen, such an entry should not be encountered in Army aviation. Operation and serviceability of an attitude indicator requires test flying the aircraft to duplicate conditions under which the system will be operated in flight. The maintenance officer would be notified and the problem resolved prior to IFR flight.

If a fault has occurred, or you have good reason to suspect a fault has occurred, and on inspection the source of the problem cannot be accurately determined, then the system or component concerned should be replaced on the aircraft and completely overhauled. This may be expensive when on a superficial inspection there doesn't appear to be anything wrong with the component, but it is only a fraction of the expense of the loss of an aircraft which could result if it were allowed to continue on its merry way until the fault reoccurred in unfavorable circumstances.

Maintenance people are not the only ones to blame. Some pilots have had problems and either through ignorance, neglect or fear of disciplinary punishment have not stated the true facts in the maintenance writeup. Like the doctor who has difficulty treating a patient who won't admit the true facts, the maintenance officer has difficulty repairing the bird when he has just been fed a dose of Hans Anderson's fairy tales by a pilot.

Where a fault is not obvious, finding the cause should not be treated as a quick decision exercise where the first solution which enters your mind is accepted as the answer. Aircraft are expensive to replace and pilots even more expensive—so don't let the simplest solution be treated as the answer for the sake of accomplishing a mission.

Major Campbell is an Australian Army officer, Aviation Branch on exchange duty with the U. S. Army. He is serving with the Department of Resident Training Management, U. S. Army Aviation School, Ft. Rucker, AL. His ratings include both fixed and rotary wing and he also holds a glider license. Major Campbell has flown more than 4,900 hours

# Above The Crest

**After tropical storm Agnes hit central Pennsylvania, Army aviators transported more than 3,500 personnel and 150,000 pounds of cargo to aid the needy**

**John C. Neamtz, DAC**

TROPICAL STORM Agnes moved into the central Pennsylvania area on 21 June 1972 and in a 24-hour period the area received approximately 15 inches of rainfall. As a result of the flooding of roads, etc., only about 15 percent of the normal work force reported for work at New Cumberland Army Depot.

The depot air section began receiving calls for helicopter evacuation of personnel trapped by the rapidly rising water at 0700 on 22 June 1972.

Nine CH-47s and 13 other helicopters airlifted more than 3,500 flood victims

The motto of all aviators is "Above the Best" and in this case it was also "Above the Crest" of the raging Susquehanna River and its tributaries.

I awakened early on the morning of 22 June 1972 with the rain being driven against the aluminum siding of my home by a 30- to 40-mile-per-hour wind. I knew immediately something very unusual was happening and I was soon to find out.

I hurriedly dressed and left for work, although it was nearly an hour earlier than usual. Ten minutes later I found the access road to New Cumberland Army Depot closed by flooding water and it was necessary to backtrack several miles to reach the only access road to New Cumberland Army Depot. This access road was closed by rising water 2 hours later.

I arrived at flight operations at 0700 to find we had only a skeleton work force. At 0705 I received our first call for help—to rescue 60 Girl Scouts from a camp near Dover, PA. At this time I could only man two CH-47 helicopters due to nonavailability of pilots. Three of our pilots who lived in government quarters on the depot were being flooded themselves and were trying to care for their families and personal effects.

I called the commander at his quarters for permission to dispatch a helicopter. He could not be contacted for 10 minutes as he was out in the depot's open storage area checking the flooding condition of the storage area.

The first helicopter was launched at 0715 hours and the nightmare began. Missions of the "life or death" type came so fast and furious the operations sergeant and myself hardly had time to write them down and brief the flight crews. Little did I know that I would not get home for 6 days.

Although twelve CH-47 helicopters were available in a flyable condition, our immediate problems were air crews to fly them and fuel. Fortunately, four complete CH-47 crews from the 154th Aviation Company, Ft. Sill, OK, and two complete crews from the 196th Aviation Company, Ft. Bragg, NC, were TDY to New Cumberland Army Depot to pick up aircraft. These crews, all RVN returnees, were pressed into service with concurrence of the U. S. Continental Army Command. JP-4 fuel was ordered in from the Defense Supply Agency supply point in New Jersey. However, the last remaining access road to the depot had been closed by the time it arrived which necessitated setting up a fueling point at Indiantown Gap Military Reservation some 20 miles away. In this manner we were able to operate nine CH-47 aircraft during the flood plus thirteen additional helicopters which were attached to New Cumberland Army Depot for operational control during the emergency.

Initially, missions were received from the Pennsylvania State Police, both by phone and radio. After the first 36 hours the Office of Emergency Preparedness (OEP) control center was established as a result of the President declaring midstate Pennsylvania a disaster area, and all flight missions were received from this office for the remainder of the emergency.

The river finally crested at Harrisburg (adjacent to New Cumberland Army Depot) on Saturday afternoon, 24 June, at 35 feet—nearly 20 feet above flood stage.

The flight operations section was operated each day from 0600 to 2130 hours and in a 5-day period aircraft from New Cumberland Army Depot flew more than 200 missions totaling more than 500 hours. Many of these missions included more than one assignment as aircraft were diverted while on one mission to accomplish another. In accomplishing these missions more than 3,500 personnel and 150,000 pounds of cargo were transported. All missions were performed without accident or incident even though the air crews were subjected to a higher than normal degree of exposure due to long hours,

The river at Harrisburg finally crested at 35 feet—20 feet above flood stage

hazadous terrain and very adverse weather (high winds, rain, minimum ceilings and poor visibility).

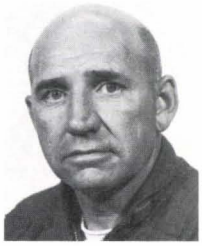
On Sunday, 25 June, a chlorine gas leak developed in New Cumberland, PA, adjacent to the depot. I received a call from the aviation officer, who had returned from leave since the flood began, alerting me that a mass evacuation of the depot by helicopter might be required and to hold all CH-47 assets until he called. There were nine CH-47s and one UH-1 available. I assigned crews, radio frequencies and held a hasty briefing of the pickup and landing sites. Within 10 minutes the aviation officer called back with orders to evacuate all personnel from New Cumberland Army Depot to Mechanicsburg Naval Depot. Within 25 minutes 800 personnel had been airlifted to Mechanicsburg Naval Depot, a distance of 7 miles.

Due to the rapid rise of the waters on the night of 22 June, eight CH-47 aircraft in storage in the maintenance area were reached by the flood waters. Flight crews from the transient personnel and this writer waded through water 4½ feet deep to reach the aircraft at 0600 on 23 June.

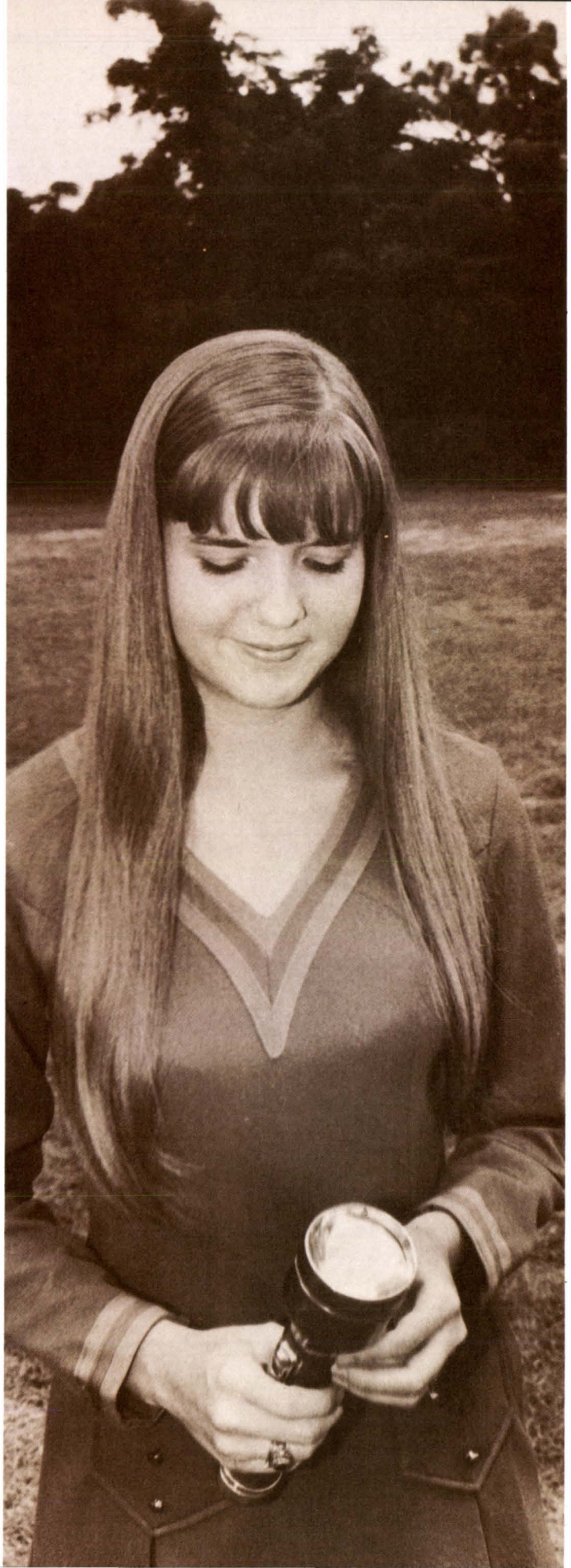
All aircraft were evacuated to higher ground with no damage occurring other than a need to inspect these aircraft for a water landing.

It was a miracle so many people were saved, and this can be directly attributed to the skill of the Army and civilian pilots at New Cumberland Army Depot and the transient crews from Ft. Sill and Ft. Bragg. They rescued more than 500 people in the most critical period of the flood disaster in the central Pennsylvania Susquehanna River Basin with the CH-47s. The experience of these air crews was the big reason for the accident-free rescue success. Most were in Vietnam and they certainly know how to stand up to a pressure situation. The devotion to duty and airmanship displayed by these men will long be remembered by the people of central Pennsylvania and reflected great credit to themselves and the United States Army.

Yes, our Army aviators are not only "Above the Best" but were also "Above the Crest" of the raging Susquehanna in the great central Pennsylvania flood of 1972.



**John C. Neamtz wears three hats at the New Cumberland Army Depot. He is flight operations officer, flight test pilot and aviation safety officer. He is qualified in all Army fixed wing and rotor wing aircraft except the U-21. He has logged 7,000 hours of flight time**



# Mad Dogs And The DIGEST Staff

**William H. Smith**
Staff Writer

*Mad dogs and Englishmen go out in the midday sun; The Japanese don't care to, the Chinese wouldn't dare to; Hindus and Argentines sleep firmly from twelve to one, But Englishmen detest a siesta.*

PEOPLE AROUND Ft. Rucker, AL, can't help but to recall this famous poem by Noel Coward when they watch the latest antics of the AVIATION DIGEST staff. For weeks these dedicated individuals have been running around in the hot Alabama sun (this was in July) with flashlight reflectors, trying to burn leaves and other assorted materials.

It all started when the ROYAL

AUSTRALIAN AIR FORCE FLIGHT DIGEST printed the little survival tip shown below. Since an easy method to start a fire is important to anyone in a survival situation, the DIGEST staff decided to test the flashlight reflector method. A flashlight reflector is like a parabolic curve, and theoretically, it should work.

Two everyday flashlights were procured. One had a 2-inch reflector and the other a 3-inch reflector. Items to be ignited were paper (heavy coated, tissue and common newspaper), rags, pine straw, grass clippings, wood chips and dried leaves.

The first attempt was made at 0900 hours (central daylight saving time). The temperature was about 85 degrees. There was a slight morning haze with drifting clouds and a mild wind. Absolutely no results were obtained. At 1030 hours on the same day another attempt was made. Atmospheric conditions were about the same. There were no resulting fires.

At 1300 hours on the same day all the paraphernalia was again brought into the hot sun. By this time the morning fog and most of the clouds had disappeared, leaving a beautiful, clear day. The temperature was just over 90 degrees and there was no wind.

The first material tried was the paper. No matter how it was held it would not catch fire or even smolder. Then the pine straw was tried with the same disappointing results. The grass clippings and woods chips did not even appear to get hot.

Finally the dried leaves were tried. A ring of light was concentrated near the top of the leaves. Still nothing happened. Then the reflector was moved so as to make a pinpoint of light on the leaves. Within seconds a small wisp of smoke appeared, followed by a widening dark spot on the leaves. As the smoke grew heavier the leaves began to smolder. By carefully maneuvering the spot of light, the leaves were finally coaxed into a flame.

In an attempt to get the other materials to catch fire, they were dipped in gasoline and placed in the reflector. The gasoline did not seem to make a bit of difference. In fact, the leaves refused to catch fire until the gasoline had evaporated.

Then the materials were dipped in oil (the only kind available at the DIGEST office was "light general purpose" FSN 9156-252-6137). It made no difference with the wood, pine straw, rags and grass clippings. But the paper caught fire in about 3 minutes and the oil seemed to make the leaves catch quicker.

In an attempt to improve the performance, two modifications were tried. First, the lenses were placed on the reflectors to hold in the heat better. Both lenses were plain glass. This did not help any.

Next, the reflectors were put back into the flashlight tubes (bulb still left out) and the bottom of the flashlight removed. The idea was to see if the tube would increase the draft, thus making the material catch fire quicker. It did not help much and made the burning leaves hard to remove.

Contrary to what the RAAF FLIGHT DIGEST says, the larger reflector did not increase the speed

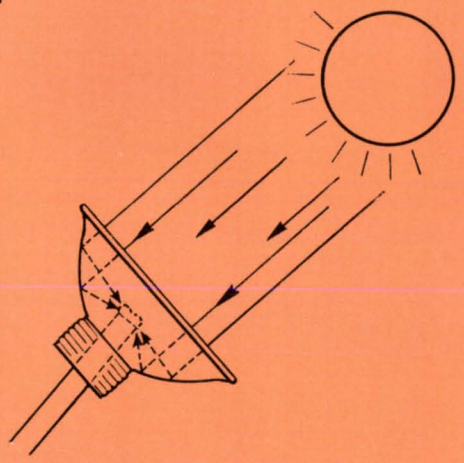
## *Survival Aid*

An emergency method of lighting a fire is by means of a flashlight reflector. The two cell flashlight with a two-inch reflector is suitable. Any flashlight with a larger reflector is better, any smaller makes success more difficult.

Remove the reflector and insert the item to be ignited through the bulb opening and point the reflector toward the sun. The focal point of the reflector can be located by reference to the filament position of the bulb normally fitted. Correct orientation toward the sun can be gauged by observing the rings of light which appear in the reflector, they should be concentric with the reflector's axis. For greatest concentration of heat, hold the tip of the item to be ignited at the focal point.

The skeptical can only go ahead and try it, with a suitable, shiny reflector it works well.

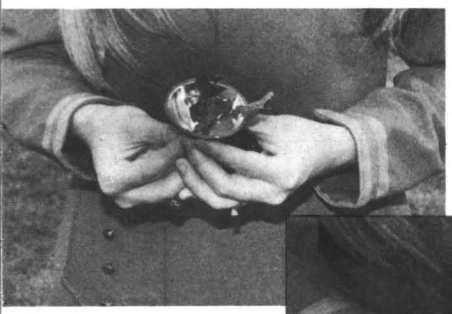
RAAF FLIGHT DIGEST



The reflector is placed in the flashlight tube to increase draft

Paper is used with the two inch reflector. No matter how we held it, it did not catch fire or smolder

We put pine straw in our two inch reflector, again with disappointing results



We tried leaves (left) in our two inch reflector. A ring of light was concentrated near the top with no results. Next we moved the reflector (below) until we got a pinpoint of light on the leaves. Within seconds a small wisp of smoke appeared, followed by a flame (below right)

of ignition. Upon closer examination, however, it was discovered that the large reflector was not as well made as the small one and did not have good reflecting power.

Possibly neither of the reflectors was very good or perhaps there are better burning materials available. Or maybe the DIGEST staff was in a hurry to get out of the hot sun and did not wait long enough. You are invited to try the experiment yourself. If you get better results, please let us know.

Also, there should be other ways to start a fire in an emergency situation. Let us know if you know of any. Please . . . we know about magnifying glasses, rubbing sticks together and the other well-known methods. Address your replies to:

Editor
U. S. ARMY AVIATION DIGEST
P. O. Drawer P
Fort Rucker, AL 36360

**Let the record show clearly that the DER and HIT maintenance checks both are valuable tools in determining engine health. Both should be used.**

**The TEAC/DER is performed by the maintenance officer. He pulls the DER after periodic inspections, engine installations, exchange of major engine components, instruments or outside air temperature gauges, or whenever the engine condition is suspect. The DER is the most accurate of the engine checks since the engine is operating at the top end of its performance band during the check.**

**The TEAC/HIT is used by working pilots on a daily basis. It provides the pilot with a less accurate but fully adequate means of determining that the aircraft can make the impending flight. In other words, it is a good rule of thumb which the working aviator should not ignore.**

**If DER is performed periodically by the maintenance officer, and HIT is checked daily by working aviators, sick engines can be located before engine failure occurs and overall engine health should be assured.**

**MAJOR GENERAL**
**WILLIAM J. MADDOX JR.**

**MG Maddox is now commandant of the U. S. Army Aviation School and commanding general of the U. S. Army Aviation Center at Ft. Rucker, AL. He was Director of Army Aviation when he prepared the above comment**

# TEAC/HIT

**CW2 Peter C. McHugh**

**The use of HIT as a pre-takeoff check will substantially increase aviator confidence in turbine engines and maintenance procedures. It will reduce or eliminate downtime but, most important, it has already proven itself capable of acutely reducing inflight engine failures**

THE SINGLE MOST important part of any aircraft is the engine. It is this component which provides the thrust and generates the secondary power which makes flight possible.

If an aviator can be provided a means of determining the "health" of his engine immediately prior to flight, he can predict failure and prevent its occurrence. This prediction should be made prior to flight in the normal course of preflight and runup and require minimum effort. Little possibility of pilot error should exist.

Additionally, information required should be available within the parameters of engine operation including torque, power turbine speed ($N_2$), gas producer speed ($N_1$), exhaust gas temperature (EGT) and vibrations limited by instrumentation in the aircraft. Normally turbine powered aircraft have instrumentation for EGT, torque, $N_1$ and $N_2$.

Several methods of determining engine health are available today. The most widely known require teardown of the hot-end at periodic intervals. Since these methods are time consuming and complicated, they will not be considered in this article.

Turbine engine analysis check/daily engine recording (TEAC/DER), a primarily maintenance oriented procedure, is established

as the Army standard for engine health monitoring.

As with TEAC/DER, turbine engine analysis check/health indication test (TEAC/HIT) can predict accurately the same impending turbine engine failures usually found during hot-end inspections but without component teardown; neither requires expensive test equipment necessary in some other health programs.

It is normal for any engine problem which affects gas flow to cause the engine to run "hotter" or "colder." The HIT system relies primarily on indicated engine temperature changes as a basis for health determination.

The U. S. Army Aviation Systems Command (AVSCOM) in April 1972 granted approval for the use of HIT in lieu of DER at Hunter Army Airfield, GA, Ft. Rucker, AL, and Ft. Wolters, TX. AVSCOM granted the waivers for a very singular reason: The U. S. Army Agency for Aviation Safety stated that in the congested training environments found at these posts DER could constitute a safety problem. It was for this reason only that the DER requirement was waived.

More recently AVSCOM recommended HIT as a useful condition monitoring tool if conscientiously employed (see "Charlie and Danny's Write-In," paragraph b of Danny's answer, DIGEST, February 1973).

**Turbine engine analysis check (TEAC):** An initial TEAC establishes engine performance by providing data in the form of a condition or performance baseline. Future TEAC checks are then compared to the baseline to determine current engine health.

A TEAC is required in order to establish a new baseline when an engine is installed, during periodic maintenance or if a major engine component, engine instrument or outside air temperature gauge (OAT) is replaced. Additionally a TEAC is performed whenever engine condition is suspect . . . current TEAC data is recorded and compared to the (first) baseline TEAC. Figure 1, extracted from change 8, TM 55-1520-210-20, 11 October 1972, indicates possible symptoms and probable causes when current data conflicts with the baseline.

That TM change also describes the new flight profile for obtaining the TEAC . . .

(1) Top the engine as follows: With copilot's altimeter at 29.92 inches Hg, climb with the twist grip power lever control in the full open position. Establish 70 to 90 knots airspeed and maximum available torque pressure (do not exceed 50 psi) and 6600 $N_2$ RPM.

*************
* CAUTION *
*************

Do not exceed maximum $N_1$ (101.5%) Torque (50 psi) or EGT limits.

Continue to climb until $N_2$ decays to 6400. Note altitude. This is Test Altitude. Record—

(a) $N_1$ speed
(b) Torque
(c) EGT
(d) Pressure Altitude
(e) OAT

Reset altimeter to barometric pressure.

Initial reaction might be that

**Figure 1**

| %N1 | TORQUE PSIG | EXHAUST GAS TEMPERATURE | PROBABLE CAUSE |
|---|---|---|---|
| Correct (Within tolerance) | Low 2-3 PSI | High 25-45 deg | Dirty inlet and/or compressor<br>Bleed band leaking<br>Leaks in anti-icing or customer air<br>FOD<br>Erosion<br>Damaged combustor section |
| Low | Low | Low | Calculation error<br>Engine not properly topped<br>N1 not rigged properly<br>Fuel control take-off trim adjustment |
| High | High | High | Calculation error<br>Fuel control take-off trim adjustment |
| Correct (Within tolerance) | High 2-3 PSI | High 30-50 deg | N1 system indicating error |
| Correct (Within tolerance) | Low 5-8 PSI | High 50-80 deg | Bleed band stuck open<br>Severe FOD or erosion in compressor<br>Excessively dirty inlet and/or compressor<br>Severe damage in combustor section |
| Correct (Within tolerance) | Low 2-3 PSI | High 50-80 deg | Anti-icing valve open<br>Damaged combustor section<br>EGT indicating system<br>Combustor chamber drain valve open |
| Correct (Within tolerance) | Low | Correct (Within tolerance) | Low torque boost pump pressure<br>Torquemeter valve clearance<br>Torquemeter sealing ring broken or damaged<br>VIGV'S set at wrong angle when full open (T53-L-13 series engines) |

TEAC alone could satisfy the need for monitoring an engine; however, the system has some drawbacks. It provides one of the most accurate sources of health information available, but this is only available to the maintenance test pilot after an extensive climbing maneuver and it is valid for a relatively short period. Furthermore, the inconvenience and time loss as a result of this climb appears to eliminate TEAC as a feasible method of determining engine health *on a daily basis.*

It is important to note, however, that TEAC establishes a "power available" check and should be performed with any engine health program to note deviations from new engine performance.

Any variance noted during TEAC may represent improper engine rig, engine wear or internal damage. This is evidenced by increased EGT, lower torque available and/or lower $N_1$ percentages obtainable. TEAC is not affected by the climate because the outside air temperature (OAT) and altitude are factors in computation.

**Health indication test (HIT):** The HIT system is the primary health monitoring system used at the U. S. Army Aviation School, Ft. Rucker. It was initiated by Mr. F. J. McCrory, an aeronautical engineer at the U. S. Army Aviation Test Board, Ft. Rucker. According to Mr. McCrory, "The HIT program is intended as a go/no-go check. It is a relatively simple method for accomplishing engine trend analysis." It relies on $N_1$ and EGT indications which are automatically corrected for temperature effect, thus providing the pilot with sufficient information to make a valid determination regarding engine health *prior* to takeoff.

HIT is instituted by the aviation maintenance officer who establishes the engine baseline upon receipt of the aircraft or upon engine installation. But, if the engine is in poor condition when the baseline is established, HIT will report only further deterioration from that condition. It is conceivable that a unit might receive an aircraft or engine with considerable time or with incomplete records. There is no way that HIT can determine the degree of deterioration that may have taken place since zero time. It is therefore necessary that the engine be in good condition prior to establishing the HIT baseline.

The HIT baseline can be accomplished by unit maintenance personnel, entered on baseline cards and placed in the flight record book (see figures 2 and 3).

With the baseline card at hand, rotor turning and all bleed air

**Figure 2**

**Aircraft SN** **UH-1B/D EGT Log** **Engine SN**

| OAT °C | N1 % | BASELINE EGT |
|---|---|---|
| -10 | 80.3 | |
| -8 | 80.6 | |
| -6 | 80.9 | |
| -4 | 81.2 | |
| -2 | 81.5 | |
| 0 | 81.8 | |
| 2 | 82.1 | |
| 4 | 82.4 | |
| 6 | 82.6 | |
| 8 | 82.9 | |
| 10 | 83.2 | |
| 12 | 83.5 | |
| 14 | 83.8 | |
| 16 | 84.2 | |
| 18 | 84.5 | |
| 20 | 84.8 | |
| 22 | 85.1 | |
| 24 | 85.4 | |
| 26 | 85.6 | |
| 28 | 85.9 | |
| 30 | 86.2 | |
| 32 | 86.5 | |
| 34 | 86.8 | |
| 36 | 87.0 | |
| 38 | 87.3 | |
| 40 | 87.6 | |
| 42 | 87.9 | |
| 44 | 88.2 | |
| 46 | 88.4 | |
| 48 | 88.7 | |
| 50 | 89.0 | |

This check should not be performed until completion of cockpit procedure, assuring that the engine is completely warmed and instruments stabilized.

INSTRUCTIONS:

1. Turn off all bleed air.
2. Turn aircraft into the wind.
3. Maintain $N_2$ at 6600 rpm.
4. Read free air temperature from OAT gauge.
5. Enter OAT line at value nearest to free air temperature.
6. Set $N_1$ at value indicated in $N_1$% column and stabilize.
7. Allow EGT to stabilize. Read EGT from indicator.
8. Compare EGT with value indicated in line labeled "Baseline EGT".
9. Record aircraft hours and difference (+) between indicated EGT and Baseline EGT.

| AIRCRAFT HOURS (-13) | DIFFERENCE FROM BASELINE EGT(±) |
|---|---|
| | |

USAAVNC(SAV-AM) Form 1108, 4 February 1971

off, the pilot merely notes the outside air temperature. He enters the chart at the appropriate temperature and sets the $N_1$ percent indicated by the chart by applying collective pitch. Maintaining 6600 engine rpm he then reads EGT from the indicator in the cockpit (figures 4 and 5). This value is then compared with baseline value and the difference obtained noted on aircraft records with engine time. Mr. McCrory says that 20 degrees C. increase over baseline EGT should be reason to notify the maintenance officer at the end of flight. A 30 degree C. increase would ground the aircraft for troubleshooting. He adds that in this way any pilot can predict engine health prior to departure. Some of the possible causes of temperature deviations are: malfunction of compressor bleed air valve, malfunction of turbine, improper bleed band operation, loss of bleed air, dirty compressor, eroded compressor or turbine or foreign object damage (FOD). HIT detects the same failures as are usually found during hot-end inspection. As confidence in the HIT program is achieved, it is not unreasonable to propose extending the time period between the lengthy and expensive hot-end inspections, or perhaps completely eliminating them.

**Figure 3**

**Aircraft SN** | **UH-1 H, M, AH-1 G, TH-1 G EGT Log** | **Engine SN**

| OAT° C | $N_1$% | BASELINE EGT |
|---|---|---|
| -10 | 86.0 | |
| - 8 | 86.3 | |
| - 6 | 86.7 | |
| - 4 | 87.0 | |
| - 2 | 87.4 | |
| 0 | 87.7 | |
| 2 | 88.0 | |
| 4 | 88.3 | |
| 6 | 88.7 | |
| 8 | 89.0 | |
| 10 | 89.3 | |
| 12 | 89.6 | |
| 14 | 89.9 | |
| 16 | 90.1 | |
| 18 | 90.4 | |
| 20 | 90.7 | |
| 22 | 91.0 | |
| 24 | 91.4 | |
| 26 | 91.7 | |
| 28 | 92.1 | |
| 30 | 92.4 | |
| 32 | 92.7 | |
| 34 | 93.0 | |
| 36 | 93.3 | |
| 38 | 93.6 | |
| 40 | 93.9 | |
| 42 | 94.2 | |
| 44 | 94.5 | |
| 46 | 94.9 | |
| 48 | 95.2 | |
| 50 | 95.5 | |

This check should not be performed until completion of cockpit procedure, assuring that the engine is completely warmed and instruments stabilized.

INSTRUCTIONS:

1. Turn off all bleed air.
2. Turn aircraft into the wind.
3. Maintain $N_2$ at 6600 rpm.
4. Read free air temperature from OAT gauge.
5. Enter OAT line at value nearest to free air temperature.
6. Set $N_1$ at value indicated in $N_1$% column and stabilize.
7. Allow EGT to stabilize. Read EGT from indicator.
8. Compare EGT with value indicated in line labeled "Baseline EGT".
9. Record aircraft hours and difference (±) between indicated EGT and Baseline EGT.

| AIRCRAFT HOURS (-13) | DIFFERENCE FROM BASE-LINE EGT (±) |
|---|---|
| | |

USAAVNC (SAV-AM) FORM 1115, 4 February 71

HIT also allows the pilot to determine whether sluggish helicopter performance and high EGTs are symptoms of a "sick engine" or merely the result of a higher prevailing density altitude and accompanying air temperature. This capability alone should provide fewer unnecessary returns of aircraft to maintenance.

One of the greatest advantages of HIT is that it can be performed on the ground. This can be an advantage safety-wise when operating in high density flying areas, as evidenced by its adoption at Ft. Rucker, a high density area.

During calendar year 1970 there were 46 inflight UH-1 engine failures recorded by the Aircraft Quality Assurance Division (AQAD) at the Aviation School. Beginning with January 1971 TEAC/HIT was adopted and since then only seven inflight engine failures have been reported. Of these, three resulted from bearing failures and four from compressor disk failure. Neither of these modes of failure can be detected by current health systems. However, as a result of the TEAC/HIT program, AQAD removed 46 engines from aircraft. Twenty of these engines were returned to the factory for overhaul, and all others (26) were rebuilt locally. Thirteen engines had cracked nozzles while 12 evidenced FOD. The significant reduction of inflight failure can be directly at-

tributed to the success of the TEAC/HIT program.

There is no doubt that monitoring engine health is necessary to promote safety and to facilitate scheduled maintenance programs. Although HIT does not eliminate the need for other engine health checks, it will supplement TEAC, spectrographic oil analysis and vibration checks.

Use of TEAC/HIT as a pretakeoff check will further increase aviator confidence in turbine engines and maintenance procedures. It will reduce or eliminate substantial maintenance downtime, but, most important, it has already proven itself capable of drastically reducing inflight engine failures; HIT can be a lifesaver.

**Figure 4**

| Line 1. OAT °C | 2. N1 % | 3. ΔEGT A | 4. EGT | 5. ΔEGT B | TEMP DIFFERENTIAL | 6. OAT °C | 7. N1 % | 8. BASELINE EGT |
|---|---|---|---|---|---|---|---|---|
| -10 | 80.3 | +68 | | -68 | | -10 | 80.3 | |
| - 8 | 80.6 | +63 | | -63 | +5 | - 8 | 80.6 | |
| - 6 | 80.9 | +57 | | -57 | +6 | - 6 | 80.9 | |
| - 4 | 81.2 | +52 | | -52 | +5 | - 4 | 81.2 | |
| - 2 | 81.5 | +46 | | -46 | +6 | - 2 | 81.5 | |
| 0 | 81.8 | +41 | | -41 | +5 | - 0 | 81.8 | |
| 2 | 82.1 | +35 | | -35 | +6 | 2 | 82.1 | |
| 4 | 82.4 | +30 | | -30 | +5 | 4 | 82.4 | |
| 6 | 82.6 | +24 | | -24 | +6 | 6 | 82.6 | |
| 8 | 82.9 | +19 | | -19 | +5 | 8 | 82.9 | |
| 10 | 83.2 | +13 | | -13 | +6 | 10 | 83.2 | |
| 12 | 83.5 | + 8 | | - 8 | +5 | 12 | 83.5 | |
| 14 | 83.8 | + 3 | | - 3 | +5 | 14 | 83.8 | |
| | | | | | | | | |
| 16 | 84.2 | - 3 | | + 3 | +3 | 16 | 84.2 | |
| 18 | 84.5 | - 8 | | + 8 | +5 | 18 | 84.5 | |
| 20 | 84.8 | -13 | | +13 | +5 | 20 | 84.8 | |
| 22 | 85.1 | -19 | | +19 | +6 | 22 | 85.1 | |
| 24 | 85.4 | -24 | | +24 | +5 | 24 | 85.4 | |
| 26 | 85.6 | -30 | | +30 | +6 | 26 | 85.6 | |
| 28 | 85.9 | -35 | | +35 | +5 | 28 | 85.9 | |
| 30 | 86.2 | -41 | | +41 | +6 | 30 | 86.2 | |
| 32 | 86.5 | -46 | | +46 | +5 | 32 | 86.5 | |
| 34 | 86.8 | -52 | | +52 | +6 | 34 | 86.8 | |
| 36 | 87.0 | -57 | | +57 | +5 | 36 | 87.0 | |
| 38 | 87.3 | -63 | | +63 | +6 | 38 | 87.3 | |
| 40 | 87.6 | -68 | | +68 | +5 | 40 | 87.6 | |
| 42 | 87.9 | -74 | | +74 | +6 | 42 | 87.9 | |
| 44 | 88.2 | -79 | | +79 | +5 | 44 | 88.2 | |
| 46 | 88.4 | -85 | | +85 | +6 | 46 | 88.4 | |
| 48 | 88.7 | -90 | | +90 | +5 | 48 | 88.7 | |
| 50 | 89.0 | -96 | | +96 | +6 | 50 | 89.0 | |

**UH-1B/D Engine Health Placard (Worksheet)**

**UH-1H, M, AH-1G, TH-1G Engine Health Placard (Worksheet)**

**DATE**_____
**AIRCRAFT SN**_____
**ENGINE SN**_____
**ENGINE TOPPING CHECK:**
**$N_1$%**_____
**Torque**_____
**EGT °C**_____

_____
**Test Pilot's Name**

**INSTRUCTIONS TO MAINTENANCE OFFICER:**

1. Perform normal engine runup and cockpit procedure.
2. Maintain $N_2$ at 6600 rpm.
3. Turn off all bleed air.
4. Turn aircraft into the wind. Read free air temperature from cockpit gage.
5. Enter line 1 at OAT nearest free air temperature. Circle OAT on chart.
6. Set $N_1$% at value indicated in line 2 and stabilize.
7. Read EGT from indicator. Record EGT above circled OAT.
8. Apply EGTA Correction Factor in line 3 to indicated EGT and record result in open space in line 4.
9. Apply EGTB Correction Factors in line 5 to EGT in line 4 and record results in line 8 for corresponding columns.
10. Enter Baseline Information in the respective columns of the EGT Trend Log.

Troubleshooting:
For high EGT's, see Engine Troubleshooting Procedures in -20 Technical Manual.

USAAVNC(AQ) Form 1316, 24 Jul 73

Editor's note: Instructions to the maintenance officer, printed above, are the same for figures 4 and 5. The HIT program and charts are currently in use on the OH-58, OH-6, CH-47, OV-1, CH-54 and U-21 at the Aviation School, Ft. Rucker, AL

CW2 McHugh was graduated (summa cum laude) from Embry Riddle Aeronautical University with the B.S. in Aeronautical Science. He is qualified in both rotary and fixed wing aircraft with more than 3,000 flying hours. Mr. McHugh is assigned to the Army Aviation Test Board, Ft. Rucker and is an instrument examiner

**Figure 5**

| 1. OAT° C | 2. N1% | 3. ΔEGT A | 4. EGT ● | 5. ΔEGT B | 6. OAT° C | 7. N1% | 8. BASELINE EGT |
|---|---|---|---|---|---|---|---|
| -10 | 86.0 | +68 | | -68 | -10 | 86.0 | |
| - 8 | 86.3 | +62 | | -62 | - 8 | 86.3 | |
| - 6 | 86.7 | +57 | | -57 | - 6 | 86.7 | |
| - 4 | 87.0 | +51 | | -51 | - 4 | 87.0 | |
| - 2 | 87.4 | +46 | | -46 | - 2 | 87.4 | |
| 0 | 87.7 | +40 | | -40 | 0 | 87.7 | |
| 2 | 88.0 | +35 | | -35 | 2 | 88.0 | |
| 4 | 88.3 | +30 | | -30 | 4 | 88.3 | |
| 6 | 88.7 | +24 | | -24 | 6 | 88.7 | |
| 8 | 89.0 | +19 | | -19 | 8 | 89.0 | |
| 10 | 89.3 | +14 | | -14 | 10 | 89.3 | |
| 12 | 89.6 | + 8 | | - 8 | 12 | 89.6 | |
| 14 | 89.9 | + 3 | | - 3 | 14 | 89.9 | |
| | | | | | | | |
| 16 | 90.1 | - 3 | | + 3 | 16 | 90.1 | |
| 18 | 90.4 | - 8 | | + 8 | 18 | 90.4 | |
| 20 | 90.7 | -13 | | +13 | 20 | 90.7 | |
| 22 | 91.0 | -18 | | +18 | 22 | 91.0 | |
| 24 | 91.4 | -24 | | +24 | 24 | 91.4 | |
| 26 | 91.7 | -29 | | +29 | 26 | 91.7 | |
| 28 | 92.1 | -35 | | +35 | 28 | 92.1 | |
| 30 | 92.4 | -40 | | +40 | 30 | 92.4 | |
| 32 | 92.7 | -45 | | +45 | 32 | 92.7 | |
| 34 | 93.0 | -51 | | +51 | 34 | 93.0 | |
| 36 | 93.3 | -56 | | +56 | 36 | 93.3 | |
| 38 | 93.6 | -62 | | +62 | 38 | 93.6 | |
| 40 | 93.9 | -67 | | +67 | 40 | 93.9 | |
| 42 | 94.2 | -72 | | +72 | 42 | 94.2 | |
| 44 | 94.5 | -77 | | +77 | 44 | 94.5 | |
| 46 | 94.9 | -83 | | +83 | 46 | 94.9 | |
| 48 | 95.2 | -88 | | +88 | 48 | 95.2 | |
| 50 | 95.5 | -93 | | +93 | 50 | 95.5 | |

# AVSCOM Comments

**The daily engine recording (DER) procedure is the turbine engine condition monitoring program currently in use in the U. S. Army. By monitoring trends in $N_1$ speed and engine measured gas temperature on a day-to-day basis at a specified pressure altitude and power output, engine degradation can be readily noted. The DER program is primarily maintenance oriented. It is designed to aid the maintenance officer in determining engine condition. This can aid him, optimizing his maintenance effort and help ensure that engines receive attention as soon as a performance degradation is noted. Aviators often feel that the DER does not offer them an immediate reference to their aircraft's engine condition. They would like to have a go/no-go type check to reassure them that their aircraft's engine performance has not degraded significantly. Thus, they can expect normal engine operation, at least as far as gas-path components are concerned, during their ensuing flight.**

**The U. S. Army Aviation Center, Ft. Rucker, AL, has devised such a procedure. It is called the health indicator test (HIT) or simply HIT. HIT utilizes the $N_1$ speed measured gas temperature relationship, with the aviator selecting an $N_1$ speed predicated upon the existing OAT. The engine measured gas temperature must then relate to a predicted temperature within a certain tolerance. Thus, the go/no-go indication is obtained. The USAAVNC has established an EGT variation limit of 20 degrees C. for the T53-L-11 and T53-L-13 series engines.**

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# Army Aviation Needs Job Enrichment

**Major Willis C. Hardwick**

Chief, Washington Field Office
2.75-Inch Rocket System
Alexandria, Virginia

**Army aviators want to be an integral part of the ground commander's organization where unlimited opportunities may emerge and where the commander can be proud of his aviation section**

As the old saying goes, "Variety is the spice of life." However, the accompanying article offers a degree of variety yet does this with many of the standard words that we use in the aviation business every day. Major Hardwick presses for decentralization in aviation operations. As a general rule, the Army agrees and practices decentralization. He stresses that aircraft must be organic to our lower level units, and the Army agrees. His mission for aviation is "to enhance the capability of the Army to perform its missions" and I believe those are my own words coming back.

Nevertheless, the variety shows up in his criticism of organizing aircraft into companies, battalions and groups. He flavors this criticism with a philosophy called "job enrichment" which separates the job stimulants into two classes: the individual growth motivators which favor decentralization and the supervisory motivators which favor centralization. The implication is that organizations feed on the requirements for supervision. For example, standardization is classified as a supervisory motivator.

In response, I would point out that standardization is badly needed, regardless of the type of organization you have. The other supervisory motivators, such as training, administration and policy, must be formulated by some parent Army organization whether it be an aviation company/battalion or a ground unit. So why should not these functions be performed by aviators?

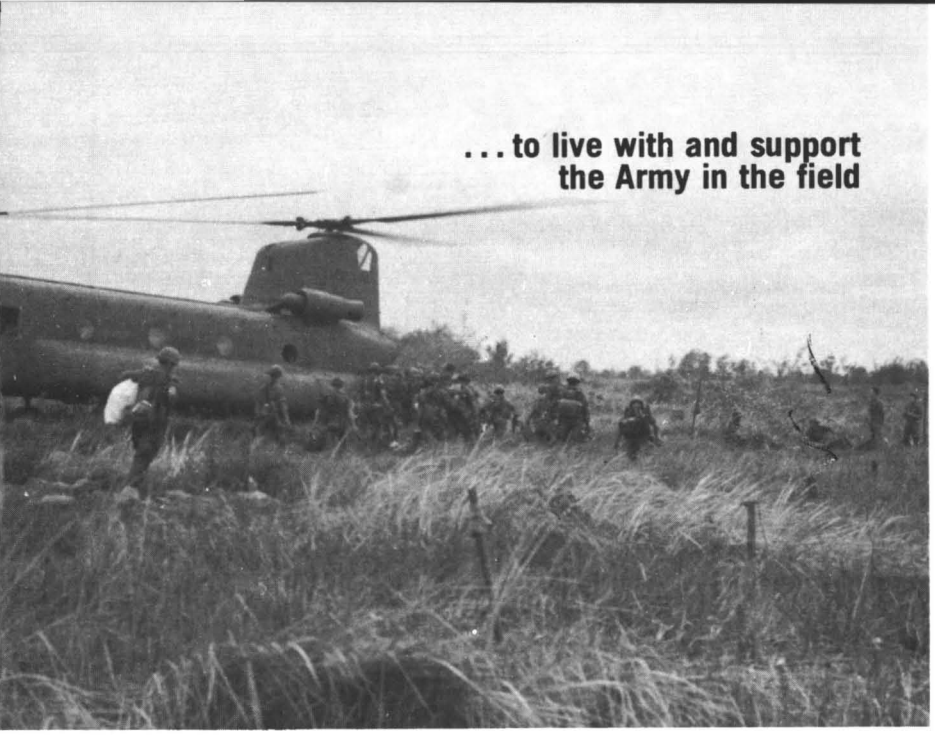
Major Hardwick then suggests that the individual aviator on his own—that is, not an organized company/battalion—gets more job enrichment. To get a better handle on this thesis, we should review how the Army distributes its aviation resources. The first main concern is tactical effectiveness and this flows into the second consideration, a demonstrated fulltime need for Army aircraft. Other factors, such as cost in dollars and manpower, the capability of the commander to maintain and care for the aircraft, standardization and supervision, also are considered in TOE decisions.

My answer to this: Our structure by no means supports the thesis that aviators empire build. We have some artillery battalions that are assigned two aircraft just as they were in the Piper Cub days; some infantry brigades have four aircraft; all divisions have organic aviation battalions. They may receive the attachment of additional companies and may be supported by additional battalions. But we have only six pure aviation colonel-level command jobs in the whole Army.

Finally, regardless of the types of organization there is ample opportunity for individual growth as well as the need for supervision. The individual aviator can be a professional whether he is performing a single ship operation or as part of a battalion lift.

As Major Hardwick proposes, let's give the young leaders of the modern Army more responsibility but let's do it within the framework of tactical effectiveness and the structuring rules for fulltime needs of the commander. There is plenty of variety and spice of life in the combination we now have.

MAJOR GENERAL WILLIAM J. MADDOX JR.




THE MISSION of Army aviation is to augment the capability of the Army to conduct effective combat operations. By definition, Army aviation is organic to the Army. It is not a separate combat branch within the Army establishment, despite trends of recent years to push toward that concept. Instead, Army aviation has held fast to remain an integral part of the Army, designed to live with and support the Army in the field. This indicates that it should be under the full and immediate control of the commander responsible for ground operations.

If the purpose of Army aviation is to enhance the capability of the Army to perform its missions, it seems obvious and basic that the aviator and the aircraft should be an integral part of the tactical unit. Why then do we do just the opposite and centralize into aviation companies, battalions and groups? Looking at the concept in general terms it seems there are these fundamental reasons for centralization to

- provide standardization of aviation maintenance and operations;
- provide a more efficient use of aviation resources;
- provide maximum supervision of aviation activities;
- provide standardization of aviator training;
- enhance aviation safety programs; and
- provide a work environment oriented toward aviation activities.

It would appear on the surface that these are overwhelming reasons to continue this concept, but let's take a closer look at an interesting area the centralizers tend to overlook—job enrichment.

Frederick Herzberg* has put before us some principles echoing that job enrichment seeks to improve both task efficiency and job satisfaction by building into jobs more challenging and responsible work. Looking further into Herzberg's principles, it seems necessary to review his Motivation-Hygiene Theory before practical suggestions can be provided. Herzberg has found that there are two distinct types of job motivators to satisfy the basic human needs. These are growth motivators such as achievement, responsibility and recognition; and the hygiene motivators such as supervision, working conditions, salary, standardization and training, status, organizational policy and administration.

Results of numerous studies indicate that the growth motivators were the primary cause of satisfaction and the lack of hygiene factors was the primary cause of unhappiness on the job. Hygiene motivators must be satisfied but they do not provide the necessary quality motivation which drives one to seek achievement, growth and responsibility. Job enrichment then is only incidentally concerned with hygiene motivators such as salary, working conditions, standardization and training, even though these factors are important in their own right. Looking back at the six aforementioned advantages of the centralized aviation unit, it is only hygiene motivators that the centralized aviation units are providing Army aviation. This means then that we are striving to avoid dissatisfaction among aviation jobs but we are not striving for job enrichment.

It is very easy and convenient to centralize the maintenance and operations of all aviation resources into an aviation company. In this manner one responsible officer can be designated in-charge and the organization can strive for maximum utilization of aviation assets and improved support of the Army in the field. In a combat situation, however, these aviation assets will likely be dispatched out of the aviation organization to support units for extended periods of time. Or-

*Frederick Herzberg, Ph.D., is chairman of the Department of Psychology, Western Reserve University, Cleveland, OH. He also is a consultant to the Veterans Administration, American Institute Research and other governmental, social and industrial organizations and has written three books—*Job Attitude: Research and Opinion* (1957); *The Motivation To Work* (1959); and *Work and the Nature of Man* (1966)

ganizational theorists push the concept that when jobs are organized in an optimum manner the most efficient job structure emerges, providing favorable job attitudes and the best means to do the job.

I am not convinced that we gain the maximum benefit from Army aviation jobs through the centralized organizational concept. The most persuasive element which is overlooked by the organizational theorists is the individual human desire to achieve personal development and growth. Decentralization of our aviation assets works toward accommodating the basic human desires to demonstrate and utilize individual skills and the appetite to learn new ones. For example, in the small aviation unit or section which could be an integral part of the tactical battalion or group the aircraft mechanic has the opportunity to develop an intimate rapport with "his" aircraft. I am convinced that the only way we will ever attain the effective maintenance we are seeking is by organizing our aviation maintenance activities around the growth motivators of achievement, responsibility and individual pride in work itself.

I have found in aviation companies that the tendency is to channelize aircraft mechanics to gain the assembly line effort. The mechanic may be limited to the repair of the engine or another to the main rotor system, but no aircraft is his own to build motivating factors around. When the maintenance officer attempts to enrich his job by rotating his assignment within his assembly line environment, he simply winds up in another job that needs enrichment.

Decentralizing our aviation assets offers much to the officer as well. In the centralized environment—for example, where there are perhaps 60 aviators—a vast amount of each officer's leadership potential is not developed. In the small decentralized environment the junior officer aviator has the opportunity to gain responsibility and personal achievement. He will be able to generate innovations in supporting his commander and thereby grow and learn at a rapid pace.

It is apparent that there are problems in implementing a job enrichment plan such as I am proposing here. There are consequences for aviation commanders and supervisors in that the more subordinates' jobs are enriched, the more superfluous the commander's old supervisory role becomes. Hopefully, any fears supervisors may have of losing their authority will be overcome by the discovery of new opportunities to do more important management-type work. For example, if an aviation company were decentralized within a brigade sized organization, the company commander might become a brigade aviation officer relieved of burdensome organizational administration. He could then advise the brigade commander and guide the brigade aviation activities consisting of independent sections operated by former aviation company subordinates given responsibilities not previously held. It should soon become apparent to the brigade aviation officer that observing the aviation activities being conducted by aviators with authority of their own is as demanding, rewarding and enjoyable as the task of running a company type operation and checking his subordinates' performance at that echelon.

A major fear that arises when one speaks of decentralizing our aviation assets is the standardization of maintenance and flight training. However, we must decide whether we desire more standardization or more quality. All indications are that if people are allowed to take more responsibility, achieve more on their own and develop more competence, we can attain better quality in execution of the job. In addition, many people feel that in a decentralized environment aviation safety programs will be ignored. The aviation officer, acting as a manager of the aviation activities within the command, should have more time to devote to safety programs in the decentralized environment than is normally the case in the company concept, where lip service is often the normal solution to safety programs anyway.

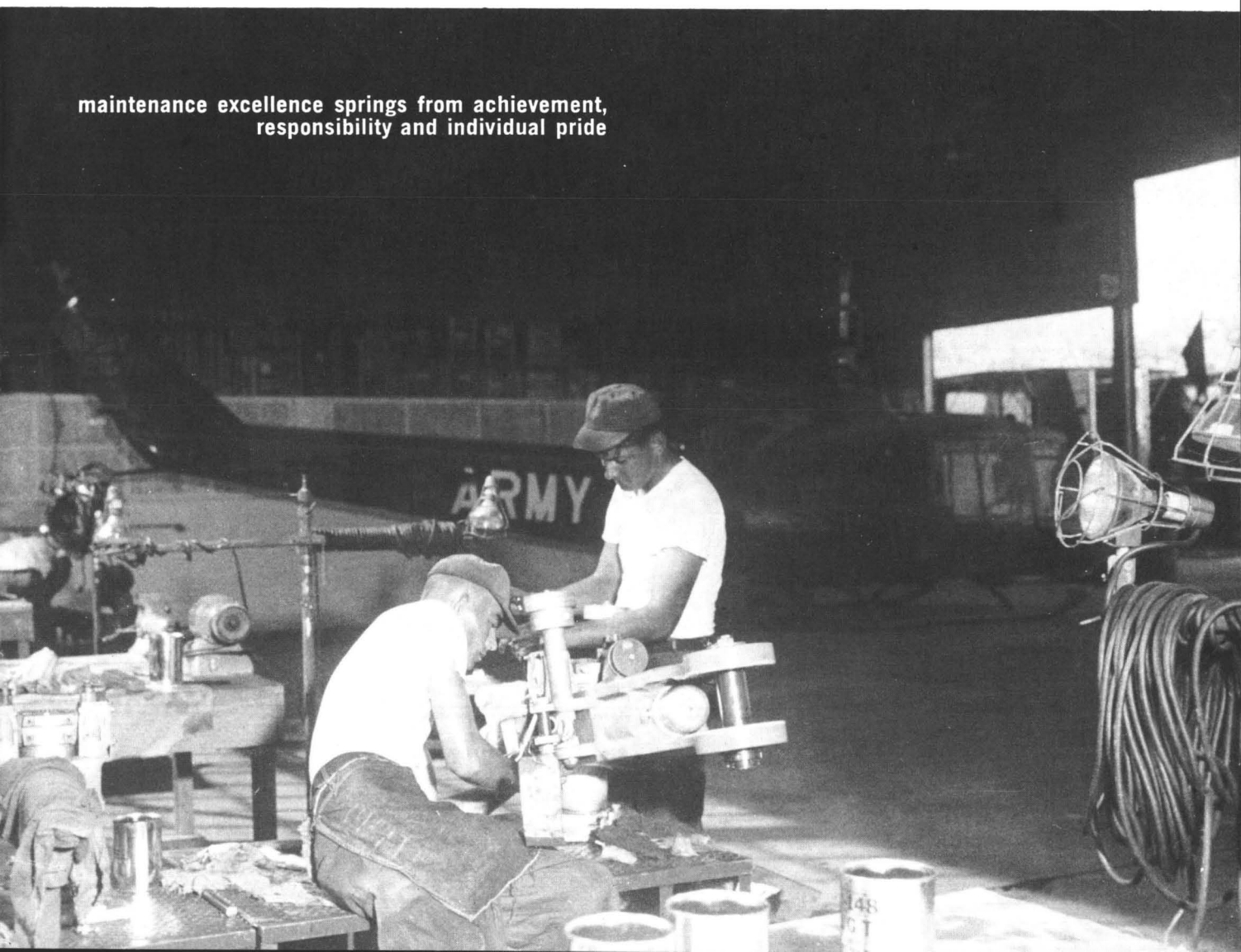
One of the problems which often brings objections to decentralized concepts in Army aviation is the apparently more inefficient use of aviation resources. It is true that centralized aviation assets such as the company, battalion and/or group can be brought to bear in support of priority missions in a minimum amount of time. I am by no means suggesting that all centralized aviation organizations should be eliminated across the board, thereby enriching aviation jobs through the decentralization concept alone. The scope of job enrichment is as broad as one can hope to find and there may be jobs or organizational concepts in existence that simply do not lend themselves to job enrichment. However, I am convinced that if you only decentralize the responsibility within a centralized aviation organization and do not structurally decentralize the organization itself into independent operational elements which support and become an integral part of the supported organization, then decentralized responsibility will be one of doubt rather than reality.

As far as quality of maintenance within the decentralized environment goes, many argue that skill levels will be inadequate and that maintenance standardization and supervision (hygiene motivators) will be practically nonexistent. I recognize that some of the more

sophisticated aircraft will require intermediate level maintenance from time to time but current maintenance concepts allow for decentralized operations anyway through the use of general support contact teams. I have personally found that a higher quality of organizational maintenance was attained when performed by mechanics and operators on aircraft that they could really call their own. The quality turned out to be so good that a depot maintenance inspection led to the cancellation of our scheduled inspect and repair only as needed (IROAN) program. This reinforced my conviction that decentralized responsibility of maintenance is the road toward reducing today's ownership costs.

The Army has been stubborn in giving way to many centralizers' desires to form an Army aviation branch. When the officer personnel management system (OPMS) becomes a reality, Army aviation will become a qualification rather than a formally recognized special career program currently contained in chapter 8 of DA Pamphlet 600-3 (1970) entitled Career Planning For Army Commissioned Officers. The concept of OPMS then indicates that the Army's current trend is to tie Army aviators closer to their individual career branches. By decentralizing our aviation assets and making them an integral part of the branch organization this would allow more participation in your branch while performing aviation duty. The facts pointed out by authorities such as Herzberg clearly show that job enrichment produces high quality results, and I am convinced that high quality results within operational organizations can produce reduced ownership costs in the defense budget.

Let's try decentralization, increase quality output, reduce some costly supervisory manpower positions and give the young leaders of the modern volunteer Army more responsibility. Bold moves in this direction should assist in reducing operations and maintenance costs and free funds for other needs. Army aviators want the image of being an integral part of the ground commander's organization where unlimited opportunities may emerge and where the commander will be exclaiming proudly about *his* aviation section.




**maintenance excellence springs from achievement, responsibility and individual pride**

# VIEWS FROM READERS

*Continued from page 1*

training flight. The aircraft reportedly was found after one of the pilot's sisters had a dream in which her brother described the surroundings in which he crashed.

Ask anyone who flies between Los Angeles, CA, and El Paso, TX, regularly just how easy it is to find wreckage on a search and rescue (SAR) mission. He'll probably tell you that more often than not the wreckage they find is not what they were looking for and also that it wasn't found on its SAR operation.

It's unfortunate that conflict such as in the Republic of Vietnam is about the only thing that hastens developments of both SAR procedures and survival equipment. But from my experience it's the truth. Nomex was unheard of when I got my wings and as for survival kits—the best there was was a picture and a list of good things to have, and maybe you could buy these items at the Four Seasons store.

I have had only one CONUS assignment besides Ft. Rucker. And in '67 I doubt if I would have been able to draw a survival vest from supply. I wonder if I were to fly on a combat readiness flight from Ft. Rucker today if I could draw one?

I'm due to return to CONUS shortly and one thing I would dearly love to be able to do is to keep my survival vest as I keep my SPH-4, but I don't think I'm going to be able to do it.

When you walk in and ask for a cross-country kit, you should also be able to ask for survival gear *including an emergency radio.* Then if you have to autorotate northwest of Troy, AL, in the woods at dusk, you can expect that sometime soon you should be able to be home with the wife and kids instead of wandering around looking for a farmhouse with a phone. Quite possibly you could be 30 miles east of El Paso and, believe me, that's no place to break down in a car, let alone an airplane or helicopter.

No one can predict the outcome of even a precautionary landing, let alone a forced or crash landing. So even if you've thought ahead and gotten a crew hot desert climate survival pack and its back in the baggage compartment and you get out just before she blows, it doesn't help . . . and the next day a nonsmoker could be praying for a lighter to start a signal fire.

There will be instances where individual survival kits might not help either, but I for one will worry about those times when they come.

Survival kits with radios should be a second nature request from operations just like "chicken plates" or "bullet boards" were in the Republic of Vietnam.

CPT Peter H. Murkland
2nd Basic Combat Training Brigade
Ft. Dix, NJ 08640

**[See the November 1972 and April 1973 editions of the AVIATION DIGEST. "Pearl's," beginning on pages 40 and 45 respectively, outlines procedures to follow when ordering survival equipment. In addition, the new U. S. Army Aviation Systems Command Ferry Flight Kit (announced in the 6-12 July 1973 edition of FLIGHTFAX) explains the procedures for obtaining survival equipment for ferry flights.—Editor]**

Sir:

As an Army aviator (with a few years service) I am constantly asked, encouraged and ordered to be a professional. Through constant usage and association, the words aviator and professional have almost become one.

But dear Mr. Editor, I am somewhat confused, for at the same time that I am told to be professional, I am also exposed to the many definitions of what an aviator really is. We have all heard these many and varied opinions. "The Air Force has pilots and the Army has aviators." The difference supposedly is that the Army aviator is branch qualified; the aviator can employ varied weapons systems, both ground and air; and he is expected to make command decisions plus much more.

Well if this is the case, why am I annually tested as a pilot and not as an aviator? This year's annual writ did not have one question on low level mission planning; low level or NOE flight; the elements of a call for fire, map reading, employment of aircraft weapons systems, tactical communication procedures or security, scouting techniques, aircraft tactical load limitations, tactical refueling, etc.

Was this the test of a professional aviator or pilot—humm?

LTC James W. Bardin
5713-A Brown Avenue
Ft. Knox, KY 40121

## INSTRUMENT CORNER

**Recently on an IFR flight into the Atlanta area, approach control asked if I could accept a STAR. Not being familiar with the area or term I refused the STAR.**

Q. As an Army aviator am I authorized to accept a STAR and where in FLIP publications can I find the information needed to execute a STAR?

**A. STAR—standard terminal arrival route—is a coded IFR arrival route established for application to arriving IFR aircraft destined for certain airports. Its purpose is to simplify clearance delivery procedures. Until military STAR publications and distribution are accomplished, STARs will be issued to military pilots only when requested in the flight plan or verbally by the pilot (Airman's Information Manual, Part 1).**

Q. If the letters NoPT appear on a standard instrument approach chart, can I still execute a procedure turn at my option?

**A. No. DOD Flight Information Publication, Low Altitude Instrument Approach Procedures states that NoPT on an approach chart prohibits the pilot from making a procedure turn without ATC clearance.**

# CRANES RETURN

THE FLYING CRANES of the 478th Aviation Company are back home at Ft. Benning, GA, and attached to the 145th Aviation Battalion. The unit's CH–54 helicopters, normally referred to as "Flying Cranes," can lift more than 18,000 pounds of cargo or 45 combat-equipped troops in a pod that can be attached to the helicopters.

The 478th Flying Crane Company originally was activated at Ft. Benning in February 1963. Redesignated the 478th Aviation Company (Heavy Helicopter) in July 1965 and attached to the 1st Cavalry Division (Airmobile), the unit departed for the Republic of Vietnam a month later. While in Vietnam it provided heavy lift helicopter support for the 1st Cavalry Division (Airmobile) and the 101st Airborne Division (Airmobile), as well as other services for the U. S. Navy's Seabees. The unit's area of operations was from the Mekong Delta to the DMZ and west to Thailand.

Normal missions for the Flying Cranes included hauling equipment such as graders, dozers, tractors, trucks, end-loaders, 175 mm gun tubes, 155 mm howitzers, 105 mm howitzers (two at a time) and disabled aircraft such as the Army's Chinook (CH–47) and the U. S. Air Force's Jolly Green Giant (CH–53). The Flying Cranes also were used in Vietnam for such missions as lifting bridge spans, placing 65-foot-high guard towers in position and moving house trailers.

The 478th Aviation Company (Heavy Helicopter) has been awarded the Vietnamese Cross of Gallantry with Palm, the Vietnamese Civil Action Honor Medal First Class, a streamer embroidered VIETNAM 1967–1968 and a streamer embroidered VIETNAM 1968–1970.

In this composite photograph LTC Lawrence A. Bell, commander of the 145th Aviation Battalion (Combat), welcomes CW2 Thomas A. Rugg, pilot of the first CH-54 "Crane" to arrive at the 478th Aviation Company (HH).

**Photo by SGT L. F. Grant**

TWO ARMY aviation Reservists who recently were flying a U. S. Army Reserve UH-1D helicopter on a training mission out of Ft. Rucker, AL, overheard two Marine aviators radio a distress call before they ejected into the dark night from their disabled F-4 Phantom jet fighter near Pensacola, FL.

First Lieutenant Robert H. Lewis Jr., 376th Transportation Company (Aircraft General Support), and Captain Grover Barnes, Headquarters and Headquarters Division, 787th Maintenance Battalion (GS), were returning to Ft. Rucker from Gulfport, MS. Shortly after passing Pensacola and while monitoring the approach control frequency they heard the jet pilots say they were bailing out. With their helicopter only 15 miles away, LT Lewis asked Pensacola approach control if they could be of any assistance in helping to rescue the downed aviators. Approach control acknowledged affirmatively and gave them a vector of 190 degrees to proceed to the scene.

The Marines, Captain R. E. McLaine and First Lieutenant J. P. Chesney, were flying the lead aircraft of a two-ship formation out of Sherman Field at Pensacola when their aircraft malfunctioned. The pilots elected to go around and requested an altitude from approach control; approach control advised all altitudes were clear. The next call was that they were ejecting; there wasn't time for a "Mayday" call.

They parachuted into a small bay before the jet fighter crashed and burned on Ono Island—a small, uninhabited island in the Gulf of Mexico about 10 miles southwest of Sherman Field near Pensacola.

In the darkness the burning wreckage of the downed jet aided the helicopter pilots by lighting the area, enabling them to locate the crash site. The Marine pilot of the second aircraft who was orbiting the area informed CPT Barnes and LT Lewis by radio that the crew had landed in the water close to the crash.

Upon arriving in the vicinity of the crash site the helicopter pilots spotted the faint glow of a distress flare through the dense smoke surrounding the burning wreckage. They were unable to land on the island near the downed pilots due to the heavy smoke and 100-foot trees which were thick over the island up to the shoreline. Instead, with their landing light on they could see into the water and landed in shallow water, a few feet from the downed Marine pilots who had made their way to the shoreline from where they had landed in the bay.

The men were aboard the Reserve helicopter within 10 to 15 minutes after leaving the disabled fighter and quickly flown back to Sherman Field. There an ambulance was waiting and the pilots were able to walk to it under their own power. They were taken to the Navy hospital at Pensacola where their condition was reported satisfactory.

Almost immediately the Reservists were asked to return to the scene of the crash. The airfield's ground rescue/recovery units, which had left for the site immediately after being alerted, were unable to find adequate passage through the dense trees to the wreckage. There was still a raging fire around the crash site and it was necessary for the ground team to bring it under control. The Reservists hovered their helicopter above the towering trees and through dense smoke and with the aircraft's searchlight were able to direct the recovery units to the crash site.

After returning to Sherman Field for fuel the Reserve aviators were once again called upon to return to the crash site. A first-aid trunk was badly needed because several members of the recovery unit had been slightly injured traversing the dense island undergrowth. For this flight the aviators borrowed a rope with which to lower the trunk. As the helicopter hovered over a small opening in the trees, and with the ground more than 100 feet below, the trunk was delivered to the recovery unit.

Well past midnight the Army's Reservist pilots departed the crash site, which was still burning, and returned to Cairns Army Airfield at Ft. Rucker where the 376th Transportation Company stations its aircraft. Their helicopter was meticulously inspected (no damage found), washed and corrosion control was effected because they had set down in the water.

The Army aviators had had no hoist or rope aboard and no crewchief since the mission was an instrument renewal ride. The Marine pilots who had ejected fortunately had made their way to shore. Had they been in the middle of the bay the Reserve helicopter could not have assisted them as it did on this flight because there was no equipment aboard with which to extract the downed crewmen from the water.

The Reservists, in reviewing the events, suggest it would be worth considering the storage of a rope ladder aboard each helicopter regardless of the mission to be flown. Though this procedure might prove an inconvenience, it could one day make the difference between successful rescue and loss of life.

# No Time For A Mayday

**John Marusich**
Staff Writer

**The burning wreckage of the Marine jet enabled the Army Reserve helicopter pilots to locate the site in the expanse of darkness over the Gulf . . . but how could they help? There was neither a hoist nor a line aboard and no crewchief**

**This article is aimed at the civilian "small-bird" aviator. But Army aviators will get the message. It should be pointed out that AIM, Part I, defines UNICOM as the "Aeronautical Advisory Station" and identifies frequencies 122.85, 122.95 and 123.05 KHz as available with their functional usage**

SOME OF US may have forgotten the official terminology for Unicom is "Aeronautical Advisory Station." The FCC allocates the 122.8 kc and 123.0 kc frequencies to provide the small-bird pilot with weather, wind and runway info at the small airpatch. Usually the fixed base operator puts in this communication convenience at his own expense. Too many pilots have given too many liberal interpretations on the purpose of Unicom. These liberalizations now include messages on calling taxis, alerting wives to ETAs—and queries to the FBO on myriad subjects. Consider this idle chit-chat:

"57 Romeo—this is 07 Foxtrot, do you read?"

"07 Foxtrot this is 57 Romeo; is that you, Bob?"

"Zahn's Unicom; do you read Cessna 75 Juliet?"

"Negative 57 Romeo, this is George."

"Cessna 75 Juliet, this is Zahn's Unicom; go ahead."

"Where are you, George?"

"Zahn's, this is Cessna 75 Juliet, over."

"I'm over the Flushing Airport, where are you?"

"75 Romeo, this is Zahn's; 1-2-3-4-5, 5-4-3-2-1, go ahead please."

"I'm over Flushing too, what's your altitude?"

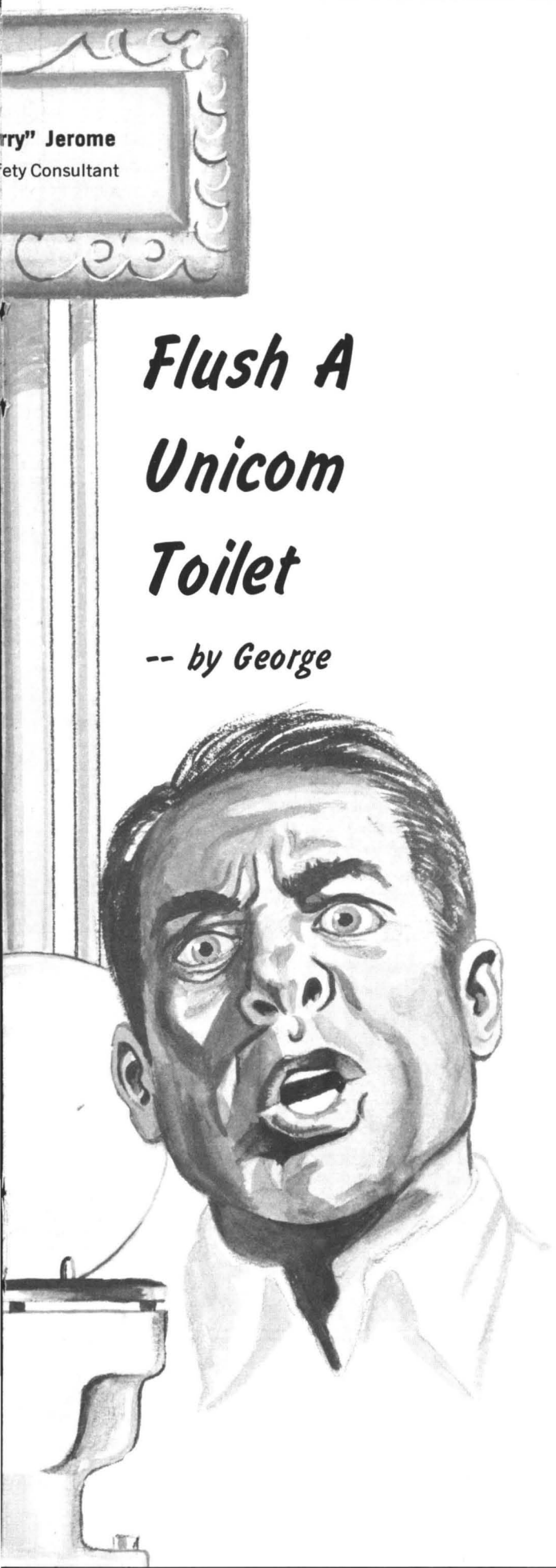
"Do you have restaurant and toilet facilities, Zahn's?"

"Three thousand—how about you?"

"Negative, restaurant is closed."

"Riverhead Approach Control, this is Red Butt Two, over."

"Aircraft calling Riverhead Approach, say your identification again, over."




# Flush A Unicom Toilet

*-- by George*

"What about the toilets, Zahn's?"

"Red Butt Two calling Riverhead Approach."

"Aircraft calling Riverhead, try calling Kennedy Approach Control."

"I can't see you over Flushing, George."

"Say again Riverhead—this is Red Butt Two."

"Call Kennedy on 127.4 stupid; you're on Unicom—and there ain't no Riverhead Approach."

"Hey Zahn's, what about those toilets?"

"He said, 'No toilet,' stupid."

"I've got to land, George."

"I gotta go too, so long, Romeo—and you too, Juliet."

The FCC certainly doesn't condone this type of comm-confusion. The airborne characters in this plot, aside from being rank amateurs, were very discourteous to their fellow general aviation airmen. Proper radio technique is a skill usually gained by experience. It also requires the intangible virtues of patience, prudence and charity.

*Patience*—by not cussing when you don't get an instant reply to your rapid-fire request. Learn to keep cool. Pause before you clog the frequency with an impatient repeat transmission.

*Prudence*—by using sound judgment before you make sparks with that mike button. This includes knowing the correct frequency to use. Listen judiciously to what's going on the party line. Don't butt in until the other guys are finished.

*Charity*—by not being overcritical of someone's obvious goof. Be internally kind and mentally lenient toward the neophyte and the inexperienced who have trouble deciphering all the verbal hieroglyphics.

After all—someday you may need a toilet too!

**The author is a former U. S. Air Force safety officer who now does consultant work in aircraft investigation and research, and lectures on aviation safety at various colleges and universities**

**STRESS IS ONE of those physiological factors that affects our lives and job performance. Many times we in Army aviation tend to apply our articles on aerospace medicine as well as other professional topics to aviators and flight crews only. We tend to forget about the other professionals in Army aviation.**

**Air traffic controllers, too, are included in the Army's extensive preventive and constructive aviation medicine program. Beginning with the controller's initial flight physical, the Army's aviation medicine program enhances an extended "whole-man" concept of medical support. It is environmental in nature and accounts for the stresses and limitations of the controller's unique environment to promote safety and effectiveness.**

**The two accompanying articles are reprinted from STRESS, the official journal of the American Academy of Air Traffic Control Medicine. Although the articles are aimed at the civilian controller, military controllers are subjected to similar stresses.**

# Uncertainty

***Provided by the Society of U. S. Army Flight Surgeons***

**Eleanore Selk**

UNCERTAINTY is the principal source of stress, says Jules H. Masserman, M.D., professor of psychiatry and neurology, Northwestern University.

We need reasonable certainty in three areas, says Dr. Masserman. We must feel that we can control our own physical environment—our health, our skills, our well-being. We must be able to depend on the cooperation of friends, lest we be alienated. And we must have some kind of belief, religious or philosophical, lest life seem empty.

Speaking at the first annual seminar on stress, sponsored by the Northwestern University Department of Psychiatry and The American Academy of Air Traffic Control Medicine, Dr. Masserman described the air traffic controller's job as fraught with uncertainty.

Air traffic controllers who must make life and death safety decisions are under exceptional stress, he pointed out.

How can they feel secure in their skills when the apparatus they work with is outdated? How can they trust in the cooperation of their colleagues when they must occasionally work with less conscientious apprentices? Their faith in their own beliefs and in the value of human life is challenged when the people with whom they work do not take it seriously. When they report inefficient conduct of colleagues they lose friends. When they report near-misses, they are told they should not make waves. Yet, if they do not make these reports they cannot improve conditions. Under circumstances as stressful as these, it is almost a relief to get an ulcer. One can diminish working hours and secure sympathetic care from a physician.

The effects on the health and efficiency of the air traffic controllers can also serve as a barometer of what happens to all of us who deal with uncertainty.

Dr. Masserman and Dr. Richard R. Grayson, President of The American Academy of Air Traffic Control Medicine, program co-chairmen both emphasized the danger to the public, as well as to the air traffic controller when judgments must be made under such high tension.

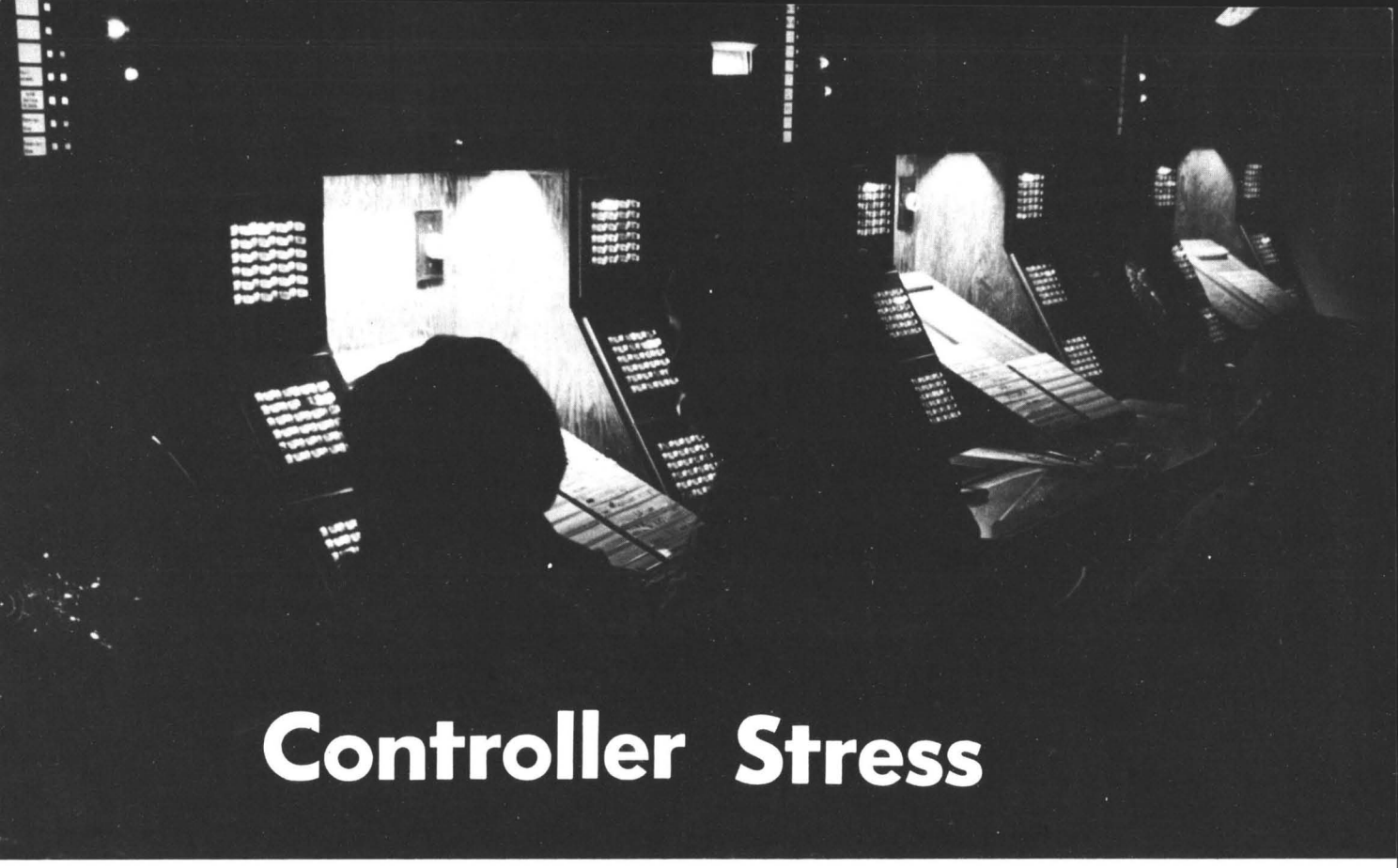
The number and speed of aircraft in both VFR and IFR flights have steadily increased to the point of submarginal technical and pilot control of factors of safety.

"The number of air crashes and near-misses has reached alarming proportions, respectively terminating or endangering thousands of lives," said Dr. Masserman.

A resolution to John Volpe, Secretary of Transportation, April 25, by a committee on collision-avoidance, of which Dr. Masserman and Dr. Grayson were members, asked the Federal Aviation Administration to facilitate the development and installation of economically available and effective automatic airborne collision avoidance indicators in all aircraft at the earliest possible date.

The uncertainties under which air traffic controllers must work are inexcusable, Dr. Masserman told the seminar on stress.

"No sane human can ever be completely certain of his health, friends or philosophy. Adequate modicums of security in each of these spheres are essential to his welfare."



# Controller Stress

# Reaction

*Aeromedic*

**Betty Forkins**

"AS THE INCIDENT unfolded in front of me, I just could not believe my eyes—watching the targets merge on the scope.

"My stomach seemed to contract to the size of a pea, causing me to belch some of my breakfast which I contained with considerable effort.

"As the targets were about to touch, the jet made a last second evasive turn. Now I was scared. I thought my body temperature was 110. I had witnessed another near-miss!"

This was Ted's reaction to a not infrequent scene he had just witnessed on his radar scope at one of the nation's largest and busiest airports. He had been a control tower specialist for 8 years and had recently filed for workmen's compensation while recuperating from ulcers.

Ted requested leave from his post. When he departed from the tower after the 7 a.m. to 3 p.m. shift he experienced waves of nausea. After arriving home he vomited uncontrollably until early the next day.

This was not his first experience with nausea. During the past year he had used most of his sick leave to ride out periodic stomach upsets.

After the last upset, he finally consulted a physician who ordered x-rays which confirmed development of a duodenal ulcer.

According to Ted and his physician, the ulcer was a product of everyday physical and emotional strain plus the nervous tension caused by frequent daily unforeseen emergencies.

At the airport where Ted spends his working day there are two northbound runways. Each is over a separate VOR. They require spacing between aircraft going over either fix at a 3-mile point.

"I had cleared a privately-owned jet on my right runway and a commercial jet on my left," Ted recalled. "I need 3 miles spacing between them. It was mid-day, the

Stressful situations can occur within seconds without warning . . . many times a controller can only watch and pray for avoidance of a disaster

sky was clear and visibility was more than 15 miles.

"When the commercial jet was northbound, I turned the private jet eastbound. When the latter rolled out on the east heading I reminded the pilot of the commercial jet to go to the right. The pilot said he saw the jet and that he would keep his spacing visually.

"I switched him to departure control frequency and watched his target on my scope.

"At 9 miles north of the airport the two jets missed each other by an estimated 200 feet. I could only watch. I had no communication with either aircraft."

Later that day Ted had four aircraft on two runways which bisect each other. He had given clearance to a 747 for landing and had cleared a departure on the same runway.

"The journeyman monitoring me asked if we could accept a commuter for landing on the strip which bisected the strip assigned to the 747.

"The departing jet had taken off, the 747 was landing and there was still another jet preparing to depart on the same runway. As soon as I saw the 747 passing the intersection, I cleared the next departure, ahead of the descending commuter.

"I informed the 747 where to turn and put a turbo jet into hold position. The commuter was about to touch down when I saw the 747 had missed the turnoff. I issued a go-around to the commuter; I gave further instruction to the 747 to turn off and I barely had enough time to release the aircraft on the runway for immediate takeoff. The latter aircraft ascended with full power and entered the intersection as the commuter jet touched down. The commuter pilot, with brakes screeching, veered to his right and passed the 747 at an estimated 80 feet. The tower had not communicated with the commuter aircraft during the entire approach. The entire operation of landings, departures, go-around and near-fatal miss consumed about 2 minutes.

"My stomach was up against my backbone. I began to perspire profusely. My mouth and throat were desert dry. Sharp and tingling sensations were shooting up my spine to my brain which seemed to be saying 'Run, run.' But I had other traffic to direct. I endeavored to keep my thoughts on that immediate problem, but it was extremely difficult to even think.

"I was removed from the operating position. My state-of-being at that point was one of complete exhaustion and frustration. While driving home I was distraught and tears rolled down my cheeks while I recalled my part in the near tragedy. At home I consumed too much liquor for several days. I required many days to slip back into my suit of confidence. Two months passed before I had really regrouped. The incident was in my dreams for several weeks.

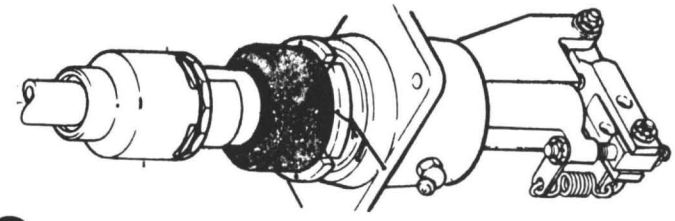
"Situations such as I have described occur very quickly, usually within seconds without warning. The aircraft involved are traveling at speeds of 160 mph, at stationary positions or just attaining takeoff momentum. When there is not space or time for corrective action, a controller must watch and pray for avoidance of disaster.

"Aside from the situations described, there are many other conditions which court disaster. In all instances the strain is intense."

Ted is working again. He may weather the next crisis or he may be staying home again "treating" an ulcer.

**would you believe 44 aircraft grounded for servos on the same day?**

# Statistics And The Servo

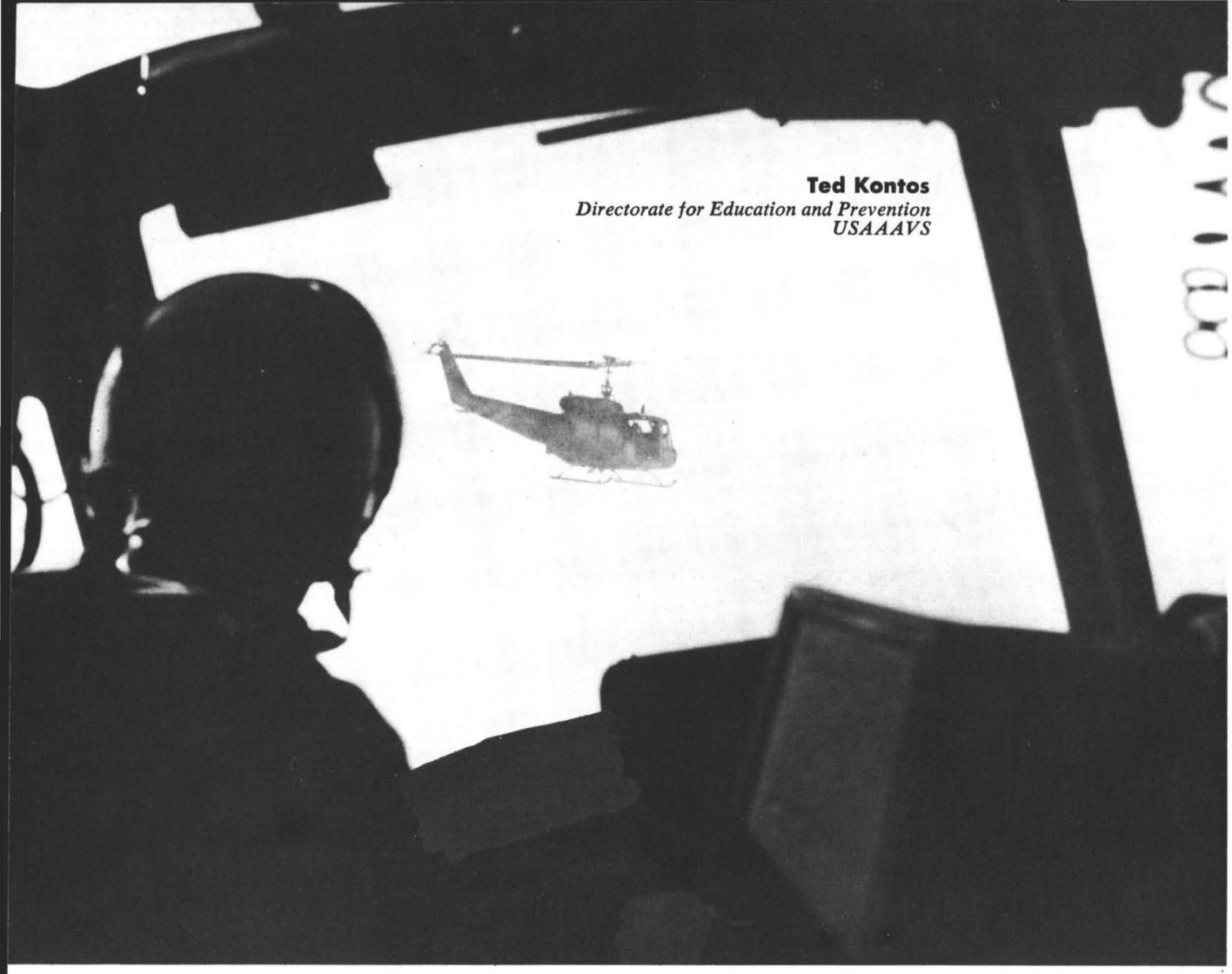


**CW3 Frank W. Kervin**

STATISTICS can reveal some amazing things about a unit's overall operation. UH-1 servo cylinders, FSN 1650-183-4426, are in great demand and have accounted for a high NORS (not operationally ready supply) rate in certain units. It's amazing when comparing two units in the same group or battalion. The assigned aircraft of the two units are about the same when considering age, airframe hours, operating environment and mission accomplishments. Yet, statistics reveal one unit uses three times the number of servos that the sister unit uses in the same period of time. This fact implies at least one of several things—either one unit is too stringent on inspection criteria and is replacing servos unnecessarily and the other unit is too lax on inspection criteria and is flying some badly leaking servos, or both units are at the extreme opposite ends of a happy median.

Many times a sudden increase in the NORS rate of a unit can be related to the influx of new personnel. A unit can be performing well when a new maintenance officer or technical inspector arrives on the scene with a specific hangup on a given item. Suddenly the OR (operational reliability) rate goes down and the NORS-NORM (not operationally ready maintenance) rate goes up. A supply system that has geared itself to supply X number of a given item per month simply cannot keep up when the demand triples in less than a month. All too often hydraulic components are changed for leakage when in fact the leakage is normal seepage. Many servos will seep when a hydraulic system is static, but once pressurized the "O" rings and/or lip seals effectively do the job.

The moral here is that statistics are not just cold, hard figures, but can be related to some very human interactions in the day-to-day approach to aircraft maintenance. All supervisors should bear in mind the human relationship when suddenly faced with an increasing NORS-NORM rate when the same item is involved on a number of aircraft. Such situations require close supervision or they can get out of hand in a hurry. When 44 aircraft are grounded for servos on the same day after there had been a decreasing demand during the previous 6-month period it is indicative of something other than a failure of the supply system.



**Ted Kontos**
*Directorate for Education and Prevention*
*USAAAVS*

# When Two's A Crowd

IN THE PAST, Army aircraft have been involved in approximately eight midair collisions each year. These accidents have annually claimed an average of 43 lives, while destroying 14 aircraft and damaging two others at an estimated cost of $4 million. Two of the aircraft either belonged to a sister service or came from the private sector of aviation. Oddly enough, most were not in formation, climbing or turning when the mishaps occurred. They simply converged. Some collided while crews were in radio communication with each other. Inadequate command and control or a lack of supervision was present in approximately half of these mishaps, and some degree of violation of instructions or procedures, or a violation of the principles of good airmanship, existed.

Slightly fewer than half of all Army midair collisions occurred in a training environment. The balance took place while aircraft were airlifting troops or performing some tactical assignment. With the cessation of Army involvement in Vietnam, it would seem that we could logically expect the number of midair collisions to automatically decrease. However, with the renewed emphasis on nap-of-the-earth flight and a possible concentration of training aircraft in certain locales, it is unlikely that the threat of midair collisions will subside. In fact, should complacency set in, their number may actually increase. Yet, all can be prevented.

*The first prerequisite* is stringent command and control, and adequate supervision in planning and conducting missions. But this alone cannot guarantee zero midairs. In one instance, two Army aviators were on a proficiency flight, with the pilot "under the hood." The flight had been properly planned, and there had been no breach of good airmanship nor any violation of regulations. Yet, after a few minutes of flight, a privately owned aircraft crashed into

the Army aircraft from behind the pilot's side. If the pilot had not been "under the hood," he would have probably spotted the other aircraft in time to have averted the collision. But even though each crew was unaware of the other's presence, the accident could have been prevented by use of some type of proximity warning device—*a second prerequisite* for collision avoidance. Not only could such a device have prevented this mishap, it could have prevented 10 of 13 others which are reported in an in-depth midair collision study conducted by the U. S. Army Agency for Aviation Safety. The following brief serves as a representative sample of this study:

A light observation helicopter was on the downwind leg of a field strip traffic pattern in an uncontrolled zone. When the pilot entered a left turn to base, his aircraft collided with another helicopter that was on a straight-in approach to the same strip. Both aircraft were destroyed and the pilots killed. This accident occurred during daylight hours on a clear day, with approximately 15 miles visibility. The position of the sun was such that it did not hinder the visibility of either pilot. Yet, neither saw the other in time to take evasive action. A warning indicator could have alerted *each* pilot and almost assuredly have prevented this mishap.

Undoubtedly, some type of collision avoidance system or warning device to help air crews detect other aircraft would aid immeasurably in preventing midair collisions. A limited number of Army aircraft have already been fitted with operational warning devices, and a program is now underway to modify others. Yet, while warning devices hold the best promise for eliminating the threat of midair collisions, they can only assist the pilot. Final responsibility still rests with the air crew, especially the aviator in command. There will always be a requirement for each member of the Army aviation team to remain constantly alert, keep his head on a swivel while airborne to spot other aircraft in his vicinity, and take necessary action in his sphere of responsibility to avert midair collisions—*the third prerequisite.*

On the surface, this sounds much like saying, "see the other fellow and don't hit him"—something not always easily accomplished. The problems involved are twofold: determining the correct action to take for any given situation, and sighting a potential target in time to effect corrective action.

As much as we may dislike admitting it, many pilots—regardless of their experience level—do not understand rate of closure, how to sight another aircraft and finally, how to evaluate the situation and take proper action when another aircraft enters their airspace. While this should be an important part of each aviator's original flight training, apparently no definite requirement for it exists in our present curriculum. Yet, thoroughly understanding the factors involved will make any pilot safer.

Oddly enough, every aviator is taught how to establish and maintain a collision course. He does this every time he flies—during every landing approach when he mentally selects his desired touchdown point. As he continues his approach, he knows he will land at that preselected point only if it remains stationary with respect to his aircraft. Should it rise, he will undershoot; should it move toward him, he will overshoot. If it moves to his left or right, he will touch down to the right or left of it, respectively. The important thing to remember is that you cannot collide with anything that moves away from you. It must become stationary at some point for a collision to occur. In short, if an object has motion, don't sweat; if it stands still, look out! Yet, all that is needed to avoid contact of two aircraft is the establishment of a difference either in direction or altitude.

When depending upon a visual avoidance system to prevent a collision, a common error is turning in the wrong direction—an action that can actually increase the chance of collision. To avoid this trap, seasoned aviators follow the old rule of "turning into the enemy and keeping him in sight until the danger has passed." This procedure keeps the pilot in full control of the situation. Suppose, for example, you are flying due north and find yourself on a collision course with an aircraft heading due west. By turning *right* (figure 1), you break the collision course, increase separation (relative movement) between the aircraft, and you also keep the other aircraft in sight in case the pilot should alter his course. Similarly, if the other aircraft had been on an easterly heading, a left turn would have been in order. Had either turn been made in the direction the other aircraft was heading, the difference in relative movement between the two aircraft would have been much less, and the possibility of inadvertently reestablishing the collision course would have existed.

*While warning devices hold the best promise for eliminating the threat of midair collisions, they can only assist the pilot. Final responsibility must still rest with the crew, especially the aviator in command*

But what if you are heading due north and find yourself on a collision course with an aircraft that is

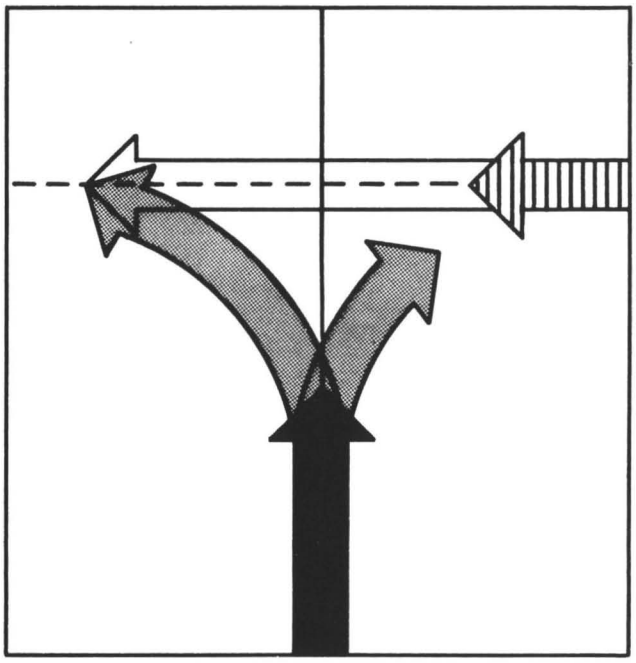


FIGURE 1—Turning toward the other aircraft breaks the collision course and increases separation

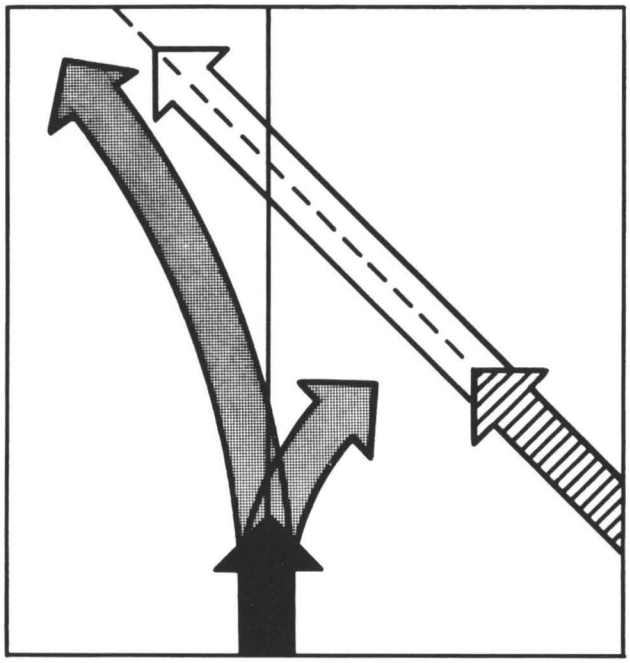


FIGURE 2—Turning toward the other aircraft can create an automatic near miss but prevents collision

on a north-northwesterly heading? If you turn right, wouldn't you be creating an automatic near-miss condition? Yes (figure 2), but it would be a definite near-miss—*not* a possible collision. Had your turn been to the left, the other aircraft might have been lost from view and it would have been difficult to have determined when and if it would have been safe to turn back to your original heading. Had the other aircraft been descending, you would have initiated a climb as well as a turn to the right.

Granted, there are exceptions to every rule. There is no relative movement between two aircraft flying at the same speed, in the same direction and parallel to each other. Does this mean they are on a collision course? Certainly not. But should you encounter this situation during flight, monitor the other aircraft carefully. If it begins to "grow" while appearing to remain stationary, you may very well be on a collision course.

What about a head-on situation in level flight? Proper action in this situation would be a descending right turn. By descending (figure 3), you keep the other aircraft in sight; by turning right, you also give the other pilot a chance to turn opposite you should he see you. The two actions provide double insurance by increasing both vertical and lateral separation between the aircraft. The right turn requirement is, of course, in accordance with FAA regulations. But what if you are unsure of the other aircraft's altitude? If you can see part of the underwing or belly, you should *descend* and turn right; if you can see a portion of the top of the aircraft, then you should *climb* and turn right. In this instance, you might lose sight of the aircraft, but you would have projected yourself above it and would be increasing the separation between the two aircraft.

Finally, what should you do if you find yourself being overtaken by an aircraft directly from behind, particularly if it happens to be a high performance aircraft that is rapidly overtaking you? This question, posed to a number of highly experienced aviators, elicited a variety of comments and created much discussion. Obviously, the responsibility rests with the pilot who is overtaking you. After all, he is in a position to see you, while you are in no position to see him. Yet, he may not see you, particularly if terrain serves as a background to help camouflage your aircraft. In one instance, an Army aircraft was struck from behind by another that was climbing. In a second collision, the overtaking aircraft was descending when the accident occurred. Anything you can do to spot and avoid contact with another

aircraft that is overtaking you definitely is in order. So back to our question: What should you do if you were to spot an aircraft overtaking you from behind? Climb? Descend? Turn right? Turn left?

A check with the Department of Standards and Instructor Training at the U. S. Army Aviation School, Ft. Rucker, AL, revealed no knowledge of any FAA regulations nor any military publication covering this situation. But, the consensus of the experts is that the safest course of action would be to either descend or climb—depending on whether the overtaking aircraft was in level flight, descending or climbing—just as you would have done in a head-on situation, and turn to the *left* (figure 4), *not* to the right. If the other pilot sees you, he will pass to your right. Since you can't know whether or not he has you in sight, your safest bet is a *left* turn.

Time spent understanding correct collision avoidance procedures will ensure that you will always take correct evasive action should you find yourself on a collision course with another aircraft, and will mentally condition you to react instinctively. It is time well spent. But now for the big one: How do you go about spotting an aircraft that may be on a collision course with your own? This is the most difficult part.

As previously mentioned, aircraft on a collision course appear to be stationary with respect to each other. Unfortunately, it is much easier to spot a moving target than a stationary one. Yet, the stationary one is precisely the one we *must* spot. It is the *only* one which causes collisions. The difficulty in sighting a seemingly stationary object is made even more difficult by a built-in defect found in every human eye. We refer to it as a blind spot, and it is located at the point the optic nerve exits the eyeball, within the field of vision of each eye, approximately 45 degrees from center. Because we have binocular vision, we are seldom aware of this defect; for the right eye can see objects in the blind spot of the left eye and vice versa. However, should the bridge of the nose or some other object obscure the vision of either eye, as occurs when the eyes are turned far toward either side, then the blind spot becomes an important flight safety factor.

While this spot covers a small area at close distances, it has been estimated that at 300 feet, it is sufficiently large in diameter to conceal a moderately large aircraft. Imagine how much this problem is magnified when you are trying to locate an aircraft at distances of one, two, three or more miles. The solu-

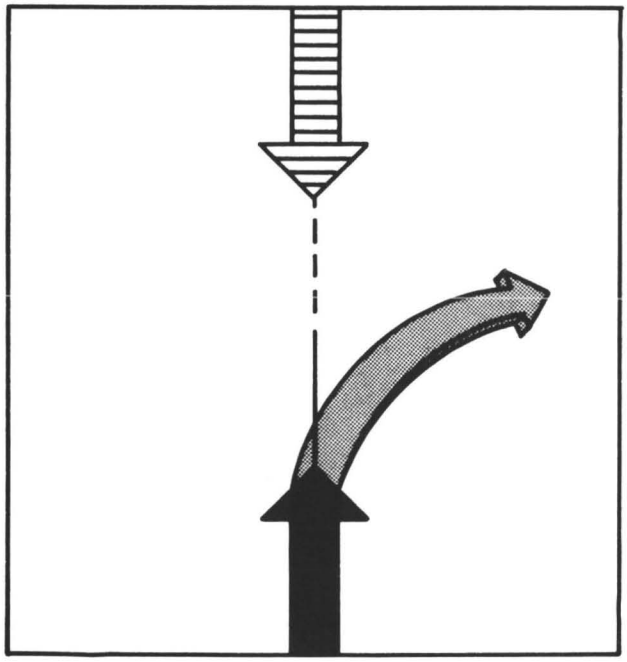


FIGURE 3—Right turn is always correct when collision course is head-on

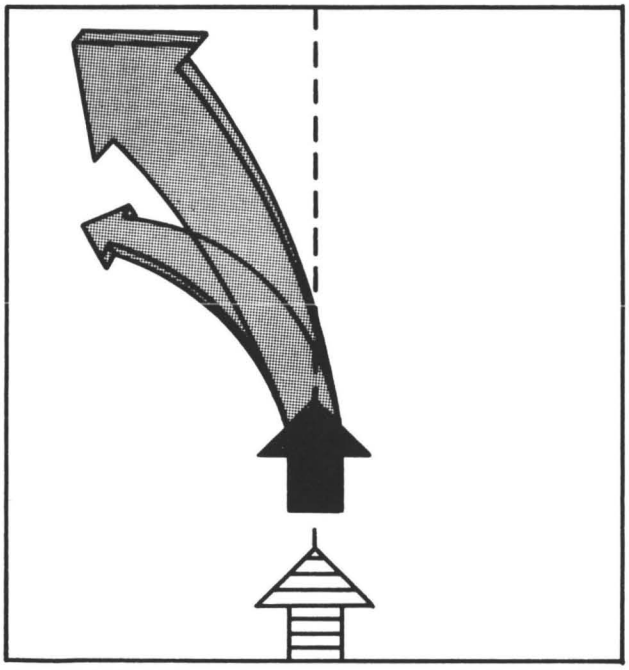


FIGURE 4—Ascending or descending turn to left is in order when being overtaken from behind

*Focusing eyes at distant point and scanning by turning head in 45° increments overcomes space myopia and problems associated with blind spots*

tion is to turn your head so that the desired field of vision is maintained within 45 degrees of center. This procedure will generally eliminate the problem associated with the blind spot. But this is not the only visual problem we encounter during flight. Space myopia is another.

This condition is similar to common nearsightedness. The eyes can focus clearly on near objects but fail to pick out detail in distant ones. On a clear day with a vast expanse of clear sky surrounding you, your eyes have nothing to focus upon and they relax, seeking a focus at a distance of about 30 to 35 feet. Any objects within this range will appear sharp while those further away will be unclear. It is difficult to sight an aircraft four or five miles distant when the eyes are set to see 30 to 35 feet away. Worse yet, the individual is usually unaware of this condition.

Space myopia is further complicated when the eyes are kept in constant motion as is often done when scanning the sky, because an eye in motion cannot see detail. Consequently, space myopia and improper scanning methods can combine to make visual detection of another aircraft an extremely difficult task.

Overcoming these difficulties requires simple but conscious acts. If clouds are in the distance, focus your eyes on them and then look for other aircraft. If the sky is clear, focus on an imaginary point in the distance. And instead of scanning the sky with your eyes in motion, look in quadrants, preferably 45 degrees at a time. Select a sector, gear your eyes for distant vision and spend a couple of seconds thoroughly covering that area, then move to another 45-degree sector. Keep in mind that at night you can see an object more clearly when it is slightly to one side (approximately 10 degrees) of the center of vision. Looking past an object at night will also sharpen it. In any event, remember that the objects you definitely want to see are those which will appear to be stationary.

Obviously, two pair of eyes are better than one, and three offer even more protection. Depending on the type of aircraft you are flying and the number of crewmembers aboard, use all eyes available, particularly in high density traffic areas. And always fly defensively, assuming that yours are the only eyes that can spot a potential target—that other pilots cannot see you. And fly as though you expect other aircraft to always be in your vicinity.

Until more Army aircraft are equipped with proximity warning devices, we must, of necessity, continue to depend primarily on our ability to spot potential targets in time to prevent midair collisions. Understanding how to visually sight other aircraft and knowing the correct procedures to follow for collision avoidance will help ensure that two aircraft in the air will always be company—never a crowd.

**P. R. Thompson**
*Directorate for Education and Prevention*
*USAAAVS*

# VITAL LIFE FLUID

IT HAS BEEN more than three centuries since the English physician, William Harvey, discovered that blood circulated in the body of man. Since this time, man has been discovering more and more about the properties of this vital life fluid. It is now standard practice for a doctor to take a sample of a patient's blood and, through an analysis of the proteins, salts, sugars and wastes, get an excellent picture of the individual's health. Based on this analysis, he can take preventive measures to correct a potentially serious condition. Alternatively, he might have to take immediate corrective measures because of what the analysis reveals. In comparison, this is precisely how the Army's oil analysis program works.

Oil analysis is essentially a maintenance tool used for diagnosing the internal condition of engines, gearboxes, transmissions and other oil-lubricated and hydraulic systems and components. Metal particles of microscopic size are produced by the friction of moving mechanical parts which enter the oil stream and are uniformly dispersed and suspended throughout the lubricating oil system. By analyzing oil samples taken from these systems at specific time intervals, abnormal wear of parts can be detected by abnormally high levels of metal concentrations. Any worn part can then be repaired or replaced before it causes damage or failure of the entire assembly or mechanical system. It is through this early detection of impending equipment component failures that the oil analysis program has become an invaluable tool for enhancing the Army aviation accident prevention effort.

The Army's oil analysis program was initiated on a voluntary basis in 1961 when the first laboratory was established at Fort Rucker, AL, to service the United States Army Aviation School and Center. Because of the increased interest and voluntary expansion of the program to other Army units, a second laboratory was established at Corpus Christi, TX, in 1963. Soon both laboratories were operating two shifts to keep up with the workload. By July 1965, over 70 percent of the aircraft in the Army inventory was being covered on a voluntary basis. Based on the high degree of reliability of the program in predicting failures, the U. S. Army Agency for Aviation Safety (USAAAVS) reasoned that if only one percent of the total component failures was prevented, the program would pay for itself. Interest became so great in the use of the program as a safety tool that, in 1966, the voluntary program was made mandatory worldwide, and a spectrometric oil analysis program laboratory was established on Okinawa. The next year, the laboratory was moved to the Republic of Vietnam, where in time laboratories were established at Tan Son Nhut, Cam Ranh Bay and Da Nang. These laboratories have since been closed. In addition to the two original laboratories, the Army today has five more located at Ft. Wolters, TX; Ft. Campbell, KY; Sharpe, CA; New Cumberland, PA; and Sandhofen, Germany.

Over the years, statistics have continued to prove the value of the Army's oil analysis program. Table 1 shows the results of the Fort Rucker program since CY 1961. In CY 1972, 123 maintenance actions were recommended on aircraft components. Ninety-five of these 123 aircraft components were actually found to be discrepant, producing a reliability factor of 77 percent of the recommended maintenance actions based on oil analysis.

Although the oil analysis program has been of tremendous value to Army aviation accident preven-

TABLE 1
Fort Rucker Oil Analysis Results

| CY | Samples Analyzed | Recommended Maintenance Actions | Verified Discrepancies (No. of Hits) | Oil Analysis Reliability Factor (Percent) | Saved Component Value ($ millions) |
|---|---|---|---|---|---|
| 61-64 | 87,000 | 389 | 171 | 44 | 3.3m |
| 65 | 46,000 | 199 | 127 | 63 | 3.2m |
| 66 | 87,000 | 387 | 216 | 56 | 5.1m |
| 67 | 106,696 | 339 | 147 | 43 | 3.0m |
| 68 | 108,124 | 233 | 142 | 61 | 3.6m |
| 69 | 72,786 | 106 | 69 | 65 | 1.1m |
| 70 | 85,494 | 308 | 248 | 81 | 4.5m |
| 71 | 88,759 | 121 | 97 | 80 | 2.0m |
| 72 | 70,437 | 123 | 95 | 77 | 1.2m |
| TOT | 762,296 | 2,205 | 1,312 | 60 | $27.0m |

tion, there is still room for improvement, particularly at the maintenance level. In the past, several problems have been encountered with the oil samples submitted from the field. These problems include incorrect aircraft serial numbers, incorrect component nomenclatures or serial numbers, incorrect reporting or omission of hours since last oil change or hours on component since new or overhaul, and, particularly, contaminated samples. Contaminated samples are usually the result of an improper method of sampling or haphazard attitude of the person taking the sample. In many cases, these problems are attributed to lack of or poor supervision, or the lack of proper education stressing the importance of correct sampling. In one such case a mechanic was supposed to take oil samples from 10 aircraft engines which were due to be sampled at the same time interval. Instead, he took only one sample from one engine, but placed the oil in 10 containers and submitted them to the laboratory for all 10 aircraft. When analyzed, the oil revealed a high iron content for all aircraft which, in turn, were immediately grounded until the oil could be resampled. The resamples revealed a problem with only one engine from which the first sample was taken. The high iron content was caused by a badly worn No. 1 bearing. Had the original sample been taken from any of the other nine engines, the worn bearing could have gone undetected and possibly caused an in-flight engine failure, resulting in an accident, injuries or even loss of lives.

Another example was a sample received by the laboratory which contained so much foreign matter that it could not have possibly been taken from any aircraft system, whereas another sample contained a large blob of grease rather than oil. Several other reported cases involved samples which appeared to be unused, clean oil probably poured from an oil can into the sample bottles. It was interesting to note that the majority of these types of samples was taken during inclement weather.

Improperly taken oil samples such as these are useless to the laboratory and are a waste of time and effort. Sometimes, individuals who do not understand the purpose of their actions may not accomplish them to the best of their ability and, perhaps, even renege. So to better educate personnel as to the importance of the oil analysis program, the Department of Maintenance Training at the U.S. Army Aviation School, Ft. Rucker, AL, incorporated a class on the proper oil sampling methods in its MOS-producing maintenance course in January 1972. Since this time, the Fort Rucker laboratory has noted a marked improvement in the quality of the oil samples received.

In accordance with Technical Bulletin 55-6650-300-15, 5 August 1970, with Change No. 2, dated 25 October 1972, the two basic procedures for taking routine oil samples are the tubing method and the drain method. The tubing method is preferred over the drain method, whenever possible, as tube samples are less likely to contain sludge and dirt than drain samples. The disposable, plastic flexible tubing, which comes in four lengths and diameters to meet the requirements of various aircraft, is used to obtain oil samples through the oil filler neck or the dipstick hole. When taking a sample through the filler neck, the tubing should not be allowed to touch the sides or bottom of the tank in order to avoid sludge, and the oil should be taken from approximately the same depth in the reservoir each time. Samples are properly taken by inserting the tubing into the reservoir, allowing the tubing to fill with oil and placing the fingertip over the top of the tubing. The tubing is then removed and placed in the sample bottle, and the finger is removed from the end of the tubing to release the oil (see figure 1). This procedure is repeated until the sample bottle is filled to within one-half inch from the top of the bottle. Some individuals are using mouth suction to fill the tubing with oil. This method is dangerous and should not be practiced as some oil is very poisonous. After the sample has been taken, DA Form 3253 should be accurately completed, wrapped around the oil sample bottle and secured with a rubber band. The sample should then be sent to the assigned laboratory as soon as possible.

The drain method (figure 2) is used when the tubing method is impractical, such as for transmissions. To prevent sludge or water from contaminating the oil, a minimum of one pint of oil must be drained before taking the sample. A quart container, such as a coffee can, can be fitted with a wire bracket designed to hold the sample bottle at the top of the can. This allows the oil to be drained into the can before the sample is taken. It also allows the sample to be taken with one hand and frees the other hand to replace the drain plug.

Both the tubing and drain samples should be taken while a major assembly is still warm. The best time to obtain a sample is within 15 minutes after an

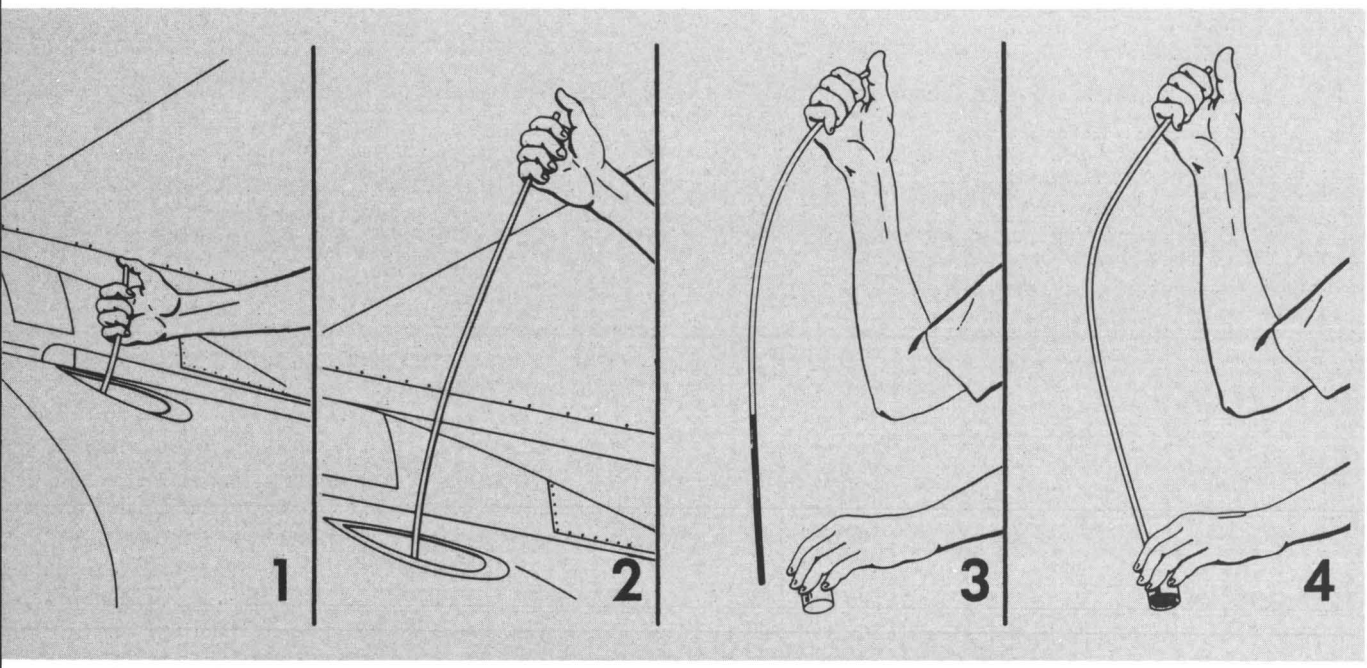



**FIGURE 1—Taking filler neck sample using flexible tubing**

engine shutdown or an aircraft landing. If a sample must be taken and the aircraft is cold (other than after an accident) the system must be run until it reaches normal operating temperature or else the oil is not truly representative of the oil circulating in the system. If a sample is taken while the system is cold, it is very ineffective as an indicator of defects or condition of wear in an assembly.

There are several variations for sampling the hydraulic system, transmission and gearboxes. The tubing method can be used to sample the hydraulic reservoir, provided it is a part of the circulating system; the drain method can be used for sampling the filter housing; or the sample can be taken from a line that circulates the fluid. The transmission and gearboxes can be sampled with the tubing by either removing the magnetic plug and inserting one end of the tubing into the sample bottle or by displacing the check valve with the other end of the tube and drawing off the oil.

In addition to the routine samples, special samples and resamples are required:

- When there is a sharp increase in the wearmetal content in the oil or there is dirt or sludge in the oil, indicating that the sample was not taken properly.
- After an aircraft accident, regardless of its cause.
- Before any oil change or intermediate or periodic inspection.
- Immediately following any flight in which there was a failure, an overboost or overspeed, or any abnormal flight condition which may have been the result of a malfunction of oil-lubricated parts or damage to an oil-lubricated system.
- After any indication of internal damage to an oil-lubricated major assembly.
- After chip detector light comes on.
- Before the removal of a major assembly regardless of the reason, including time between overhaul.
- Before an aircraft is deployed overseas.

The special samples will be clearly marked "SPECIAL" and banded with red tape or marked in some other conspicuous way so that they will be given priority by the laboratory.

Improper sampling methods are not the only area in which there are problems in the program. Assistance visits to various units by USAAAVS personnel have revealed these additional discrepancies:

- Personnel were not assigned to monitor the program. In accordance with AR 750-13, "Maintenance of Supplies and Equipment, Army Oil Analysis Program," dated 14 February 1973, all commands, units, installations, depots and activities which operate or support Army aircraft are responsible for conducting

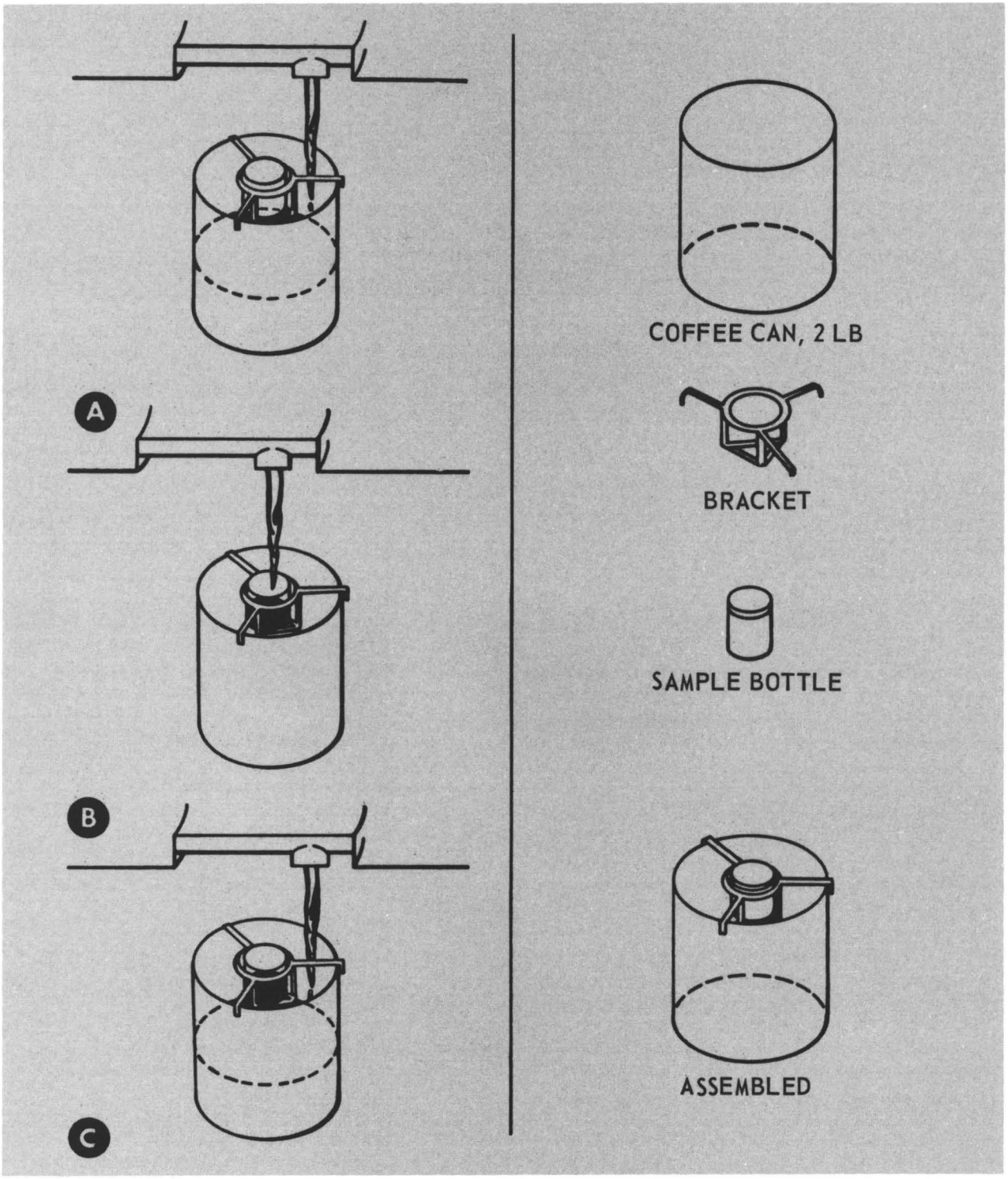



FIGURE 2—Taking drain sample using locally made kit

an effective program. This also applies to all activities involved with the management of the program. The unit commander of each aircraft operating unit must assign a project monitor to coordinate the overall effort to ensure that his unit's program functions properly.

• Records were not being maintained and it could not be determined when, where or how samples were taken. To assist maintenance personnel in taking proper and timely oil samples, USAAAVS recommends a form similar to that shown in figure 3 be locally reproduced and maintained on each applicable component. The form should be kept on file in the maintenance office for ready reference and followup action.

• Samples were not being taken on a timely basis and some were overdue as much as 25 hours. *Most* components are sampled after every 25 hours of operation. However, it should be noted that turbine engines are always sampled after every 12½ hours of operation. Oil samples must be systematically taken at the regular intervals specified in table 1, TB 55-6650-300-15, for the systems involved; at times when trouble is expected; and after the last engine/assembly operation immediately before each intermediate and periodic inspection. Samples taken at prescribed time intervals are of utmost importance in revealing any progressive increase in wearmetal or abnormal wear within a system on which to base corrective maintenance actions. While it is true that the operating time between an incipient and total failure of a system may vary from a few minutes to 80 hours or longer, it would be impossible and impractical to take routine samples after each flight. Therefore, the routine sampling intervals for each major assembly is a compromise based partly on what is practicable, partly on operating conditions and partly on the failure history of the assembly.

• Samples were not being submitted to the laboratory in a timely manner. The effectiveness of the oil analysis program depends on the response time; that is, the time consumed from sampling, transmission time of sample, and laboratory analysis time and the time to inform the operating unit of a recommendation made by the laboratory evaluator. Program effectiveness decreases when there is an increase in response time. Aircraft failures have occurred during the time the oil sample was submitted to the laboratory and the turn-around time of the results to the field.

• Samples for a particular assembly were being taken from another oil reservoir, e.g., a 42-degree gearbox sample was taken from a 90-degree gearbox. Personnel must ensure that samples are taken from the proper reservoir and that they are labeled immediately to prevent a mixup in samples when more than one is taken at the same time.

OIL ANALYSIS

A/C TYPE & SERIAL NO. UH-1 67-08400

Type of Component Engine Where to Sample Filler Neck

Component SN LE02400 How to Sample 15" 3/8 Tubing

Component Sampling Interval 12½ hrs

| TYPE OF SAMPLE | TIME ON COMPONENT | RESULTS OF SAMPLE |
|---|---|---|
| | | |
| | | |
| Routine, Special or Resample | 1,212 | Resample Neg. |

FIGURE 3—Suggested form to be locally reproduced and maintained on each component

• Authorized bottles were not available for taking oil samples. The authorized sampling bottle (FSN 8125-933-4414) is a glass 5-dram (⅝ ounce) pill bottle with a plastic screw cap. The bottle can be procured by the gross, using B-17 as the source of supply.

The success and overall effectiveness of the Army's oil analysis program depends on the testing and analysis of reliable oil samples. Individuals must ensure that samples are not contaminated, are properly taken and identified, are taken at the proper intervals and are dispatched to the laboratory immediately, along with accurate "Used Oil Sample Information," DA Form 3253, dated 1 November 1972. An oil sample, as small as it may seem, can detect a serious problem which could save lives or an aircraft.

# PEARL'S

## Personal Equipment & Rescue/Survival Lowdown

*USAAAVS' records prove the need for*

## SURVIVAL EQUIPMENT IN THE STATES

THE USE OF personal survival equipment in the jungles of Vietnam was a must for successful search and rescue of downed air crewmembers. Because we are no longer involved in the Southeast Asia conflict, however, does not eliminate the need for this equipment in the States. U. S. Army Agency for Aviation Safety (USAAAVS) mishap files contain a number of cases showing the need for this survival equipment, especially signaling equipment; i.e., survival radios, personal signal kit and signal mirror. These records also show crashes need not occur in remote areas to create a need for personal survival equipment.

For example, a pilot with one passenger was on a stateside rotary wing routine mission when his helicopter crashed into a wooded and swampy area covered with heavy foliage (photo 1). When the pilot failed to report in one hour after the intended end of flight, the helicopter was considered missing and an unsuccessful search from the air, ground and waterways was conducted. The wreckage was accidentally discovered 53 days later by a farmer when he saw the reflection of the sunlight in the red anti-collision light mounted on the transmission. *The wreckage was located only 2.8 miles from a small community.*

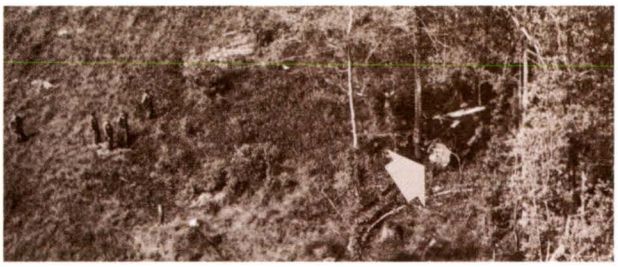


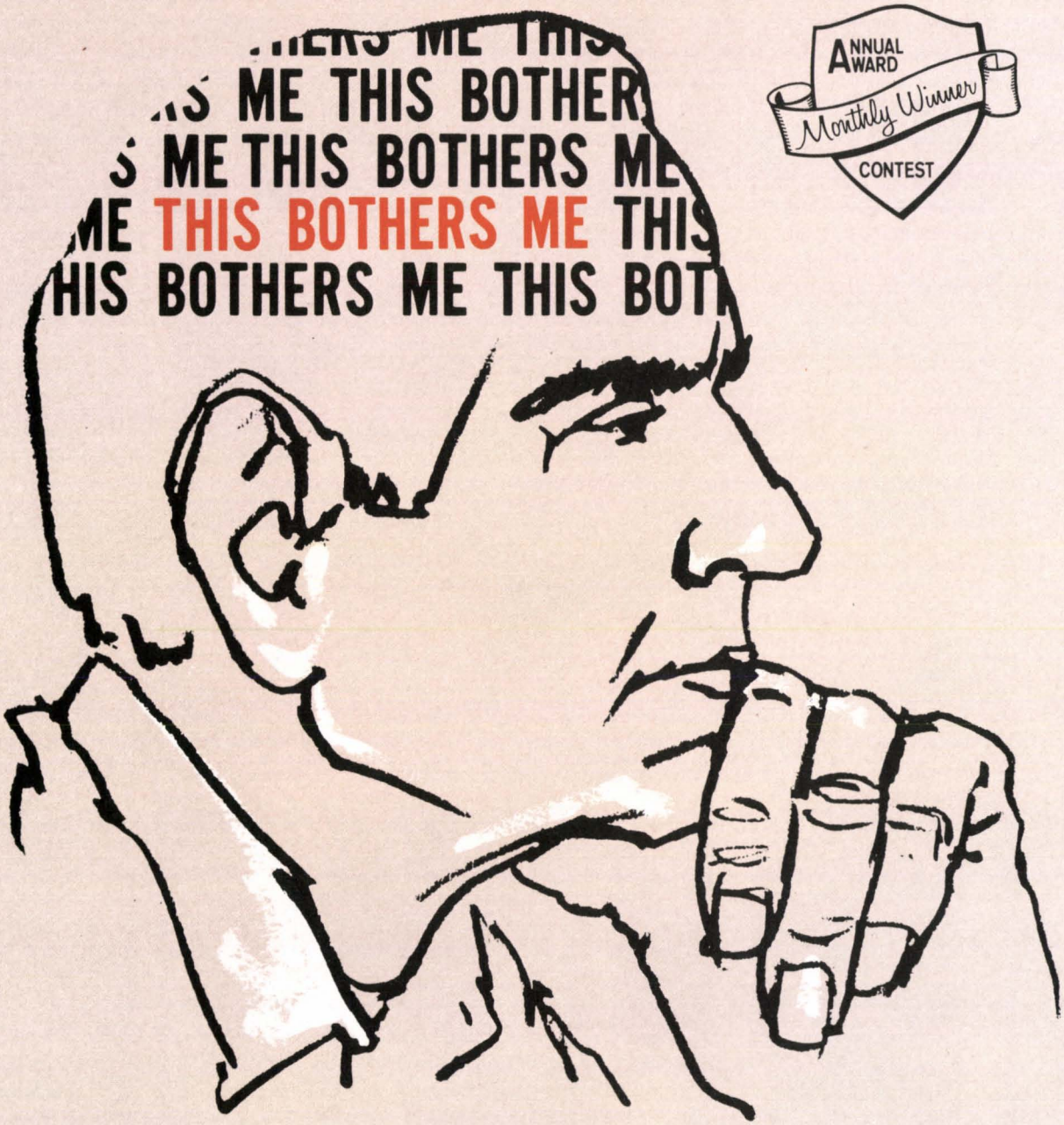
PHOTO 1—Crash site. Note the proximity of the clear area

Evidence at the crash site indicated that one or both occupants survived the crash and lived for an undetermined length of time. It was noted that, when the flight originated, the pilot was wearing his flight jacket with the green side turned to the outside. However, when his body was found, the orange surface was exposed. His necktie was tied in a double knot to a branch about 8 feet from the wreckage with a closed safety pin stuck through the knot as though he had tried to make a splint. The aircraft first-aid kit was found about 10 feet from the wreckage and part of the contents had been burned (photo 2). It was reasonably assumed that at least one of the occupants was alive for some time after the crash and had tried to signal for help. The board strongly felt that if the pilot had been carrying a pen type flare gun or other distress signaling devices on his person, he would have most likely been rescued.

It is the commander's prerogative to determine whether air crewmen should be issued personal survival equipment for certain types of missions. However, if an air crewman requests survival gear which he feels is necessary and which is available in his unit, USAAAVS feels that the commander should carefully consider the type of mission and the different types of terrain over which the flight will be accomplished before refusing to issue the equipment.

*An article entitled "Just Pure Hell" which appeared in the September issue of the U. S. ARMY AVIATION DIGEST contains many good ideas on the use of improvised survival equipment and any "leftover" items from Vietnam.*

PHOTO 2—Arrows denote branches cut from tree to make splint and partially burned contents of first-aid kit




**A concerned senior aviator expresses his opinion of today's Army aviation "attitudes" . . .**

AS WE SENIOR aviators get more and more senior, it seems that little things which once did not bother us, not only bother us, but nag at us. Perhaps along with getting "seniorer," the thousands of hours we have acquired, the situations of stark terror we have lived through, the loss of close friends through needless accidents, the countless stupid stunts we, ourselves, have pulled yet lived through—and hopefully profited by—all come under the heading of experience and maturity. And experience and maturity make us less tolerant of actions or lack of action which causes mishaps.

As a civilian air traffic controller for more than 15 years, I have witnessed many incidents by civil and military aviators which not only bothered and nagged at me, but downright scared me. As an Army aviator of almost 20 years, I have felt a special obligation to watch out for my fellow green suiters, and help when I can. Oh, I take my licks from fellow controllers when an Army pilot fails to follow a clearance, or does not comply with air traffic instructions, or just plain screws the system out of tolerance. But I am

**Lieutenant Colonel Gerard J. Mialaret**
*State Aviation Officer*
*Louisiana Army National Guard*

proud of Army aviation, its contributions and its place in the aviation community.

Throughout the years, whenever an Army aircraft became involved in an unusual situation, I would get bothered. Then I would feel rather paternal. In fact, I guess I considered it a personal and professional responsibility to dig into the situation to see if a fellow aviator could benefit from some guidance. Such a situation occurred recently. I relate this one incident primarily because it didn't turn out the way previous situations have, and secondly because I consider it a symptom of one of the major problems plaguing Army aviation today.

An OH-58 pilot called in, advised he had a low fuel state and requested a straight-in approach to the airport. This was provided and the aircraft landed safely. I couldn't help but wonder about the low fuel state and it nagged at me. The only way to relieve the nagging was to take time to check a little further.

My investigation revealed that the aircraft was assigned to an aviation detachment in the northeast and had as a crew two captain aviators. They had departed an Air Force base in Texas and filed a VFR flight plan nonstop to our airport, 270 nautical miles away. After landing, the aircraft was refueled with 67 gallons (capacity 71.5). (I guess he did have a low fuel state!) I shuddered to think what might have happened if the crew had had to deviate because of the numerous thunderstorms in the Gulf area at that time of year, or if they could not have been given priority handling without expressly declaring an emergency.

On previous occasions when I was confronted with such facts, I passed on the information to the commanding officer of the unit concerned by calling him and informally discussing it. I did this solely with a sense of responsibility and concern for the welfare of the individuals, for the reputation of Army aviation in the aviation community, for the safety of the taxpayers above whom we fly, and for the conservation of our aviation resources. I just hope action taken now might prevent a future accident. All previous incidents ended on a successful note, with the information offered accepted in the spirit in which it was given.

However, when I called the unit commander, he was not in, so I spoke to the operations officer. Instead of the usual cooperation I had been accustomed to, I encountered a very defensive attitude and received a litany of justifications for the actions of the crew. Among the most noteworthy were:

- They were already aware of the situation, for the crew had returned and told them of it (yet they did nothing).
- AR 95-1, paragraph 4-2 (30-minute fuel reserve for VFR flight) is for "flight planning purposes" only.
- The pilot was an "outstanding instructor in the OH-58 who knew what he was doing."
- He, the operations officer, "did not have any control over the aviator. He already knows everything he needs to know."

Now, this really bothered me! When individuals who are responsible for the supervision of our aviation activities exhibit such attitudes, it affects my ability to sleep at night, because a long career in aviation has taught me that safety is basically an attitude. A letter through command channels brought this situation to an acceptable resolution, but it still bothers me and here's the second reason I relate this incident.

Operations in Southeast Asia have concluded, and the chapters that Army aviation has written are closed. Our aviators have thousands of hours of flying time, much of it combat. But many of them think they are still living and flying in the "combat" mission-oriented environment, while Army aviation today operates primarily in a civilian type environment (with the exception of authorized nap-of-the-earth, gunnery, etc.).

To fly safely and successfully today requires professionalism of the highest order. Hours of combat flying, decorations and awards for valor are not exclusive hallmarks of a professional. They are stubs in the book of tickets which we have used to accumulate our reservoir of aviation knowledge. We can only benefit from them if they have taught us lessons, increased our aviation maturity and helped in the ongoing shaping of our attitude. They cannot be accepted as an excuse or even a reason for deviation from safe flying. A ticket stub will gain you entrance to nowhere.

The true hallmark of the professional is safe, conscientious and consistent performance. And this is one of the biggest challenges of present-day Army aviation, to remold and shape the "attitudes" of our young combat aviators. Until we can successfully accomplish this task, we can expect to have tales of "ridiculous flights of the month," mishap summaries and crash facts messages.

Army aviation has grown without equal since I first became a part of it many years ago. Now it is time for it to mature, and yes, stop bothering me.

# The USAAAVS Assistance Visit Program

**Arnold R. Lambert**
*Directorate for Education and Prevention*
*USAAAVS*

A SOUND ACCIDENT prevention program is a must for all Army aviation units. Each has such a program, and its effectiveness has improved over the years as evidenced by the reduction in the accident rate from 30.1 per 100,000 hours of flight in FY 1960 to 7.41 in FY 1973—the best safety record ever. But we are all human and despite our best efforts, we sometimes fail to note the presence of accident-producing agents which may exist within our scope of operations. So what can we do? We can borrow from industry and the old adage that "two heads are better than one."

An engineering firm is awarded a contract to design and construct an industrial complex. The firm, in turn, obtains the services of consulting engineers. A highly successful and efficient retail chain periodically brings in business consultants to assist them in examining their operation. Similiarly, before any author's work is published it must pass the scrutiny of an editor. Why? Are the consulting engineers better qualified than those of the engineering firm which contracted the project? Are business consultants who are not operating their own businesses more qualified than personnel managing a highly successful multi-million dollar enterprise? Is an editor a better writer than the author whose novel he is about to publish? Not at all. When a project is completed, the person or persons doing the original work will seldom find the need for improvement because they have put their best efforts into it. However, the consultants and editors are effective because they are not "close" to the particular project or operation and can study it objectively.

Similarly, outside assistance can give each Army aviation unit's safety program a shot in the arm and boost its effectiveness. The United States Army Agency for Aviation Safety (USAAAVS) provides such a service in the form of assistance visits to Army aviation units throughout the world. While these visits have the wholehearted support of the Department of the Army, they can be effective only if they have the wholehearted support and cooperation from all Army aviation units.

For years, aviation accident prevention was dependent primarily upon the individual commander, pilot and mechanic—upon his knowledge, skill, concern and effort. Then, early in 1964, USAAAVS initiated a safety education program which has steadily grown and is now available for all levels of aviation personnel, including NCOs. The individuals exposed to this educational program put their newly acquired knowledge to work—shared it and improved it.

Feedback from the field, provided through the Agency's traveling educational team and subsequent contacts, provided the initial impetus for the assistance visit program. Indications, from commanders and aviators alike, were that there was a definite need for additional aircraft accident prevention services. USAAAVS was well equipped to provide this service because of its inherent capability and the information available from its data sources. The USAAAVS commander set the wheels in motion by an in-depth review of the requirements and finalized his plans to improve the Army's aircraft accident prevention program. With the preliminary planning completed, the last step was initiated by advising Continental Army Command (CONARC) and requesting the concurrence of that headquarters.

It was determined that the best vehicle for assistance would be a team of highly qualified individuals to visit aviation units in the field. USAAAVS didn't want to send personnel well versed in the LOH to an installation heavily weighted with cargo helicopters and vice versa. Therefore, USAAAVS directorate chiefs reviewed the qualifications of their assigned personnel and submitted nominations for team membership. The final selection was made by the USAAAVS commander and teams have since included officers, enlisted men and civilians. As a companion action the USAAAVS Management Information System Directorate prepared reports of accident experience for the major Continental United States (CONUS) installations. When ready, these were evaluated by a panel of specialists to determine where significant problems were evident and where the efforts of the assistance team could be used to best advantage. Once this was accomplished, it was a simple matter to marry up the proper team, provide it with the

necessary data and related material and send the members on their way.

The primary purpose of the USAAAVS assistance visits is to determine the effectiveness of your unit's accident prevention program. The assistance teams consist of highly skilled individuals (consultants) with the ability to study your accident prevention program objectively—not to criticize, but to find areas where improvements would increase the effectiveness of the overall program. Upon arrival, the team chief will give an entrance briefing to inform unit personnel of the team's mission and discuss the functional areas the members intend to visit. The team will then split into subteams with their unit counterparts and proceed to their particular areas of interest. Team members must observe normal operations and will ask questions of unit personnel. They will avoid undue interruptions of ordinary operations. The team chief will give an exit briefing which will include a concise summary of the team's findings by functional areas. Specific mention will be made of outstanding functional areas as well as areas with potential safety hazards.

Once again, it is important to keep in mind that these are assistance visits. USAAAVS has undertaken the program within the context of the Agency's worldwide aircraft accident prevention mission and to provide assistance to commanders in their accident prevention programs. To lend credence to this statement, here is a direct quote from the message that alerts installations to an impending visit.

"Your headquarters is requested to arrange a briefing for the assistance team on mission, aircraft resources, and major problems confronting aviation operations and any specific areas that are recommended for in-depth examination by USAAAVS."

The efforts of the assistance team serve to complement the endeavors of a separate survey or inspection group dispatched by another headquarters. A useful purpose is served by all these efforts, and particularly so when we combine these efforts and are instrumental in saving lives and equipment.

The USAAAVS team is augmented with a highly qualified individual from the U. S. Army Aeronautical Services Office. Also, staff officers from the appropriate Army headquarters have attended the exit briefing. The visits properly address the following areas of interest:

- Command implementation of the aviation accident prevention program
- Standardization
- Operations/facilities
- Maintenance, supply and POL
- Ground safety
- Aviation medicine
- Training
- Air traffic control (USAASO)
- Unit morale

Upon return to Fort Rucker after the completion of an assistance visit, a careful analysis of all findings is made and the final report is compiled. The report identifies areas for improvement and recommends corrective actions. It is then submitted to the commander of USAAAVS for approval and dispatched to the field command concerned. A copy is also provided to higher commands so that they are aware of areas where they can assist the unit. However, it's up to the unit commander and aviation safety officer to carry the ball and follow up with necessary actions to eliminate all hazards.

The concept of assistance visits was developed in the summer of 1971 and the first assistance team departed Fort Rucker 21 September 1971. Since then, teams have visited about 130 active Army, Reserve and National Guard units, both in CONUS and overseas. Overseas visits either completed or scheduled for the near future include Germany, Korea, Alaska, Hawaii, Panama Canal Zone and Kwajalein.

Assistance visits to active Army aviation installations are programmed by USAAAVS, with aviator population and aircraft density being the primary determining factors. However, aviation units are encouraged to request assistance visits. National Guard and Reserve units may also receive assistance visits by sending requests to USAAAVS. Direct communication is authorized by AR 10-29.

To date, acceptance of the assistance visit program and reception of team members by the various commands and installations concerned have been most gratifying. Assistance teams have been instrumental in getting the attention of several activities on numerous problem areas that resulted in immediate corrective action.

Records show that many shortcomings in a unit's safety program are discovered during the course of accident investigations. Why wait for an accident investigation board to find existing hazards in your unit? Close the barn door before the horse gets out—let a USAAAVS team assist you in finding potential safety hazards.

*If you have a question concerning aviation accident prevention, write to Commander, USAAAVS ATTN: Orval Right Fort Rucker, AL 36360*

### UH-1 Takeoff Procedure

*Recently, I observed a UH-1H take off while the two crew chiefs were sitting in their seats, without their seat belts secured, and both cargo doors were open about 2 feet. After the aircraft cleared the airport, the crew chiefs closed the doors. When I asked the pilot about this procedure, he replied that, "It lets the crew chiefs clear the aircraft while we take off. This is the way we did it in Vietnam." Is this an approved takeoff technique?—ASO*

The takeoff technique you describe is not approved. Chapter 7-5 of the UH-1D/H dash 10 states: "When securing the cargo door in flight the crewmember must be fastened to the aircraft by seat belts or other safety devices." Further, chapter 3-34 of AR 95-1 places the responsibility with the pilot to ensure each occupant uses a safety belt during landings and takeoffs and in rough air. True, some pilots allowed such procedures as you described in Vietnam, but that didn't make it correct.

### Medevac Mission

*When you are flying a medevac mission with a patient on board, do you have to request a firetruck to stand by at your dropoff LZ?—ASO*

A firetruck and crew are required for *scheduled* aeromedical evacuation as per paragraph 6-3, AR 95-26. Minimum requirements for air evacuation of hospital patients are contained in paragraph 5-17e(3), AR 420-90.

### Who's in Command?

*After an aircraft crash, is the pilot-in-command still the ranking command authority and responsible for all passengers and crewmembers, or is the authority and responsibility transferred to the senior ranking individual on board or in the area?—ASO*

According to paragraph 3-6 of AR 600-20, the senior commissioned officer, warrant officer, cadet, noncommissioned officer, specialist or private among troops at the scene of an emergency will exercise control or command of the military personnel present. As an aircraft crash does constitute an emergency, the senior ranking member would be in command.

### Wig Hazards

*What is the flight surgeon's opinion of wigs being worn by flight crewmembers while they are performing their flight duties?—National Guard aviation officer*

We have had very little experience with wigs and their associated hazards, but our flight surgeon is of the opinion that wearing a wig is not in the best interest of aviation safety. He points out that excessively long hair—even without a wig which is sometimes worn to give a military appearance—can compromise the protection offered the wearer by an SPH-4 helmet. Worn over long hair or over a wig, the SPH-4 doesn't stay on the head as well. In addition, wigs of synthetic material can melt when exposed to heat and thus aggravate what would otherwise be a minor burn injury. Wigs also provide an obvious source of FOD. We would appreciate hearing from anyone who has firsthand knowledge of the hazards wigs pose to aviation.

# USAASO Sez

The U. S. Army Aeronautical Services Office discusses

**The AIM as a tool**
**Field conditions as NOTAMs**
**Pilot-age and your birthday**

**Aim Well: Pilots, like other artisans, should have and know how and when to use all tools available to aid in accomplishing their tasks. It is for this reason that each Army, U. S. Army Reserve and Army National Guard flight activity is issued the complete Airman's Information Manual (AIM) for flight planning purposes. Part I of the AIM is usually lifted by someone soon after receipt which is all right as this basic information is available generally in FLIP I and II or service TMs. The sharp Army aviator is only interested in Part III and III A anyhow. At those stations not on the Air Force/Navy Central NOTAM Facility (CNF) network, there are possibly some safety-of-flight items available to the Army pilot only in AIM III/III A. Both III and III A contain stable NOTAM information from the National Flight Data Center. When published in AIM, these NOTAMs disappear from the daily civil NOTAM circuits. If one does not receive the FLIP summary or corrections through CNF, AIM III becomes the only place to find some changes for civil fields that occur between the productions' cycles of FLIP. Some examples of routine changes are missed approach procedures, civil SIDS and STARSs, minimum altitudes, control zone and hours, etc.**

**USAASO Sez: The board variance in FLIP publication cycles may leave you in an information vacuum unless you include AIM III in your preflight planning action.**

**Attention Operations Officers: *Field conditions are NOTAM material.* At some Army airfields fortunate enough to have an attached USAF weather bunch, a new or change to field conditions (ice, wet runway, etc.) is handled over the WX counter for transmission on their circuits for pickup and transmission by the CNF. A lot of us other guys are sitting out at places where we have only civil circuits to look at. Help us out, also, and give that NOTAM to your friendly FAA Flight Service tie-in station. Procedures for reporting field conditions on FAA circuits are found in FAA Manual 7110.10 and should be detailed in unit SOPs.**

**PILOT-AGE has nothing to do with your birthday! However, it may well have something to do with your enjoying a full share of them in the future! Yes, of course you have been flying instruments for years and consider yourself pretty sharp on the gauges—but how much time have you given lately to practicing navigating without them? How sharp are you at orientation when turbulence, atmospherics or a malfunction renders navaids unreliable or useless? And how about certain world areas where you have to operate wherever the existing few and far between navaids may be—shall we call it "arbitrarily" silenced? At this point a professional job of pilotage will be rather useful if not essential for the success of your mission. What better time than here-and-now to practice this fine art of finding out where you are at all times. Give it a try on your next VFR cross-country. Come out of that cozy cabin complacency and become more familiar with what suddenly may be unfamiliar terrain below. See if your "dead-reckoning" skill is dead or just lost as you may be. When your DG fails, can you apply a variation correction to the standby compass and press on or did you mistake that isogonic line for highway 3 E? Can you make and apply an off course correction and continue a direct flight or must you follow the "iron" or "concrete" compass? How did your preflight time/distance and heading computation come out at your destination? Your local ops office will supply you with all the necessary aeronautical charts to complement your instrument FLIP package. Pilotage—try it; see precisely where you are!**



☆ U.S. Government Printing Office 1973—746-161/5

# NEW!

## EM Career Plan

WORK IS UNDERWAY in the U. S. Army Military Personnel Center's Enlisted Personnel Directorate to develop a new system of enlisted career management.

This project—begun in July 1973 and expected to continue over the next 2 years—calls for a detailed analysis of the 35 enlisted career management fields (CMF) to determine first of all whether each CMF allows smooth promotion progression for the individual soldier.

The specially organized Enlisted Personnel Management System (EMPS) Task Force consisting of five officers and three NCOs is also looking closely into enlisted promotion equity between and among the existing CMFs. By applying the same type of fullscale analysis to all MOSs within the CMFs, the EPMs Task Force will eventually decide which changes to the current enlisted grade structure will be required throughout each CMF to achieve across-the-board promotion equity.

After the Task Force members have identified the proper grade structure within each CMF, they will work with MILPERCEN's Personnel Management Development Directorate to combine those MOSs within a CMF which, over the years, have become too specialized. Empahsis at this stage of the project will be on combining specialized MOSs at the senior NCO grades so that in the future, career NCOs will be able to broaden their knowledge and supervisory responsibility as they advance within their respective career patterns.

Once the new enlisted career patterns have been formulated, the Task Force will coordinate its recommendations with the USA Training and Doctrine Command (TRADOC) so that the new training courses complementing the new career patterns are developed and prepared for integration into advanced training as well as both the basic and advanced courses of the Noncommissioned Officer Education System (NCOES). Meanwhile, the Enlisted Evaluation Center at Ft. Benjamin Harrison, IN, is working to determine how to adapt MOS evaluation testing to the new career patterns.

Toward the end of the project all EPMS Task Force findings and recommendations will be presented to a steering committee consisting of general officers on the Army Staff and, it is expected, the Sergeant Major of the Army. Pending final approval by the Army Chief of Staff, the EPMS Task Force estimates that it will take at least 18 months before regulations can be revised and authorization documents modified and fully implemented.

The result of this effort should provide something the Army has been working toward for some time—a comprehensive, carefully designed and equitable career management system for its enlisted soldiers.

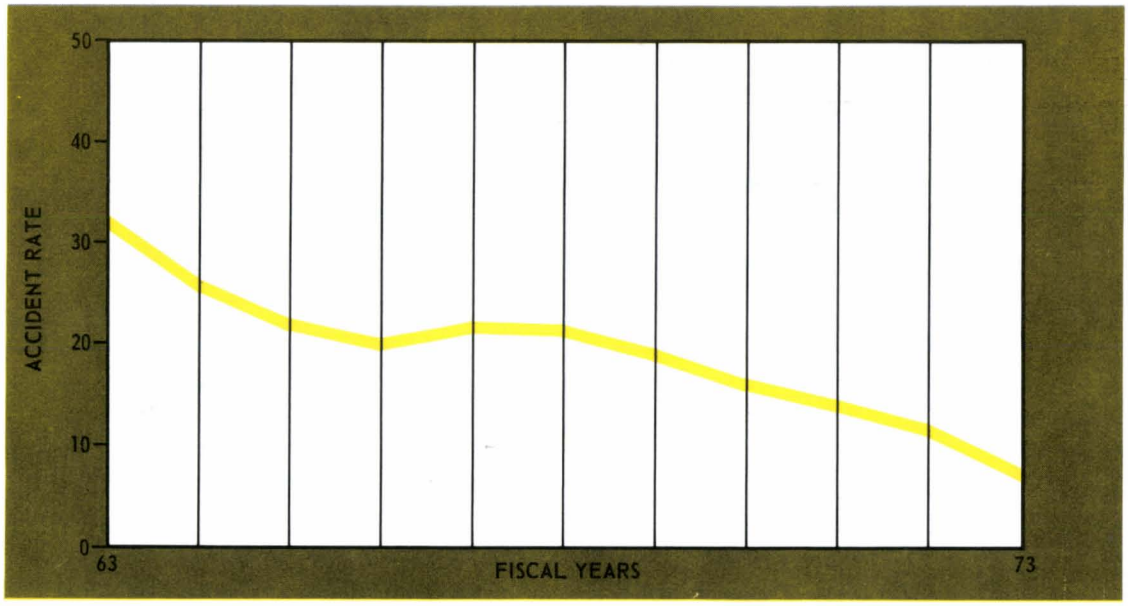
Colonel Francis M. McCullar
U. S. Army Aviation Safety Officer

# The Negative Proves The Positive

It is unfortunate that we must use a negative factor as an indication of success in flying safety; that is, we must measure part of our progress by accidents which have occurred rather than by those prevented. A comparison of the accident rate for FY 73 with that of previous years, however, shows that we are enjoying a favorable downward trend in the reduction of accidents. From this, we can conclude that the accident prevention program is getting positive results. Certainly this improvement has increased the Army's combat readiness through the saving of lives of crews and passengers and millions of dollars in equipment.

Credit for this belongs to all the individuals associated with Army aviation who enthusiastically accept and support the accident prevention program. I join you in being proud of this achievement.

Obviously we would like to continue this trend, and there is no doubt in my mind that even greater gains are possible. Even though the task becomes more difficult as we get closer to a near-zero rate, this indication that your programs are paying off should encourage everyone to try even harder. As accidents become fewer, the time we previously spent in reaction to accidents can now be spent initiating action to prevent accidents—seeking, identifying and eliminating causes.

Today our manpower and equipment resources are carefully budgeted. Every loss due to an aircraft accident immediately reduces the effectiveness of this force. As a consequence, command must continue to assign a very high priority to the requirement to eliminate avoidable accidents. Judicious application of accident prevention principles during the commander's decision-making process must become a way of life. We must also realize that new, challenging operations dictate an openminded attitude toward new accident prevention concepts and procedures.

Our objective is to enhance rather than to inhibit mission accomplishment. This calls for an aggressive approach to flight safety—an approach that ensures maximum effectiveness when mission accomplishment is combined with minimum exposure to needless risks.