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UNITED STATES ARMY

APRIL 1971

AVIATION DIGEST

UNITED STATES ARMY AVIATION DIGEST

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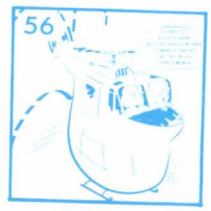

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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other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

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

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VIEWS FROM READERS

Sir:

The last initial entry fixed wing classes, OFWAC 71-18 and WOWAC 71-17, have arrived at Ft. Rucker, Ala., and are scheduled to complete their training on 29 June 1971. All future fixed wing training will be conducted as a transition course after the successful completion of the rotary wing flight training courses. Finales bring back memories so I thought your readers would like to share the lyrics of a nostalgic talkin' blues song with all those who remember the small but faithful Bird Dog. It was composed by Major Joe T. Pope while stationed in the Republic of Vietnam.

CPT David C. Goodwin
Dept of Adv F/W Tng
USAAVNS
Ft. Rucker, Ala. 36360

WHISTLING WILLIE

I'm a hot pilot—but I sure feel
silly cause they gave me a plane
called "Whistling Willie."

When I signed in—the CO said
son—come down to the flight
line and have a little fun.

Well there on the line—dirty as
heck—sat a Bird Dog plane—a
damn big wreck.

He said check it out and we'll
go try—to get enough speed to
make it fly.

I took the book from that
dirty old dog—it looked like a
mail order catalog.

I should have known it was
a flying tramp—cause the red
X symbol was in rubber stamp.

I looked at the gear and found
a tire—held in place with
safety wire.

Well I fired it up and it
ran queer—sounded like an
ole John Deere.

Flew around the pattern with
no bad luck—but the wings—
they flapped like a mallard duck.

The FM—is all screwed up—
got 90 feet of wire on a
Dixie cup.

The UHF is the best part yet—
got two cat whiskers on a
crystal set.

When I fly over Charlie you can
see him dash—for overhead
cover in case I crash.

Came back feet wet and
hauling tail—dragging 40 feet
of net and a sampan sail.

Called up the tower—the clearance
was chilly—get the crash crew out
cause here comes "Willie."

Rolled out on final in that
ragged old thing—the cowls
stood out like an angel's wing.

Put "Willie" on the ground after
hours aloft—when the gear touched
down the tail fell off.

Though "Willie" is a terror—mighty
hard to fly—he takes me into combat
and brings me back alive.

I'll stay a hot pilot and I'll
feel silly—but as long as he
flies—I'll keep my "Willie."

Sir:

Major Marsh, in his article in your January issue on personnel management problems, was concerned about the problem of assignment to G-1 jobs of officers possessing no prior experience, education or training. That problem has been solved by the U. S. Army Adjutant General School. The Adjutant General School has developed a resident Personnel Staff Officer Course. It is 5½ weeks in length and is designed to provide training to field grade officers for assignment to G-1 positions in divisions and comparable size units or activities. Emphasis is on management of personnel and administrative activities and development of policy. The next class begins 12 April 1971. The Personnel Staff Officer MOS, 2260, is awarded upon graduation.

Your readers who desire S1/adjutant training may be interested in the correspondence course program. The purpose of this course is to provide officers with a working knowledge of the functions, duties and responsibilities of an S1 or adjutant at battalion or brigade.

The Adjutant General School has many training options and materials for those who are interested in personnel work. Further information about training materials may be obtained by writing to Director, Department of Nonresident Instruction, U. S. Army Adjutant General School, Fort Benjamin Harrison, Indiana 46216.

LTC William M. Shattuck
Director, Dept of NRI
U. S. Army Adjutant General School
Ft. Benjamin Harrison, Ind. 46216

* * *

Sir:

Reference is made to your article in the January 1971 issue of AVIATION DIGEST, "Maintenance Matters," pertaining

Continued on page 35

Will The True Pro

DURING MY CAREER in aviation, one of the many things that has impressed me is the role of the air traffic controller, the unsung hero of the skies. When the subject of aviation comes up, few bother to mention air traffic control (ATC) despite its significance.

A good air traffic controller is a considerable boon to all pilots and deserves their cooperation and the same respect accorded to any competent professional. For example, few pilots envy the job of the tower operator at the Tan Son Nhut tower in Saigon, Republic of Vietnam, during launch period or the feeder controller at Cairns Army Airfield, Ft. Rucker, Ala., during recovery period. These men must be able to cope with a large variety of situations under stress without error.

The major function of the controller is to aid the pilot, and the pilot, in turn, should make every effort to cooperate. This would provide a healthy atmosphere to facilitate the flow of air traffic. However, there are times when patience wears thin and tempers flare. No one enjoys waiting an hour to receive IFR clearance, 20 minutes for takeoff clearance or 15 minutes holding VFR. In such situations there often arises an overpowering urge to vent your hostility verbally on the tower operator or radar controller. While it may be frustrating for those about to enter downwind to be instructed to hold, this same action comes as a godsend to those on the ground who have been waiting 30 minutes to take off.

Admittedly there are times when the controller is at fault and, perhaps, even in need of censure. Harsh words, however, seldom improve the situation. Courtesy is always the best policy and should be practiced by pilots and air traffic controllers alike. If more pilots were familiar with the controller's function, then there would be less likelihood of misunderstanding and the resulting uneven tempers and migraine headaches.

Like pilots, air traffic controllers, both military and civilian, are highly trained. Military personnel must meet the prerequisites of DA Pamphlet 350-10 for acceptance into a 4-month formal course. Upon graduation he is qualified to serve as an apprentice controller under direct supervision of a rated air traffic controller in tower, approach control and ground control and ground control ap-

Please "Shaddup!"

proach. After 6 months in a specific job, he is eligible for certification by an FAA appointed examiner. To change specialties, the controller must receive on-the-job training until tested and rated by an FAA examiner. The controller training continues in accordance with Army TM 95-200 and Army Subject Schedule 1-4 throughout his entire career.

Currency requirements for the Army Radar Approach Control include satisfactory performance of the duties associated with all operational positions for at least 8 hours each month. Further, he must conduct four surveillance and four precision approaches per month. Currency requirements for the ground control approach final controller are somewhat stiffer. He must complete 20 actual approaches or 15 actual and 15 simulated approaches per month and, in conjunction, five no-gyro approaches.

Ratings for controllers recently have been changed to establish a "facility rating" that may be obtained by a certified air traffic control tower operator who qualifies at all operating positions at a particular control tower. The previous ratings given were known as junior and senior ratings.

An 8-hour shift and a 40-hour week are standard for the air traffic controller. Frequently, this has to be extended but is limited to a maximum of 10 consecutive duty hours and a 60-hour work week within a given 30-day period. A 16-hour rest period is standard between shifts, but an 8-hour rest period is the minimum. During periods of light activity different positions can be consolidated if the personnel are qualified to handle all duties.

With each shift change it is recommended that all radios be checked. Thus, when ATC asks you for a communications check on several different frequencies it simply means that the controller is taking extra precautions to ensure the best possible help for the pilot.

Also, the pilot is occasionally asked to make a practice instrument approach on a beautiful VFR day. This can be particularly frustrating if one is about to finish up for the day and is looking forward to a cold shower or beer. Try to look at the situation from the controller's point of view. He may need the practice approach to maintain his currency and proficiency, or it may be for training

Captain Joe L. Tilghman

purposes. By regulation no trainees can work when the weather is below 1,000 feet and/or visibility is less than 3 miles. Thus, the only time training can be conducted is during good weather.

Controllers also must fulfill other requirements that may lead to confusion for some pilots. For example, by regulation U. S. Navy and Air Force controllers must require a readback of all IFR clearances and departure instructions. Similarly, Army and Air Force regulations require the tower operator to remind the pilot to check his landing gear down unless he has already done so. Navy controllers must request the pilot to report his gear down and cannot clear him to land until he does so.

Other ATC duties include a navigational aid check, when assigned, at the beginning of each shift. This entails an aural identification of the appropriate VOR, VORTAC, ADF or TACAN. If the aural identification cannot be heard on the aural monitor, then the aid must be considered inoperative. This explains why the pilot is occasionally asked if he can pick up a certain navaid. If no automatic alarm is available on an ADF, then it must be checked every hour.

The air traffic controller is supposed to provide service to aircraft on a first-come, first-serve basis, although there are exceptions. These exceptions include medical evacuations, presidential carriers and other priority missions. The provision of additional services is not mandatory and is left entirely to the discretion of the controller, whose decision is not subject to question and need not be made known to the pilot. Among these additional services are included air traffic information to IFR aircraft, pilot requested vectors, weather information, bird activity and holding pattern surveillance.

While familiarization with some of the requirements mentioned above may lead to a more harmonious relationship between the pilot and the controller, a greater knowledge of the equipment available may also prove invaluable to the pilot. In accordance with Army Technical Bulletin 95-1, each control tower should be provided with the following equipment:

- Control console.
- Flight progress strip holder.
- Radar display.
- AN/FSW-8 communications control panel.
- Altimeter setting indicator.
- Method for displaying current weather.
- Wind direction and speed indicator.
- Navigational aid monitor.
- Tower/radar coordination system.

You Are Both Professionals...

... And Don't Either Of You Forget It!

• Two traffic control light guns (one battery operated).

• Two pairs of binoculars.

• Airfield lighting panel.

• Primary and secondary crash phones.

• Radar navaids emergency warning system.

• Mechanical counters for recording VFR traffic.

In addition to the equipment listed above, each tower also should have a crash grid map, an airfield diagram, a visibility check point chart (if applicable), a diagram of areas not visible from the tower, a diagram of remaining runway length for intersection takeoffs and a crosswind component chart for all locally based aircraft. Emergency lighting systems also should be available at all ATC facilities.

All control towers will maintain a file of aircraft operator (dash 10) manuals for all locally based aircraft as well as other appropriate publications. Controllers are instructed in the use of these publications which are maintained primarily to better assist the pilot. Using these publications the controller can relay verbatim specific emergency instructions to the pilot. It is then the responsibility of the pilot to interpret these instructions.

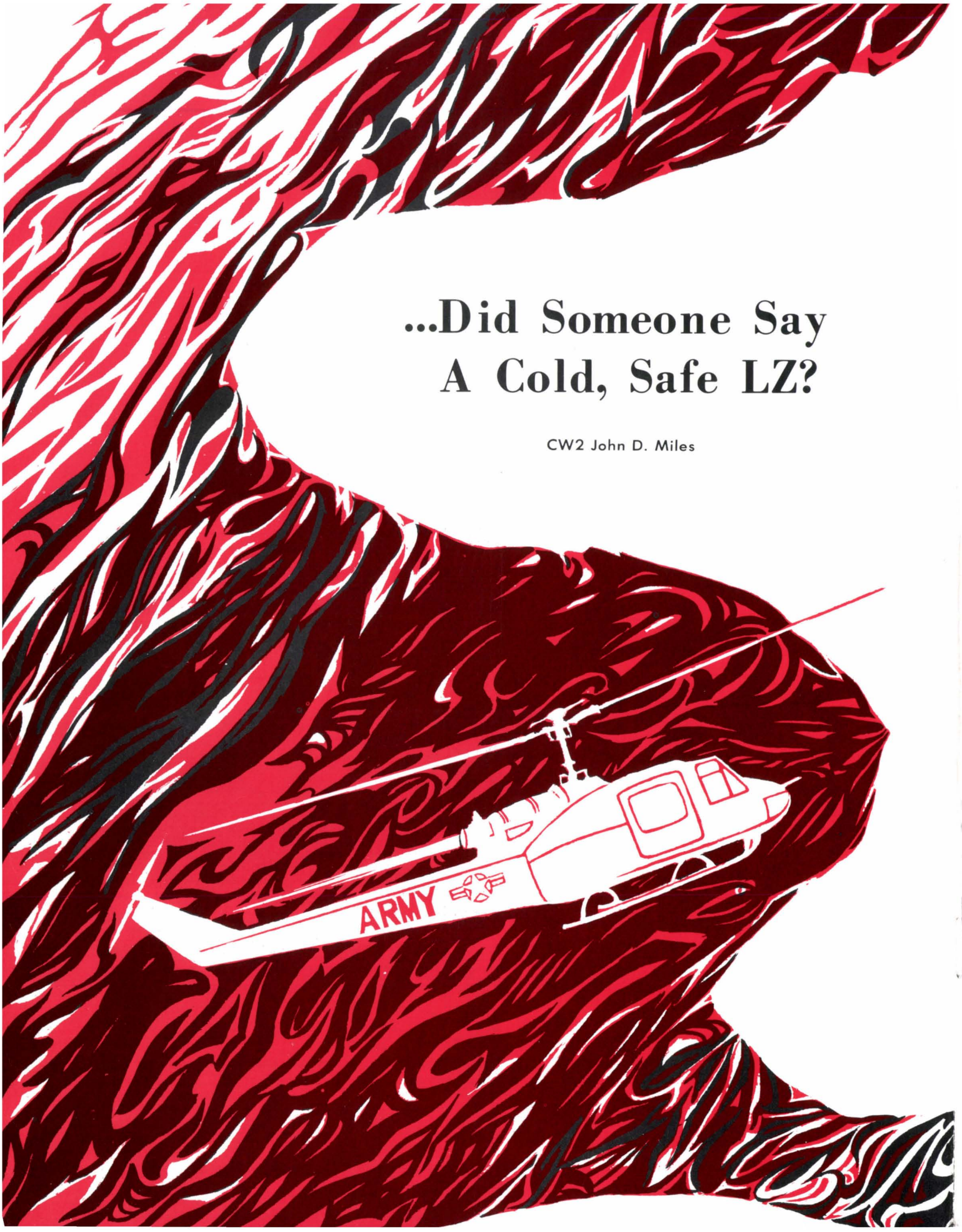
All pilots, and aviation unit commanders in particular, should make a valid effort to establish rapport with all members of the aviation team. It must be remembered that the pilot forms only one segment of this team and that the other members are often neglected. Better cooperation can be achieved through acquiring an understanding of the capabilities and responsibilities of the other members. This can be accomplished in a number of ways.

A short, simple visit to the control tower can provide much insight into the problems confronting tower operators. The airport looks much different from the tower than it does from a cockpit. Similarly a quick tour of the local radar facility can prove informative. I guarantee that pilots will always receive a friendly welcome when visiting either facility. Most air traffic controllers enjoy the opportunity to meet the people they work with each day instead of just knowing them by a call sign.

Above all, an aviator should attempt to maintain a high standard of professionalism when dealing with the air traffic controller and can, in turn, expect the same. In this case professionalism can be liberally interpreted to include not only the use of proper phraseology but also, and more importantly, the practice of courtesy and respect for a fellow airman.

...Did Someone Say A Cold, Safe LZ?

CW2 John D. Miles



DON'T BELIEVE IT! An aviator can use a landing zone (LZ) every day and know the location of every tree and rock, yet suddenly find himself being pulled from the wreckage of his helicopter.

Early in 1970, 21 slicks made a combat assault into a large, secure LZ. Of the 21, only 18 flew out. The remaining three were destroyed or heavily damaged.

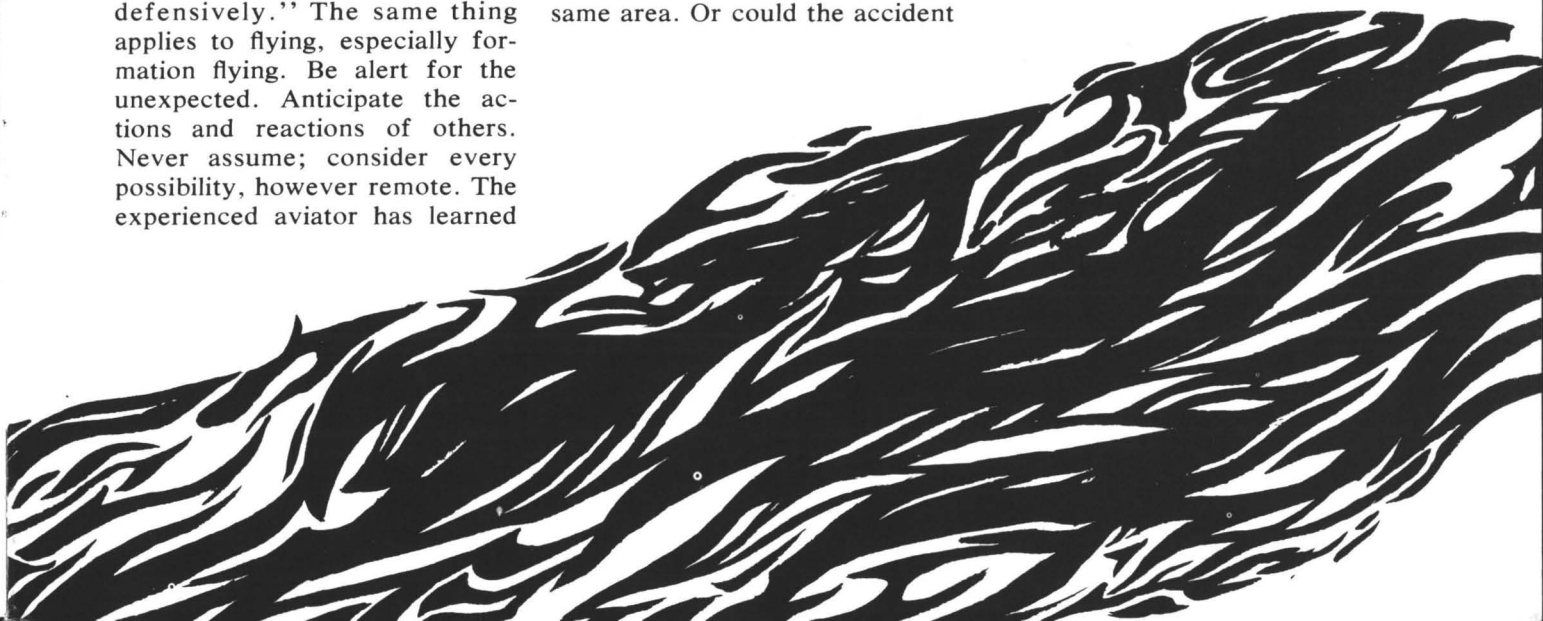
What caused these accidents? Every pilot had flown into the LZ at least once before, so it was not a strange LZ. The enemy was not a factor and neither was the weather. It should be apparent that the "safe" LZ should not be so labeled until the aircraft has come and gone.

LZs can be divided into two types: TOLZ (terrain obstacle landing zone) and EOLZ (enemy occupied landing zone). Terrain and obstacles are not the only things to watch for when entering a TOLZ. Most of us are familiar with the term "drive defensively." The same thing applies to flying, especially formation flying. Be alert for the unexpected. Anticipate the actions and reactions of others. Never assume; consider every possibility, however remote. The experienced aviator has learned there is no room for complacency in himself or his crew.

If the enemy is present the situation becomes more critical. Then the TOLZ becomes an EOLZ. One bright spring morning in the Republic of Vietnam, Army Huey 123 made a routine long range reconnaissance patrol insertion into a cold LZ. Reports indicated no enemy activity in the area. These reports held true until 123 was on short final, then the surrounding jungle erupted with enemy small arms fire. The only occupant hit was the aircraft commander, who slumped over the controls. Before the pilot could regain control, 123 crashed. Fortunately, there were no fatalities and all occupants were rescued. Nevertheless, 123 was a total loss.

As is the case with many aircraft accidents, the crash of 123 leaves many questions unanswered. For instance, was the area properly scouted? Investigation revealed that a week prior two aircraft had taken hits in the same area. Or could the accident have been avoided if the pilot had kept a closer watch on the controls? The answers to these and other questions are unavailable, but perhaps the most important thing to remember is that a cold LZ is only positively cold *after* the mission.

Many times the safe TOLZ has snatched its victims from the air and tons of molten scrap metal testify to the ability of the cold EOLZ to do the same. But always remember that the elements contributing to these disasters are not only the terrain, obstacles and enemy. Determine for yourself the other elements and remember: when you fly, plan before doing and be prepared for the unexpected. As you continue your flying career stay alert and fly defensively. The cleared LZ may be highly deceptive and the cold LZ may be your melting pot.



Maintenance

Any Beaver Starting Problems Lately? In order to keep the U-6 engine starter operational it is important to keep the plunger assembly of the starter electrical solenoid free of rust or corrosion. Frequent inspection and lubrication of the plunger will help keep the starter operating trouble free.

Whenever the engage switch is activated electrical power is sent to the solenoid and the plunger moves outward contracting the bellcrank on the operating shaft of the starter and the starter is engaged to the engine. If corrosion or rust is present the plunger will not freely move through the starter housing (forward of the solenoid coil) and the starter will not engage electrically. If this occurs the plunger will have to be pried out with a screwdriver and while it is held outward the plunger will have to be lubricated. Once lubricated with either graphite or a spray silicone, the plunger will operate normally.

Preventative maintenance of the plunger through inspection and lubrication will prevent unnecessary delays or damage to equipment.

★ ★ ★

Grinding Machine Operation: When operating grinding machine, bench, hand operated, FSN 3415-241-3116, from the "A" tool set, or operating grinding machine, utility, FSN 3415-517-7754, from the "B" and "C" tool sets, avoid grinding on the side of the abrasive wheel. Using the side of the abrasive wheel will cause it to become out of balance. This may result in the wheel breaking up—a definite hazard to the operator because flying fragments can penetrate the body.

★ ★ ★

Electrical Compartments: A little reminder on the UH-1 series helicopters—when working in and around the electrical compartments, to include inspections—to remember to help prevent any electrical shock or burns—remove all rings, bracelets and watches. Always do this even though the battery switch may be OFF and/or the battery is disconnected.

★ ★ ★

Toolbox Talk: So you're taking your toolbox on the mission with you. Good toolbox maintenance assumes new importance when the toolbox is used for recovery or mission maintenance operations. Is your toolbox ready to go? Is it complete with all authorized tools and are they all serviceable? Is your box organized so that you can readily locate each tool—even under poor light conditions? Is your toolbox free of unnecessary parts and materials?Are the delicate and the sharp or cutting tools protected from vibration damage? If you can't answer yes to all the above questions it's time for some serious thinking on your part. A properly maintained toolbox can be the best friend a mechanic ever had.

★ ★ ★

Mechanics Beware—Caution: After the main drive shaft has been repacked, extreme care must be taken to handling of the short shaft prior to installation in the helicopter. Carrying the short shaft in the vertical position causes the grease to compress in the downward retainer assembly and results in a lack of grease on the gears. If this should occur in flight, it would result in a short shaft failure, thus causing loss of the engine.

★ ★ ★

Hydraulic Filters Foulup: When removing the hydraulic filters from your OH-58, beware of the drip. According to the tech manual you should disconnect

Matters...

both lines and cap them. However, if you disconnect the inlet line and cap it first, you will avoid losing any hydraulic fluid, not to mention saving on cleanup after the job is completed.

* * *

Collective Bounce: In the dash 10 on the UH-1D/H series helicopters, paragraph 4-68, section IX, chapter 4, TM 55-1520-210-10, indicates that a cause for collective bounce can be pilot induced. However, this situation on the "H" model has been found to be untrue many times. In TM 55-1520-210-35P, figure 370, items 48 and 49 show a NUT (PN 204-001-222-1), SPACER (PN 204-001-622-3) and WASHER (PN 204-001-622-5) respectively. When installing the SPACER AND WASHER, if either one is installed incorrectly and the proper torque is not applied to the NUT, collective bounce can be induced. Therefore, it's imperative that the spacer and washer be installed correctly and the proper torque be applied to the NUT, for the correct friction.

* * *

How Are Your Pubs? When was the last time you pulled maintenance on your TMs? TMs require attention to keep them serviceable. Give them the following checks. Does the issue date and number of changes posted agree with DA Pamphlet 310-4? Are all pages present and legible? Do new TMs and changes reach you automatically? If you can't answer yes to all the above questions get with your unit publications clerk and get straight.

* * *

Contaminated Oil Cooler: On the U-6, R-985 engine, when the oil cooler is contaminated with metal particles it must be removed without flushing and shipped to maintenance overhaul. (Reference: chapter 5, section 5, paragraph 2-231, page 5-41, TM 55-1510-203-20.)

* * *

Leakage Of NII Gearbox On UH-1: A common malfunction of the T-53 engine is leakage of the NII gearbox around the NII tach generator. Corrective action for this is sometimes performed incorrectly. In order to correct this leakage properly, two components must be replaced. First, replace the NII tach generator drive shaft seal which is located in the gearbox (part and stock number not available). Second, replace the gasket, FSN 5330-023-7623. The first step is the most important in correcting this leak; however, this step is usually omitted by most mechanics for the simple reason they did not know that the tach generator drive shaft seal was there.

* * *

Replacing UH-1 Tail Rotor Chain: Do not apply lubricant of any kind to the tail rotor chain. Lubrication causes grit and other foreign matter to adhere to the chain.

* * *

Notice: It has been pointed out that the article appearing in the January issue on cleaning Lycoming turbine engine compressor blades with walnut shell grit is misleading. There appears to be more exceptions to the case than those to which this procedure can safely be applied. Consult your appropriate TM for each engine and model for the most effective method of cleaning. Alternate measures that can be applied are usually also listed and are acceptable.

BLOW IN MY EAR...

ACID TEST III

A portable heater is used to warm helicopter parts under repair during ACID TEST III held near Ft. Greely, Alaska, in December. Temperatures reached a cool 50 degrees below zero during the exercise

...or when keeping warm really counts

SOLDIERS and airmen from the United States and Canada jointly battled temperatures ranging to 50 degrees below zero near Ft. Greely, Alas., during a cold weather test of men and machines. ACID TEST III was the first major combined effort to take place in Alaska in the last 2 years.

Major General James F. Hollingsworth, commanding general, U. S. Army, Alaska, directed the 6 day exercise. Highlights included air drops of soldiers and supplies, air reconnaissance, tactical air strikes and helicopter airmobile lifts of fighting forces.

A UH-1 Huey helicopter undergoes a heat treatment. Special maintenance and operating procedures are required to maintain most equipment functioning in the subarctic environment

AIRCRAFT RECOGNITION

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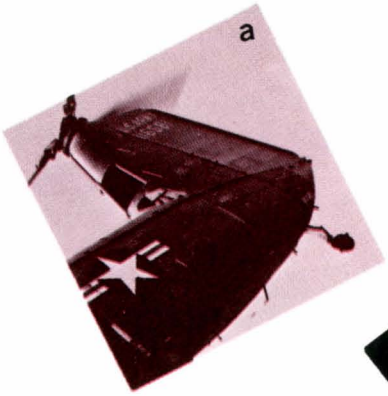

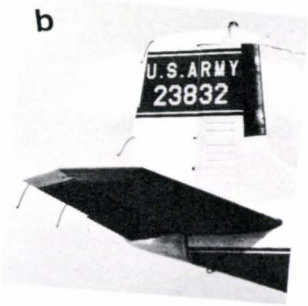

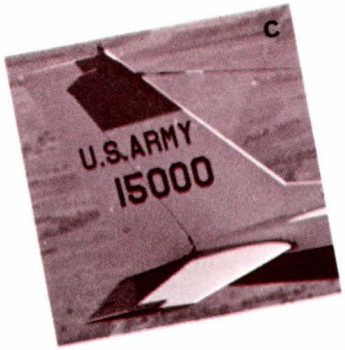

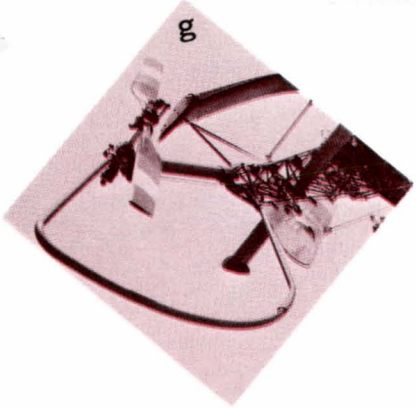

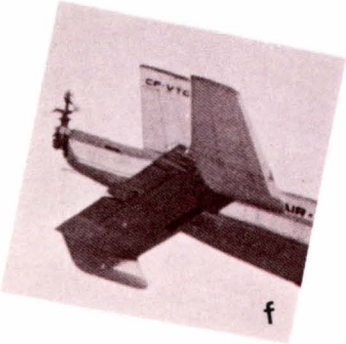

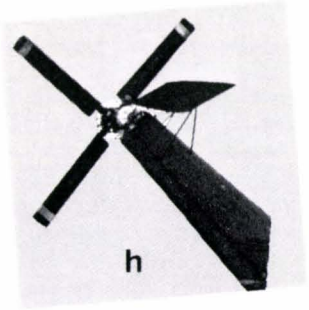

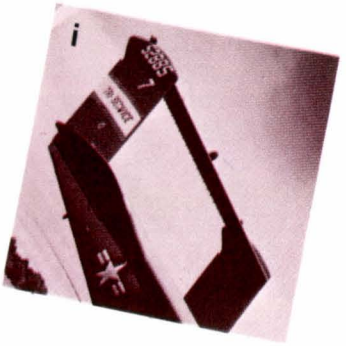

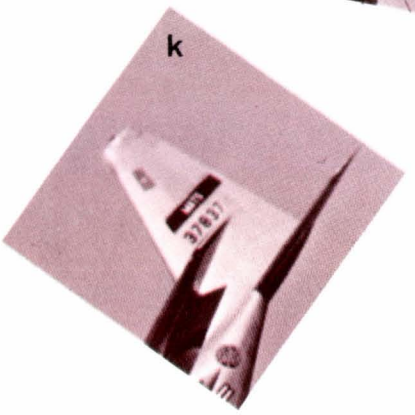

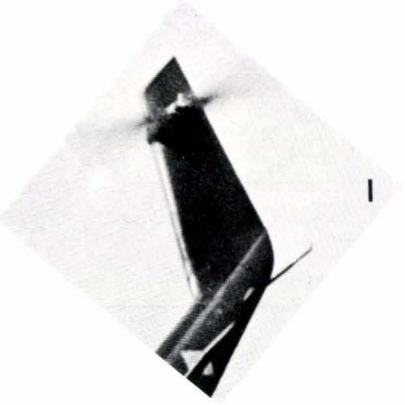

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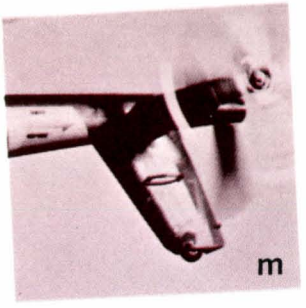
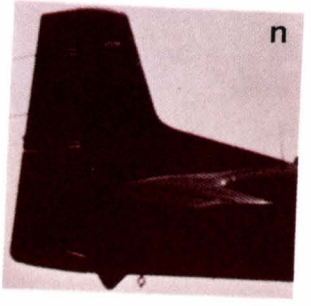
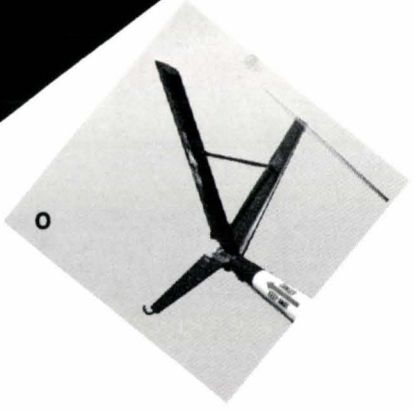
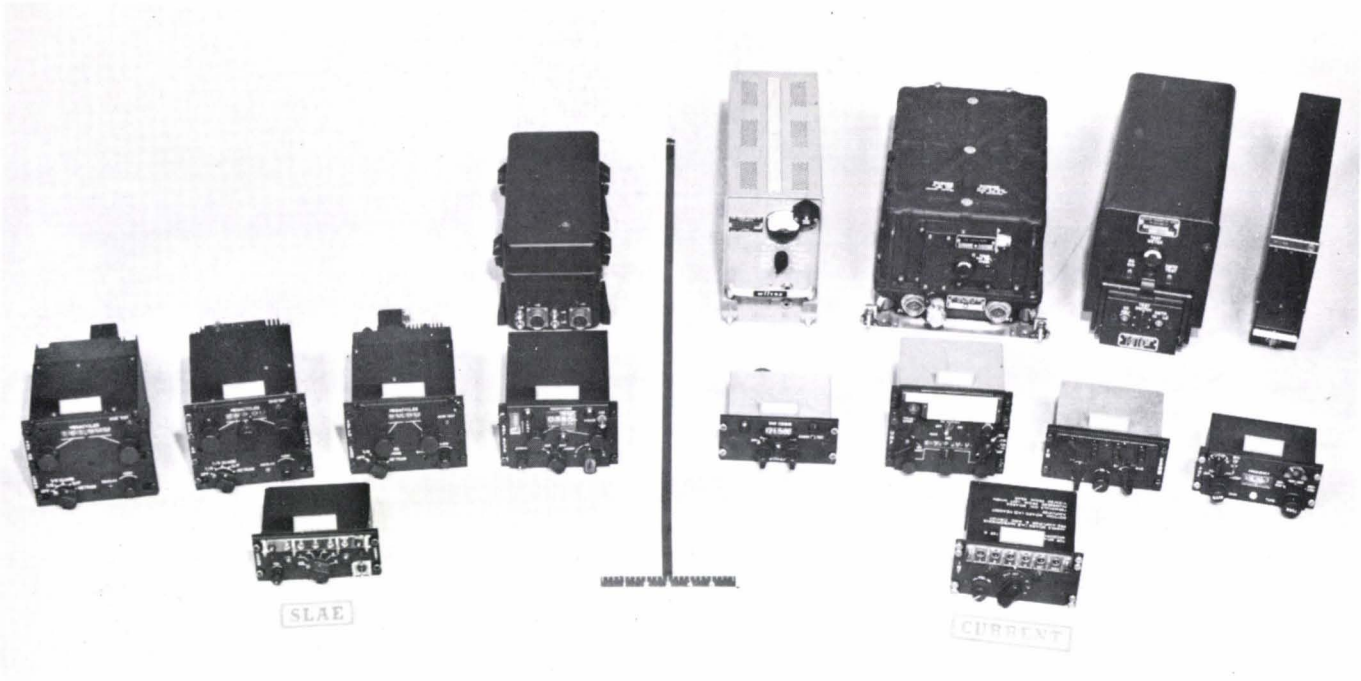


ANSWERS BELOW





a H-25	f CL-84	k C-130
b U-8	g TH-13	l AH-1G
c T-41	h CH-37	m AH-56
d T-42	i OV-10	n T-28
e U-1A	j U-10	o OH-6



Standard Lightweight Avionics Equipment

Avionics, long the secretive stepchild of Army aviation is introducing a multitude of communication and navigation improvements. This new equipment is lighter, more compact and often far more reliable than the older ones. Standard lightweight avionics equipment—SLAE to you insiders—is one of these significant developments. If you have ever wondered what those aircraft radios actually do, read on. . .

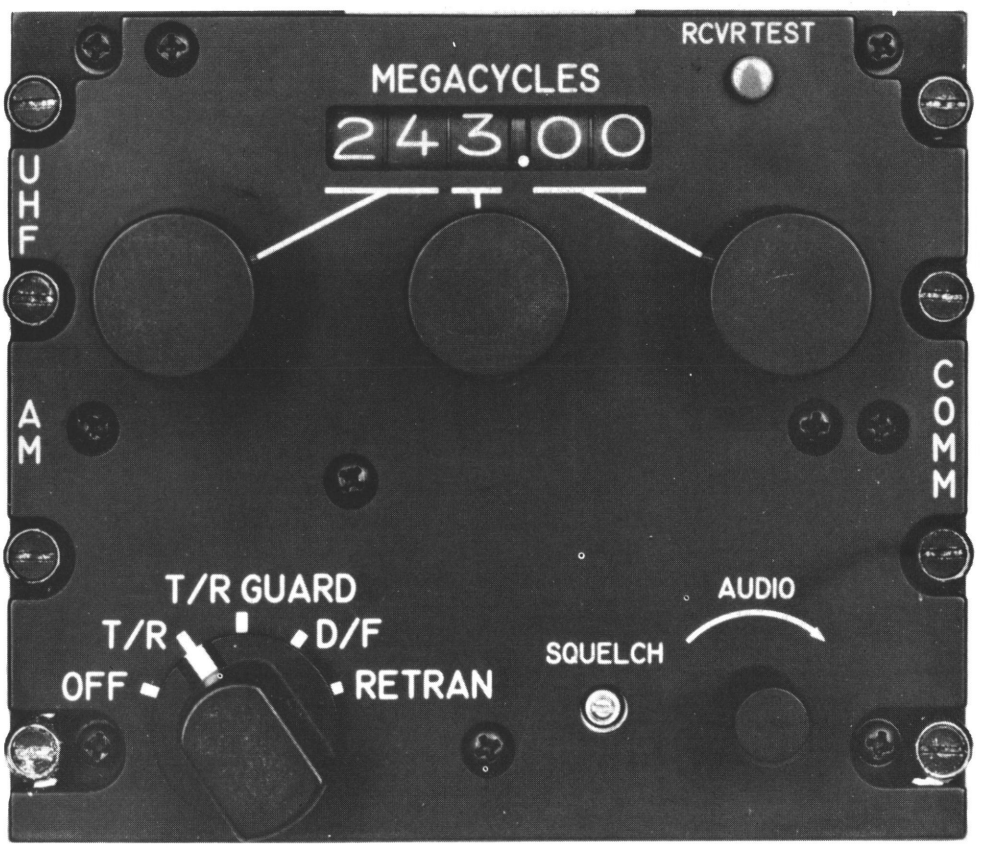
Major John M. Apgar

FREE, 70 POUNDS of fuel, ammo or any other additional cargo you desire to carry in your flying machine. Equally important you'll have more time to transport this additional cargo with less time waiting on the ground for repairs. This too is free.

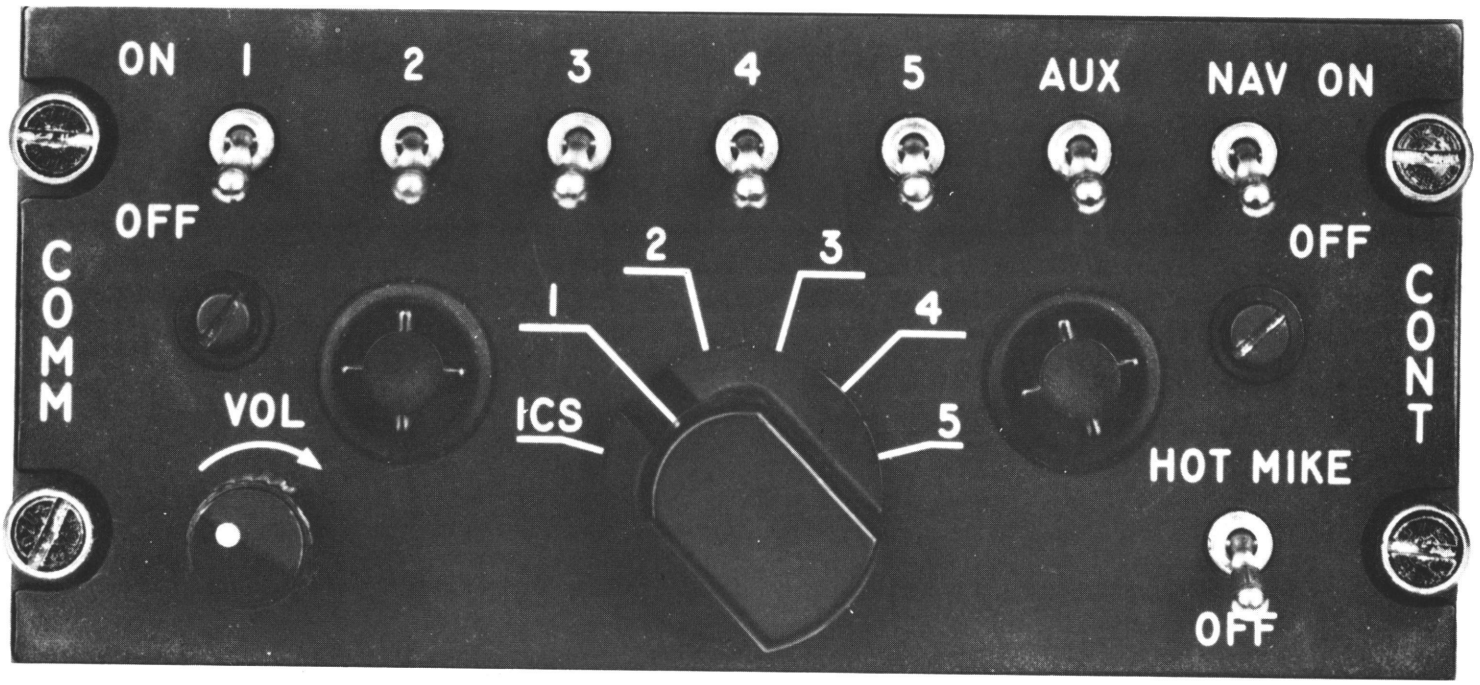
How do you get this 70 pound windfall? I'm glad you asked. There are no forms to fill out, no jingles to complete. The U. S. Army is giving this to you in the guise of four new communication/navigation radios and an intercom called standard lightweight avionics equipment. Not to be outdone, standard lightweight avionics equipment uses an acronym—SLAE—and is now classified Standard A. SLAE is pronounced the same as Santa's flying machine or what David did to Goliath. SLAE represents a giant step forward in the field of avionics as the Army has SLAEed the avionics weight problem and at the same time received a gift of reliability and short downtime for repairs.

SLAE was originally designed as an avionics package for the Army's light observation helicopter (LOH), but now is being used by other triservice aircraft as well as those of allied nations. SLAE consists of three transceivers, an automatic direction finder, a communication system control and three maintenance kits (see figure 1).

SLAE came into this world as



The AN/ARC-116 is a transceiver capable of amplitude modulated (AM) air-to-ground communications in the ultrahigh frequency (UHF) range. You select one of 3,500 channels. It is extremely lightweight and reliable



The C-6533/ARC is the control unit . . . a centralized "switchboard." It is extremely versatile

LOHAP (lightweight observation helicopter avionics package) in January 1964 when the LOH project manager requested the U. S. Army Electronics Command (USAECOM) to develop and produce an avionics package for the light observation helicopter. On 21 January 1966 a development/production contract was awarded to provide a total avionics package for the LOH, then determined to be the OH-6A. To avoid confusing the two project managers' offices (LOH-PM and LOHAP-PM), LOHAP became SLAE. In lieu of a qualitative materiel requirement (QMR), the military characteristics of the LOH (dated 30 March 1960) were used for SLAE requirements which were, and still are:

- Avionics—not to exceed 100 pounds.
- Complete provisioning for UHF and VHF communication radio (only one installed at a time).
- FM radio with auxiliary receiver and FM homer.
- Headset and microphone for the second crew station.
- Complete provisioning for the ADF navigation set.

Each respective radio covers the accepted aircraft communication/navigation band for that type radio, with the exception of the ADF which covers 100 KHz to 3 MHz—a 50 percent broader frequency spectrum than other ADFs. Additionally, the three communication radios have a harmonically related receive guard capability in each of their frequency bands. (It should be noted that preset switch to guard transmit was not a requirement until 23 June 1969. At that time the Army determined that it ". . . should be incorporated . . . as soon as practical without causing a reduction in the production rate.")

It can be noted in figure 2 that SLAE communication radios have more available channels, wider frequency spectrum for transceiving and one-third the weight of the present equipment. The ADF is two-thirds the weight of the present equipment and has twice its tunable band width. In addition to what its predecessor can do, the lighter weight C-6533 intercom control can select any of five transceivers to operate and is provided with four direct audio circuits for continuous monitoring.

A complete SLAE system weighs a couple of pounds more than one ARC-51BX, which occupies twice the space of all

SLAE items. Just the control head of the ARC-51BX is approximately the size and weight of one entire communications transceiver of SLAE-FM, VHF or UHF.

Test, alignment and repair have been simplified for SLAE by maximum use of integrated circuits, removable circuit (pluck-out) boards and builtin self-test features, as well as alignment and fault isolation equipment. One of the self-test features is located on the front panel of the three communications transceivers. This is in the form of a "push-to-test." When the operator wants to make a receiver check, he depresses the button for an 800 Hz tone. Presence of the tone indicates the receiver is working properly (this is also a tremendous morale booster when you haven't received a transmission for some time).

The three pieces of test equipment—MK-994, MK-1191 and MK-1192—are used with standard shop equipment to isolate a fault down to a pluck-out circuit board. Should it become necessary, this same test equipment is used for alignment of the radios. Demonstrated mean-time-to-repair (MTTR) at direct support level is 15 minutes.

As with all equipment, SLAE has had some development and early production pains. Let's look at some of them:

• No preset "switch to guard" transmit—not a requirement until June 1969.

• Spare parts not available—delay at manufacturer's plant is being corrected.

• Water entering radios—modification work order issued.

• Radio frequency interference problem has been corrected and a fix will be incorporated if it is cost effective.

• Unusable channels in the ARC-116—true, all three of them! There are 46 channels with background noise; of the 3,500 channels this represents 1.3 percent.

• Failure rate excessive—SLAE has demonstrated a mean-time- between-failure (MTBF) in

Figure 1

SLAE COMPONENTS

1. The AN/ARC-114 transceiver operates in the VHF frequency band and is frequency modulated (VHF-FM). The primary use of this radio is to net with Army tactical ground forces.

2. The AN/ARC-115 transceiver operates in the VHF frequency band and is amplitude modulated (VHF-AM). The primary use is for air traffic control (ATC) by the Federal Aviation Administration.

3. The AN/ARC-116 transceiver operates in the UHF frequency band and is amplitude modulated (UHF-AM). The primary use is for military ATC and air-to-air communications.

4. The AN/ARN-89 automatic direction finder is generally used as either a backup or auxiliary navigational system, or as a terminal navigational aid at secondary or smaller airfields.

5. The C-6533/ARC communication system control provides a switching capability for the audio portion of the avionics items installed in the aircraft.

6. The MK-994/AR maintenance test facility kit interfaces between SLAE and standard test equipment to provide a facility for trouble-shooting and isolation of faults as well as radio alignment.

7. The MK-1191/AR general support and depot maintenance test facility kit interfaces between the MK-994 and SLAE to provide test points for fault isolation.

8. The MK-1192/ARM direct support maintenance test facility kit interfaces between the MK-994 and SLAE to provide test points for fault isolation.

Figure 2

COMPARISON DATA

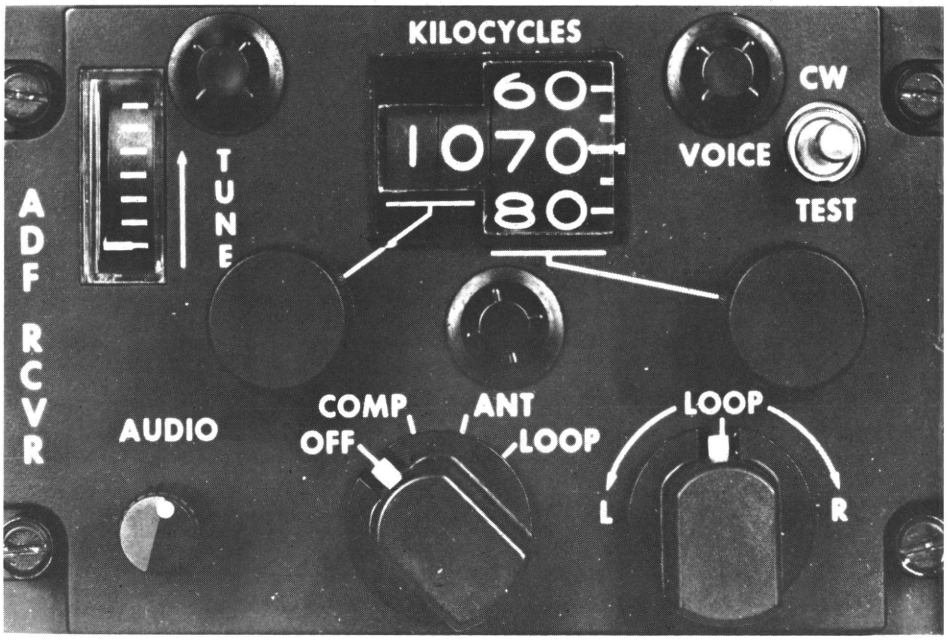
Equipment	Frequency	Weight (Pounds)* SLAE	Weight (Pounds)* Present	Channels SLAE	Channels Present
AN/ARC-114	30.00 - 79.95 MHz	7.0		920	
AN/ARC-54	30.00 - 69.95 MHz		27.7		800
AN/ARC-115	116.000 - 149.975	7.2		1360	
AN/ARC-73	116.00 - 149.95		30.0		680
AN/ARC-116	225.00 - 399.95	8.6		3500	
AN/ARC-51BX	225.00 - 399.95		34.0		3500
AN/ARN-89	100KHz - 3MHz	12.2		N/A	
AN/ARN-83	190KHz - 1750KHz		17.7		N/A
C-6533/ARC	N/A	1.9		N/A	
C-1611/ARC	N/A		2.0		N/A
SLAE		36.9			
Present Equipment			111.4		

*Figures represent most accurate weight data as determined by project manager, Selected Avionics Equipment for Army Aircraft (SAEFAA), Ft. Monmouth, N. J.

excess of 660 hours—a significant reliability improvement over previous equipment.

Despite these early "problems" SLAE still represents one of the significant avionics innovations in 20 years. It will eliminate the cumbersome heavy weights and separate control heads of older equipment and should provide the pilot more dependable and versatile equipment for the future.

So, next time you need that extra lift, take a SLAE ride.



The AN/ARN-89 is a low/medium frequency automatic direction finder. It is of modular and solid state design. Used as a backup navigation system, it is very light and reliable

The DIGEST recently received the following letter which aptly reflects the growing stature and image of Army aviators and thus the increasing significance of Army aviation

Bangkok, Thailand

Dear Sir:

I know there are many unsung heroes in the Army . . . many who are not officially recognized, but have made us proud of them and proud of being Americans.

There was such a man—an Army aviator—working with us in Thailand. His radio call-sign was "Super Chief," and he was a chief—a chief warrant officer. Perhaps you also would call him "super," particularly when you knew how he flew and trained others to fly, and how he helped people. He was crusty and "old-times-ish"; he hated inefficiency, sham and pretense. But hundreds of Thais in the land where he died would call him their friend—and yes, "super."

When the land was flooded and the raging river flowed around the submerged towns and villages, he flew day and night to bring succor to the people. In one day alone he flew and delivered 2,000 rations to the people stranded by floods. He flew missions for the Thai border police, bringing aid when aid was sorely needed. Many a weekend he spent flying Air Force medical personnel to distant areas for medical aid to poor people in those remote villages.

When MITRAPAB (Thai-American Educational Foundation) required air support to reconnaissance drop zones, or support for the parachuting demonstrations that raise money for Thai schools in remote areas, he was there. When the skydivers finished their freefalls and parachuting demonstrations, then old Super Chief wound up his bird and showed wide-eyed Thai villagers and blasé Americans alike what a CH-34 helicopter could do under the expert tutelage of an old-hand warrant aviator. Then, when he was on the ground, the kids would watch in amazement when he pulled a farcical facial trick or made his thumb come apart at the joint.

Every governor of every province in Thailand knew Super Chief for he had flown many times, in many areas, for a multitude of missions. Yet, his primary duty was to train people and the assistance and help was unprogramed, not planned, an additional added effort of one man. By helping and simultaneously training, he accomplished two missions without extra money, time or personnel. That is why the Super Chief was so widely and well known. And, whereas most men rest and seek relief on weekends, he continued to fly, train and help people.

He worked with Boy Scouts, orphans and handicapped children. My son said, "He was a second father to me."

One Sunday last year (1969) the CH-34 that Super Chief was flying suffered a mechanical malfunction. Skill and experience were to no avail, and the helicopter crashed into a rice paddy near Phichit, Thailand.

The stories out of Southeast Asia normally are tales of war and politics and events that sell newspapers or make lively pictures on television. Super Chief did not make the headlines, but the heartlines of thousands of Thais in hundreds of villages were touched and warmed and had new vistas because the "old warrant" had been there.

Like so many comrades that served with him in Southeast Asia, Warrant Officer George T. McKenzie, true to his code as soldier and flyer, gave his life while helping others. Super Chief's position is vacant, and shortly a replacement will arrive. It will be no insult to the "new man" that the Super Chief's flying boots initially will be a little bit too big for him to wear. But, I feel confident he will try to live up the the heritage Super Chief has helped to create. That's why I am proud of the American soldier.

Lewis L. Millett
COL USA
(Medal of Honor)

P. S. The MITRAPAB Educational Foundation has voted to name the school, number 79 being built at Phichit, Thailand, for CWO McKenzie.

Aeromedic

WHEN IS A HELICOPTER LIKE AN EJECTION SEAT?

In rotary wing accidents the forward folding seating position is best. This position is assumed by bending forward at the waist with feet firmly planted on the floor. The chest rests on the knees and the position is held by enfolding and locking the arms around and behind the thighs with the hands

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

Lieutenant Colonel John P. Heilman Jr., M. D.

To the air crew member: During the course of two recent aircraft accident investigations, it became apparent that a certain amount of confusion existed as to the appropriate and proper position to be assumed by certain air crew members in the event of an approaching and imminent crash. One young lad, flying in the back of a UH-1A, remembered a recent trip he had taken on one of our unnamed commercial airlines and assumed the position described to him at that time by a lovely young lady called a stewardess. His memory of this description was somewhat blurred by his obvious division of attention, but he did get into a rather acceptable legs extended torso folded forward onto the knees sort of position. For a fixed wing aircraft accident, this really would not have been very bad. However, in this particular accident the aircraft happened to be a helicopter settling into trees with almost totally vertical forces being involved in the crash (approximately zero ground speed at impact). Had these forces been severe this would have been probably the most improper po-

sition he could have assumed. In the second case the individual concerned, riding in the right front seat of a UH-1, assumed a similar position but further modified it by placing his feet firmly against the instrument panel. When the crash occurred, again primarily involving vertical forces, his rapidly descending feet managed to wipe out the whole instrument panel (fortunately without injury to the individual). In both of these accidents the position assumed was perhaps ideal for a fixed wing type accident with a low angle of incidence, a relatively flat trajectory and primarily involving horizontal decelerative forces.

In each of the above described accidents, the crewmen occupied seats equipped with seat belts only. Thus, they had the option to select a position which would optimize the inherent structural strength of the human skeleton. This preparation is not normally required of air crewmen occupying seats equipped with seat belts *and* shoulder harnesses. With the shoulder harness locked the body is adequately stabilized to spread crash forces over a larger, more tolerant area of the body when horizontal forces are generated. With vertical forces the locked shoulder harness ensures a vertically erect, stable and untwisted spinal alignment as well. Thus, the discussion which follows pertains only to those aircraft occupants not provided with a shoulder harness.

What then is the proper position for a rotary wing aircraft crash? If we postulate a rotary wing accident in which the impact is near vertical with little (less than 10 percent) or no horizontal decelerative force (i.e., zero ground speed), the aforementioned "fixed wing" positions could really *contribute* to bodily injury since they place the body in a position which permits shearing forces to be brought into action between the components of the spinal column. Elsewhere in military aviation we have a situation in which forces similar to those found in rotary wing crashes are planned for every day; this, of course, is the ejection seat found in the Army's OV-1 Mohawk and a variety of Naval and Air Force aircraft. It is well known that the proper position to be assumed upon initiating the ejection sequence is an upright one, with the head and shoulders placed firmly against the back of the seat. This permits the impact to be absorbed by the spinal column in the direction in which it was designed to absorb impacts, i.e., through the vertical axis. It would thus seem logical to assume that in the event of a near vertical impact rotary wing aircraft accident, the ejection seat position would be the most logical to mimic (providing the impact is at near zero ground speed).

At this point some of you may be eagerly and impatiently waiting to (state) (retort) (rejoinder) (reply) that all rotary wing accidents are not vertical . . . some are horizontal. Indeed, this is true—as a matter of fact the majority of rotary wing accidents, while generating mostly vertical impact G forces, do have a healthy representation of forces in the horizontal direction. Very often then a significant percentage of the forces are directed horizontally. Under these conditions a locked shoulder harness is essential for the maintenance of the upright, erect upper torso position. This amount of forces in the horizontal direction can seldom be overcome by attempting to hold the erect position by muscle alone without the help of a locked shoulder harness. Thus, in most rotary wing accidents the forward folded position is best. This position is assumed (see picture next page) by bending forward at the waist with feet planted firmly on the floor. The chest rests on the knees and the position is held by enfolding and locking the arms around and behind the thighs with the hands. With this position tolerance to the impact will most probably be increased the majority of the time, provided that the seat remains intact. Unfortunately, present aircraft jump and troop seats are inadequate and fail at G forces below the level of human tolerance.

After dwelling on the above discussion, several recommendations become apparent.

- When jump seats or other cabin seats are to be used consistently by students or other crew members of the aircraft, they should be equipped with shoulder harnesses and locks. Only with this type of restraint can optimal survival be assured at all crew positions.
- Jump seats and other crew seats must be designed to assure that the inherent tolerance of the human body to impact deceleration can be fully realized.
- Crewmen must be trained to prepare themselves for an imminent crash. Teaching them to assume the appropriate protective positions will maximize their likelihood to tolerating impact G forces.

To the flight surgeon: The importance of your role in the continuing education and training of your air crew members cannot be overstressed. The two cases brought out by recent accident investigations reflect the fact that little or no training had been given to the two aviators

Position helicopter crewman should assume if crash is imminent

concerned prior to their crashes. What little they had came from various nonstandard sources. Let us use our heads and pull together on this sort of thing. Begin to prepare our people to think logically through education and training. This goes not only for crash positions, but also for personal protective equipment and survival gear. These things have been touched upon before and have been the subject of several preceding articles in this column. Wear the Nomex flight suit properly and encourage your crew members to do the same. Be sure your chin strap is fastened; that your helmet fits correctly; that you wear gloves and boots. Set the example!

In addition to educating and training air crewmen, think also about the evaluation of factors such as those discussed above during your aircraft accident investigations. Some of you may know that a new series of accident reporting forms has been established recently. These are the DA Form 2397 series dated 1 Sep 70. The utilization of these forms is required by AR 95-5, change 2, effective 1 January 1971. The series consists of 20 dash-numbered forms, many of which require input from the flight surgeon. The forms are designed in such a way that they facilitate codifying and storing of data by computer for later retrieval and analysis. However, do not be mesmerized by box filling and checking. Intelligent narrative explanations of positive findings are still required and expected of the flight surgeon to clarify data.

No form yet devised is absolute. A form that anticipates every possible eventuality would exceed the capabilities of our printing plants. Thus, we must be prepared to think of and record data, even that not specifically requested by the form which might increase our knowledge of flying safety and prevent future accidents or injury.

The flight surgeon may note that no accident investigation form yet devised, including the new DA 2397 series, specifically refers to data on the prevention and protective positioning of aircraft occupants (particularly those without shoulder harnesses) prior to an imminent crash. The elicitation of such information is implied in the medical information form pertaining to injuries and their cause. Yet the flight surgeon is not directed to specifically evaluate predisposed body positioning prior to impact.

Since little prior information has been acquired regarding this subject of protective positions, except as it pertains to ejection, it is essential that the flight surgeon examine its potential application and report on its success. The aircraft and accident investigation and report serve as a medium for such analysis. Thus, again we see that while curative or therapeutic medicine heals the ill, it is preventive medicine that saves time and money, spares inconvenience, avoids disability and, most importantly, preserves and protects our fellowmen's precious and useful lives.

Starch And Nomex

SHIRT, ARMY AVIATION CREW MEMBER
Contract No. 9626
DSA, DPSC, DIR OF MFG.
Content 100% polyamide

INSTRUCTIONS

This shirt is inherently flame resistant. No other special flame resistant treatment is required.

1. Wear as outer garment.
2. Pockets are designed to accommodate personal effects and equipment during ground and in-flight operations.
3. Wear sleeves down with cuffs secured at all times.
4. Wear bottom of shirt tucked in trousers.
5. Shirt may be hand laundered. Make sure that all soap is thoroughly rinsed out.
6. DO NOT STARCH - *Starching will destroy the flame resistance.*

Sir:

This might be worth publishing—to save a flight suit and a buck.

While flying in RVN (1968-69) I discovered that some pilots and crewmen were throwing away "new" flame resistant, two-piece flight suits. A few quick inquiries and I found the WHY. A cloth tag, sewed in the shirt and trousers, states, among other thing: "DO NOT STARCH—Starching will destroy the flame resistance." Pilots and crewmen, upon discovering that their un-English reading maids had starched their flight suits, were throwing them away believing (erroneously) that they were no longer fire resistant. What the cloth tag does not say is—if inadvertently starched, wash with soap and water, garment will still be fire resistant.

LTC Charles W. Sills
Chief, Supply Div, DIO
USATCFE
Ft. Eustis, Va. 23604

The DIGEST obtained the following comment

from the Department of Aeromedical Education and Training, USAAVNS, Ft. Rucker, Ala.

The comment made by LTC Sills is accurate and noteworthy. The fact is that starch in itself is a flammable hydrocarbon, thus it would reduce the effectiveness of the Nomex fiber. This particular fact was tested in the early design stages of this protective garment. It is extremely important that when soap and water is used to clean the garment, whether it be for starch removal or perdiodic cleaning, that the soapy residues be completely rinsed from the garment. Soap residues, particularly those formed in hard water, tend to leave fatty residues in the garment. Without thorough rinsing these soapy residues will reduce the effectiveness of the garment in much the same way as does starch. Thus, these Nomex garments, being specialized uniforms, must be treated with care. In the same vein, every effort must be made to reduce unnecessary wear on the fabric. Thinning and fraying of the Nomex fabric will reduce its effectiveness as a fire retardant. Thus, these garments should not be used for extended periods as work uniforms unless their wearer is associated with the risk of exposure to fire either on the ground or in flight.

Charlie and Danny's Write-In

DEAR CHARLIE: Has there ever been any thought given to replacing TM 1500-1 and the CLs with a publication like the one used by the Navy (NATOPS)? Its size and shape allows it to be carried in the flight suit pocket or clipped on a knee board. The bold print is much easier to read and it is also oil and water resistant. TM 1500-1 is a beautiful binder to keep your Polaroid prints in, but it leaves a lot to be desired for maintaining a checklist.

Mr. D. P. B.

Charlie's answer: The present CL format is the result of considerable staffing and research. It is the concensus of most users that the present arrangement of material meets the requirements of Army aviation. However, it is known that there are many disadvantages to the 1500-1, especially when used in aircraft such as the O-1, OV-1 and AH-1G. A new softback version, similar to that used by the USAF, has been staffed by USAAVNS and submitted to USAAVSCOM as the recommended replacement for TM 1500-1. This new binder is smaller, can be held on the pilot's lap with "hook and pile" binder, can be clipped on a knee board and is designed so that it can be flipped open to the desired section. Plasticized paper to replace the present plastic envelope is also being considered. The NATOPS binder suggested has been considered previously. Although the size of the Navy binder is larger than the recommended replacement, this was not a factor in its evaluation. Army regulations provide that the CL be maintained in the aircraft and not individually issued to the pilot. The size of print, within certain parameters, is governed by DOD publication specifications and are the same for the checklists produced by the different services. The NATOPS checklist is published on heavier stock, but it is not oil and water resistant as suggested.

Dear Danny: I say the 20-minute warning fuel light in the Huey-Cobra is valid, even if one of the fuel pumps is inoperative. My buddy claims the system is the same as the UH-1B's. Who is right?

1LT A. M. Q.

Danny's answer: You, sir, are correct. TM 55-1520-221-10, change 9, page 2-22A, paragraph 2-116A, states the warning light is valid as long as one of the fuel pumps is operating. However, you may have more than 20 minutes if the forward pump is inoperative and a nose low attitude. TM 55-1520-219-10, change 2, page 2-19, paragraph 2-101, NOTE, specifically states that if either fuel pump is inoperative, you have approximately 5 minutes of light at cruise power.

Dear Danny: In reading TM 55-1520-221-10 I attempted to find the service ceiling of the Huey-Cobra. What is it and where is this information located in the manual?

CW2 R. A. S.

Danny's answer: Presently this information is not available. When the Cobra was initially procured, all flight tests were not completed. At present the test agency at Edwards AFB, Calif., is conducting additional flight tests on the Cobra. I hope the information on its service ceiling as well as other pertinent information will be available to you in the very near future.

Dear Danny: I recently received change 4 to TM 55-1520-227-10 on the CH-47B/C. A question has been raised as to the incorporation of the cargo hook operational check in chapter 3. The incorporation of this check in its present location causes difficulty for the flight engineer as he should still be outside the aircraft at this point. He must come into the aircraft, complete his portion of the check and then go back outside to retrieve the chocks. As a suggestion it would seem more logical if this check could be moved farther back in the ground operational procedures until the flight engineer is in the aircraft with the ramp closed and the fuel valve and crossfeed caution light checked.

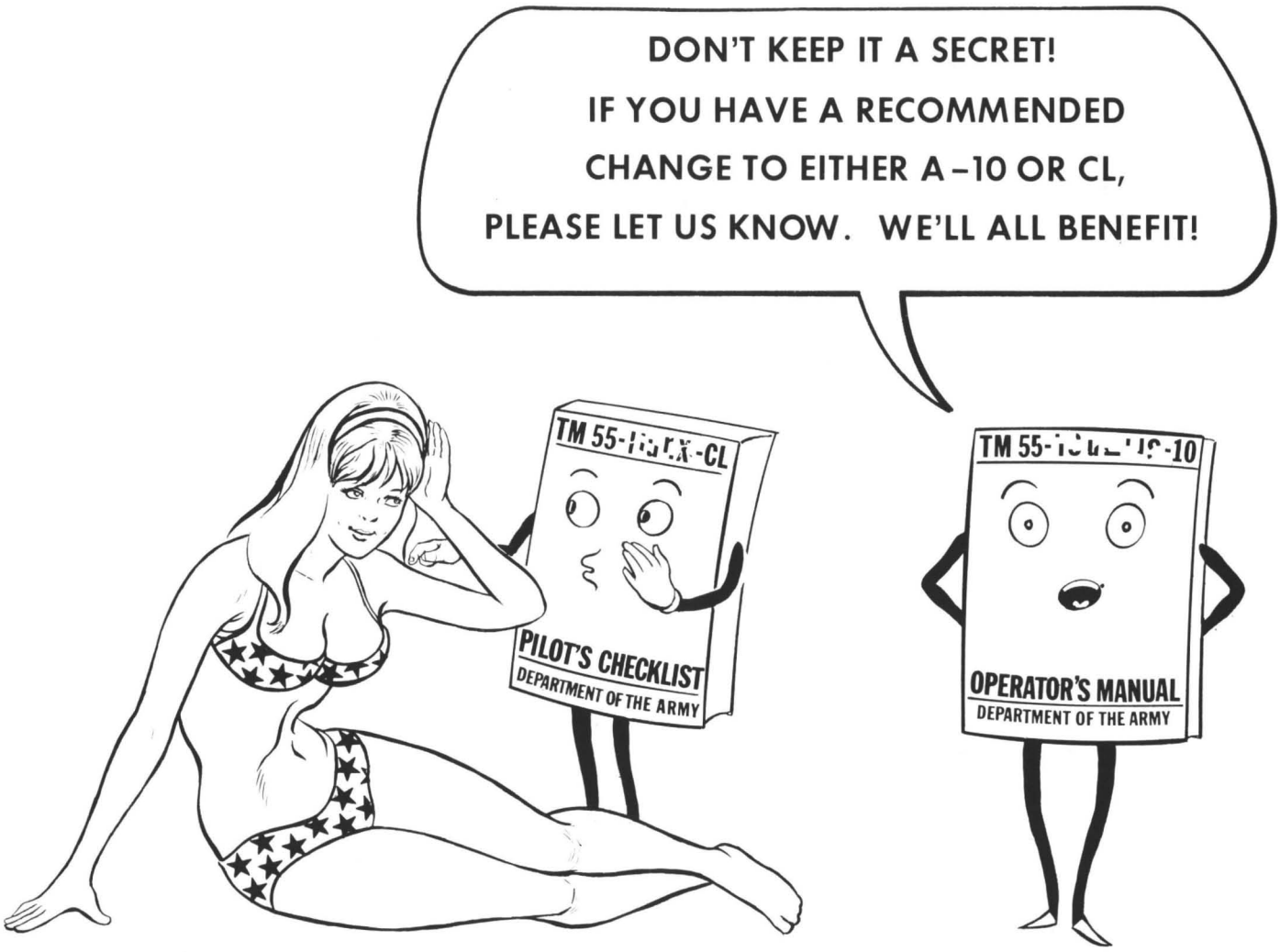
LT T. L. D.

Danny's answer: An astute observation on your part and an obvious blunder on ours. The next change to the dash 10 and CL will reflect the change as you recommended. Thank you for your time and effort.

Dear Charlie: Steps 1 and 2 of the general "Before Starting Engines Check" for the CH-47 have raised the question as to why a pilot, once seated in the cockpit, should wrench his back to make these misplaced steps. Research disclosed that step 1 has already been accomplished six pages earlier in the CL. Why recheck it after being seated? It would also seem logical that the troop commander's seat should be checked six pages earlier while you are on your feet. Can this be solved through a change to the dash 10 and CL?

CPT S. N. O.

Charlie's answer: It can, and it



will! A present proposal is to delete step 1 in the general "Before Starting Engines Check" and relocate step 2 to the area in the "Cargo Compartment Check" you recommend. Thank you for your recommendation.

Dear Danny: The procedure for propeller overspeed given in the operator's manual of the U-1A assumes that the overspeed condition is due to a governor malfunction. A broken oil line or prop dome seal failure will give the same indication and if the dash 10 procedures are followed the result will be the exhaustion of the engine oil supply through the prop and eventual engine seizure. Would it not be best to place the propeller lever in full low pitch instead of high pitch as recommended in the dash 10?

CPT P. C. M.

Danny's answer: During prop overspeed if the oil pressure drops significantly and remains low or if traces of oil appear on the cowl and windshield, a broken oil line or prop dome seal failure may be reasonably suspected. Returning the prop lever to INCREASE (low pitch) and controlling the rpm with throttle will prevent pumping engine oil overboard. Based on your inquiry a change to the procedure has been submitted which will cover this type of propeller failure and give the pilot the option of controlling the flow of oil during oil line or dome seal failure.

HELP !

At The Learning Center

Stop beating your head against a wall. Now there's a place designed for you. Feel embarrassed when you forgot the proper starting procedure on your Huey? All you had to do was meander inside this new place for some help . . . your instructor need never know! If that sounds a trifle bold for you, try disguising as your best friend, worst enemy or whatever . . . but do something! That's what this article is all about

Lieutenant John H. Zwarensteyn

HELP! A strange beginning to a story on a new, exciting and different idea. However, based on past experience, pilots (students and pros alike) rarely admit the need for help. An admission before their peers about some difficulty they are having would be incomprehensible. If you agree with this type of thinking, read on pal.

Aviators, especially the student variety, must assimilate an endless aray of technical information. Consider the relatively short time the U. S. Army Aviation School at Ft. Rucker, Ala., and the student spend together . . . approximately 4 months. Four months to digest all that data! No wonder some students are left groping for help on certain blocks of instruction. That helpless feeling is a thing of the past.

Several months ago a study group concluded that the aviation school should provide flight students a place to develop weak areas and receive individual attention. The result is the learning center . . . its mission of offering additional and supplementary training is aimed primarily at the student pilot, both fixed and rotary wing.

Identifying and isolating various training problems became critical. The more common ones could be dealt with initially, with a gradual move to the more complex ones. The programs

that arose were new, but they are constantly reviewed and improved. Additional programs are being reviewed for future use.

The learning center is divided into two main study sections: procedural training and audio-visual programs. The procedural training section, the first of its type in existence, features two UH-1 Huey cockpits. The student reacts to the instructor's inputs. He can simulate starting, running up and shutting off the aircraft. He could improve his pre-takeoff checks, instrument reading and following established procedures. Of course, an instructor is always ready to assist when needed.

The audio-visual section features ultramodern teaching techniques, many adaptable to classrooms of the future. There's the Mark IV cartridge audio-visual system featuring 12 to 15 minute instrument training sound films with a super 8-mm projector. The student simply selects the program he would like to review, then inserts the cartridge into the projector. Future plans call for additional tape programs to be implemented, and learning center personnel anticipate producing their own programs soon to augment the training syllabus.

The sound on slide booths are very popular and presently feature: (1) Introduction and General Information, UH-1; (2) Test Flight and Inspection Requirements; (3) Fuel and Oil Systems, UH-1; (4) Transmission, UH-1; and (5) Tactics. A wider selection of interest areas is under development and should be available shortly.

The instrument cross-check sound-slide system utilizes a rearview projection device, in conjunction with a speed reading concept, to illustrate instruments in all types of situations. The student performs the cross-checks at his own pace.

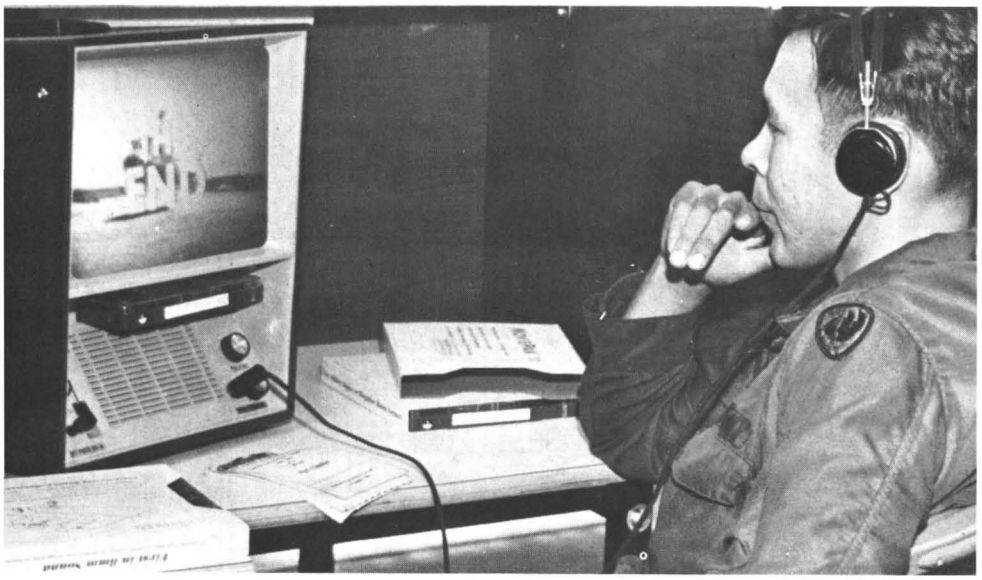
Of course, there's always educational television. Scheduled television lessons are currently presented on a limited basis Tuesday and Thursday evenings.

Each audio-visual teaching aid allows the student to work individually at his own speed. Time is no problem. If he encounters a situation that requires outside assistance, one of eight highly competent instructors is always ready to help. He even has his own private study booth with no one disturbing him. It's a fantastic way to learn.

The learning center operates on a voluntary basis. No one forces attendance. The decision to attend thus is an individual one. Suppose you have problems concerning the proper UH-1 starting procedure. You need simply walk into the center where you select the help you need.

Basic and advanced instrument training constitutes a significant portion of learning center material, but other problem areas are covered also. The lesson plans are closely coordi-

Procedural trainer . . . the Aviation School learning center has two UH-1 helicopter cockpits for use as training devices. The trainer teaches cockpit procedures to students and is a good refresher for rated aviators



This student in the advanced instrument area of rotary wing training found the benefits of the new super 8-mm projection system. It makes learning fun and results are excellent

nated with those in the aviation school's regular courses of instruction. But rather than duplicating them, the center's lessons are designed to clarify particularly difficult sections.

As expansion dominates the learning center, other problem areas will be covered. Rated pilots, air traffic control students, fixed wing students and aircraft maintenance students each have their own problems. The center is attempting to include material for each. Consider the pilot who is assigned to a nonflying job. He worries about "rustiness" setting in. The procedural trainer serves to maintain his "feel of the cockpit" without actually flying. He can perform operations checks, starts and runups. If he desires to improve his instrument techniques, he could select tapes, slides or television classes and sit in the privacy of his own study booth.

A recent learning center visitor, a nonflying pilot, stated: "You better believe I'll spend time here before I renew my instrument ticket." That's a pretty fair testimonial for the center.

If you're a "cost bug," consider the expense of flying a rotary or fixed wing aircraft per hour. With everything operating in the center, the only operational cost is the electricity consumed. You don't need a vivid imagination to comprehend the potential savings to the Army. You'll save time on the flight line also!

The center is always interested in new ideas. If you have any helpful suggestions, the staff would enjoy hearing them. Your ideas are always welcome.

If you feel the need to delve deeper into VOR (visual-omnirange) approach techniques, or to improve your UH-1 Huey cockpit procedures, the U. S. Army Aviation School learning center stands ready to help. *Use it!*

Popular with students is the new sound/slide booth. This student is studying a tactical problem with fixed wing observation aircraft. Sound and slides are fully synchronized

CROSSWORD PUZZLE

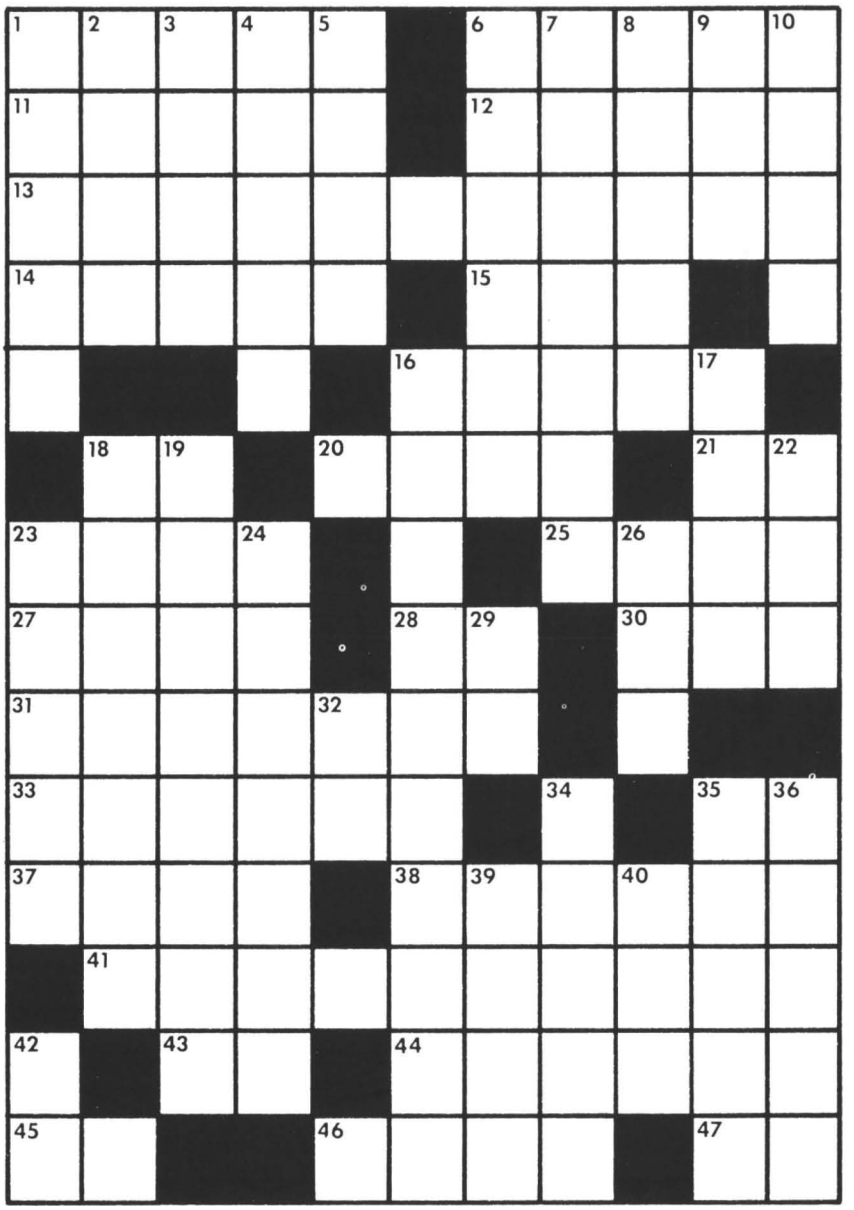
ACROSS

1. Pertaining to the sun
6. Detects underwater objects
11. Air navigation aid
12. Smell: noun
13. Capacity to be air portable
14. Intersection of two orbits
15. This fluid expands easily
16. Pitches
18. Official Army publication: abbr.
20. Holds together
21. Low frequency: abbr.
23. Steep descent: past tense
25. Elliptical
27. Destruction
28. Exclamation
30. To seethe
31. One uncivilized being: 2 wds.
33. Celestial body
35. Amplitude modulation: abbr.
37. Exterior covering: pertains to flowers
38. Aviation era: 2 wds.
41. What a chimney sweep expects: 2 wds.
43. Neptunium: abbr.
44. Considerable amount: Scot.
45. Commanding officer: common term
46. Test for tuberculosis: var.
47. Electronic reconnaissance: abbr.

★ ★ ★

DOWN

1. Radar searches target
2. One of the 50 states
3. Grease
4. Ready to fight
5. Combat radio operators: abbr.
6. Major SE Asia city
7. Central Florida city
8. Clamor
9. Amount: abbr.
10. Beams



Answers on page 35

16. Surface configuration
17. Radar scanning device: abbr.
18. Extinguishers
19. Aircraft operations
22. Birds do this
23. Play
24. Surround
26. Governed by visibility
29. Helium: abbr.
32. Area of operations: abbr.
34. Opposite of erect
35. Quick
36. Distance measure
39. Asian country
40. Rearward
42. Aircraft commander: abbr.

INSTRUMENT TRAINING...

Captain Arturo E. Grandinetti
Army of Argentina

DOES YOUR INSTRUMENT rating assure you proficiency in instrument flying? Of course we fully realize that the instrument rating mentioned above does not physically control the aircraft. The instrument rated aviator is responsible for control of the aircraft during instrument flight. Before a flight is filed under actual instrument conditions we, as instrument aviators, should consider the following:

- Have I continued to practice instrument flying since initial instrument training?
- How long has it been since I have had any training under the hood?
- What is my physical condition?
- What is my psychological condition?

Neglect of any of the above may make a nice beginning for safety officer's precrash plan.

Even if you hold a standard instrument rating or consider yourself a genius in instrument flight and you fail to continue practicing instrument flying, an actual instrument flight could result in a catastrophe. Consequently, to stack the deck in your favor you must continue to increase your education, training and confidence in your abilities and actual instrument time with an experienced pilot. Don't rely on your instrument rating.

Of course your experience and proficiency in IFR flight conditions are very important and must be considered, however, if you do not maintain this proficiency it will decrease rapidly and in a very short time you will lose most of those learned skills. If your proficiency is falling off, it will take a shorter time for you to regain it than an initial entry student, but it will still take a few hours of good training.

INSTRUMENT CORNER

Q. What is the air speed restriction on "copter" instrument approaches depicted in FLIP, Low Altitude Instrument Approach Procedures?
A. Ninety knots IAS maximum. Reference DOD FLIP, section II, page II-80.

Q. What action should a pilot take if for any reason he is unable to comply with any provision of an issued ATC clearance or restriction added thereto?
A. He is expected to immediately advise ATC. A brief reason such as "unable account of load" may be included. Reference DOD FLIP, section II, page II-61.

Q. Will a clearance from ATC provide separation between an IFR flight and all other traffic?
A. During the time an IFR flight is operating in VFR weather conditions, it is the direct responsibility of the pilot to avoid other aircraft. VFR flights may be operating in the same area without the knowledge of ATC. Reference DOD FLIP, section II, page II-61.

Q. Change 1, AR 95-1 states that "Army aircraft will not be flown into known or forecast *severe* icing conditions." What accumulation constitutes severe icing?
A. The airframe icing reporting table in DOD FLIP IFR-SUPPLEMENT describes severe icing as the rate of accumulation is such that de-icing/anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary. Reference DOD FLIP IFR-SUPPLEMENT, page 436.

In this regard the synthetic trainer is a very good friend—visit it and use it to maximum advantage. Many pilots have an adverse opinion of the "little monster" because of their tendency to fight the trainer and its reaction, especially in the first few periods. But, it remains an invaluable aid in maintaining instrument flight proficiency.

Now consider our physical condition. The human body contains sensory perceptors that help us maintain orientation and equilibrium. These perceptors are located in our eyes, inner ear, muscles, joints, tendons, skin and abdominal organs. Under visual flight rule conditions we employ these sensors in their normal roles, but what about abnormal conditions?

Since man has taken to the air he has acquired a new dimension in motion, the third dimension. But man is not a bird and was not born with flight instincts. Therefore, he must acquire new habits and maintain a proficiency in these habits if he is going to live to be an old aviator.

The sense of balance is separate from the normal five (sight, smell, taste, hearing and touch). You must maintain balance on the ground and of course in flight also. In order to maintain our balance we employ eyes, body sensations and the inner ear.

During visual flight conditions these three equilibrium elements are used to maintain a proper relationship between the horizon and cockpit scan. This is fundamental flying—"flying by the seat of your pants." If you can see a reference point you are in good shape because your eyes tell you where you are in relation to the horizon. You feel both comfortable and normal. But, what will happen when you cannot see a reference point outside the cockpit?

Even the birds, born to fly on course with no instruments, refuse to take a chance if they run into an IFR condition and cannot see. But many a man has died trying to prove that he was smarter than a homing pigeon.

When you "get in the soup" turn to your instruments. Only they can help you. Trying to fly IFR without the aid of instruments is insane and will rapidly turn a well-planned, no-incident flight into the proverbial can of worms.

What happens between entering IFR conditions and the crash? Nobody has yet returned from St. Peter's initial orientation briefing to inform the crackpot pilots of the "Red Baron Squadron." For those pilots visual flight rules were sufficient, but for the modern Army aviator this is not enough.

Maintaining orientation and equilibrium requires interpretation of sensations from your eyes, now on the instruments, the vestibular apparatus in the inner ear and pressure readings from the body senses. All of the messages traveling to the brain from these sensors need to be interpreted and placed in their proper perspective. The sensations experienced in IFR flight can be misleading because the inner ear cannot distinguish between gravity and centrifugal force. You can have the sensation of turning when you are actually flying straight and level.

The pilot's brain needs time to learn to suppress faulty sensory illusions. The first step in successful instrument flying, therefore, is to ignore the sensations of going up and down, slipping, skidding or turning and let your flight instruments feed accurate, ungarbled information to your brain. This must be learned during flight training, not in an actual flight. Also when a pilot finds himself in an IFR situation and knows that he lacks the necessary experience, anxieties start to build. These anxieties lead to increased tension. In the cockpit during an IFR situation this may develop into sheer panic, an extremely hazardous condition.

Training and continued practice are the keys in maintaining instrument proficiency. Practice instills confidence in one's skill and this reduces accidents. Remember, it is better to spend a few extra hours in IFR practice than to fly wingman for St. Peter.

...CONFIDENCE AND SAFETY

TASK FORCE:

Following the Malaysian flood Army aviators and their aircraft proved to be invaluable to the sticken people

Malaysian civilians wait for relief supplies on high ground

"GOLDEN HAWK"

Specialist 4 Tony DeStafano

A RUMOR projected by a local fortune teller in Malaysia predicted that by New Year's Day 1971, it would rain for 7 consecutive days. If that story was true the man's prediction was off. It rained for 10 days and it was the heaviest rain on record in decades.

The rain started on 26 December 1970, the beginning of the winter monsoon. At Kuantan Royal Malaysian Air Base on the east coast of Malaya, 4 feet of rain fell in 10 days. Unofficial reports say that 80 inches fell in some inland regions. No one quite expected such a torrent and as rivers and streams began choking on the waters it became apparent that Malaya would be hit by major floods.

The flooding that occurred was the most severe for Malaysia since 1926 and left 100,000 people homeless, cold and cut off from food, fuel and water. Miraculously less than 70 deaths were reported. But the crisis had reached a major disaster level.

At the request of the Malaysian government, the United States, British and Singapore governments mobilized flood relief missions. Task Force "Golden Hawk," an amalgam of helicopters and Army personnel from U. S. Army, Vietnam was rushed from Saigon.

Packed into a U. S. Air Force C-124, the first two UH-1H helicopters—one from the 118th Assault Helicopter Company and one from the 45th Medical Company (Air Ambulance)—arrived at Kuantan Air Base on 7 January. Maintenance crews from the 34th General Support Group had the aircraft flight-ready by midnight.

On 8 January additional helicopters from the 1st Aviation Brigade arrived at Kuantan, along with support personnel from the 269th Combat Aviation Battalion. The additional aircraft came from the 117th, 173d and 187th Assault Helicopter Companies.

Taking mission requests from the Malaysians the U. S. Army Hueys, along with Royal Navy Wessex and Singapore Allouette helicopters, fanned out over 8,000 square miles of Malaysia. The ships shares in a giant operation that continuously taxed the Malaysian Air Force.

The first missions flown by Americans were food and fuel supply runs. "Proud Mary" of the 118th Assault Helicopter Company flew the first food mission to isolated points along the swollen Pahang River. It gave the Americans their first closeup look at the flood. The area was covered with light brown water as if a giant cup of coffee with cream had overturned.

Hungry Malaysians rushed out to greet the aircraft as the crew tossed out sacks of rice and canned food. The people rushed to the sacks, tore them open, smiled and managed a vigorous wave of thanks to the men. In some areas people had gone for 7 days without a decent meal.

Medical operations are vital in flood relief and with the threat of typhoid and cholera always uncomfortably close these opera-

tions became even more important.

"Don't drink the water," shouted Malaysian radio, warning citizens about water polluted by bloated animal carcasses and rotting vegetation.

U. S. Army helicopters made numerous sorties to fly precious inoculation teams throughout the flooded areas of Malaysia's Pahang State.

A dramatic medical evacuation was made by the 45th Medical Company at an isolated landing zone 30 miles from Kuantan Air Base. After leapfrogging around deserted sandbars, the crew landed to pick up a dying woman who had just given birth. The landing zone was marked by yellow and orange towels.

"She was really bad off," said Chief Warrant Officer Ralph Conrad, "and after giving birth she began hemorrhaging."

Once aloft a Malaysian doctor worked to save her by intravenous treatment. The helicopter hastened to the hospital. The doctor wrestled with the uncooperative intravenous device. Glucose solution sprayed around the helicopter.

"We didn't think we'd make it with her," said Conrad later, "but it really made you feel like you were doing something."

By 11 January the flood emergency in Malaysia had begun to diminish. Food was plentiful in some market places. Thousands of people who had been forced out of the jungles and lowlands by flood waters started to return home. Receding water levels opened many roads and life regained some normality.

By the morning of 17 January Task Force "Golden Hawk" had flown 209 hours and carried 153 tons of food, fuel, blankets and medical supplies to isolated and needy Malaysians. The U. S. Army helicopters made over 400 sorties in the relief operations.

Besides a strong feeling of accomplishment, the Malaysian duty was a much welcomed relief for the aviators from the tension of Vietnam and combat flying . . . no hostile fire, no booby traps, no suspicion.

"You really felt a sense of accomplishment," commented CW2 Paul Shumate, of the 173d Assault Helicopter Company, "doing something that seemed worthwhile. The people were really happy to see you."

"It was a groove," added a crew chief, "I mean we were really building something up."

During his first night in Malaysia an old woman approached SP4 Ron Willey a medic with the 45th Medical Company. He was wearing a floppy bush hat and carried his bulbous flight helmet, very conspicuous on the Malaysian street. The woman asked him where he was from.

"Vietnam," said Willey.

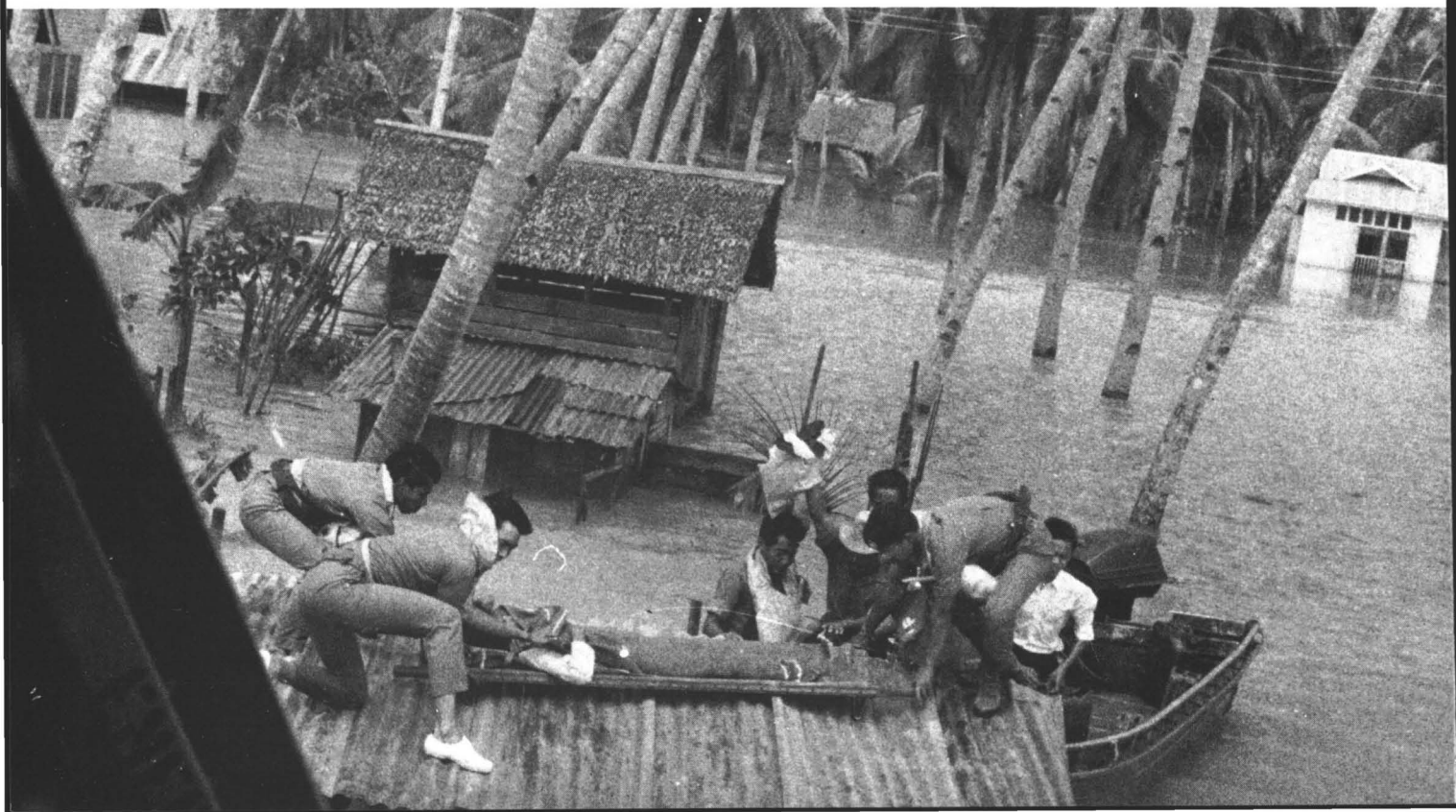
"Are you here to help out in the flood?" the woman asked.

"Yes, we are," Willey answered.

"Well," said the old woman, smiling, "thank you." She turned and walked away.

"That," said Willey, beaming, "is what it's all about."

Malaysian soldiers carry a sick woman to a rooftop for evacuation



VIEWS FROM READERS

continued from page 1

to the painted red band on the landing gear strut of the U-8 aircraft.

As stated in the article, it has been a popular belief and possibly instructed that the red band on the landing gear strut was for the purpose of indicating "bottoming out" on hard landings. This article states that the purpose of the band is to prevent corrosion on the portion of the strut which is not chrome plated.

It would appear that should the necessary care be taken in preflight, wiping the strut with hydraulic fluid, that this would prevent the corrosion on the unfinished surface. Additionally, it would appear that if paint was used for the prevention of corrosion, the color would be immaterial.

Request clarification of this matter and reference to support subject article.

SFC James P. Banner
1140th Transportation Co.
(Aircraft Direct Support)
Georgia Army National Guard
Winder, Ga. 30680

• We have received several inquiries regarding the source of our information. "Maintenance Matters" is put out by the combined efforts of the Department of Maintenance Training, U. S. Army Aviation School, Ft. Rucker, Ala.; the U. S. Army Aviation Systems Command, St. Louis, Mo.; and the U. S. Army Transportation School, Ft. Eustis, Va. The particular information you requested was submitted to our office by DOMT, Ft. Rucker, in accordance with a letter dated 3 July 1964 from a Beech Aircraft Corporation technician. The pertinent paragraphs are reprinted for your information.

> Our engineering group states that the purpose of the band of paint around the landing gear strut is to prevent corrosion on the portion of the strut which is not chrome plated.
>
> Due to normal manufacturing tolerances on the components in the "strut" assembly, the painted area may or may not be affected whenever the strut "bottoms-out" on a hard landing.

Thank you for your inquiries; please keep them coming!

1 S	2 O	3 L	4 A	5 R		6 S	7 O	8 N	9 A	10 R
11 C	H	A	R	T		12 A	R	O	M	A
13 A	I	R	M	O	B	I	L	I	T	Y
14 N	O	D	E	S		15 G	A	S		S
S			D		16 T	O	N	E	17 S	
	18 D	19 A		20 B	O	N	D		21 L	22 F
23 D	O	V	24 E		P		25 O	26 V	A	L
27 R	U	I	N		28 O	29 H		30 F	R	Y
31 A	S	A	V	32 A	G	E		R		
33 M	E	T	E	O	R		34 P		35 A	36 M
37 A	R	I	L		38 A	39 I	R	40 A	G	E
	41 S	O	O	T	P	R	O	F	I	T
42 A		43 N	P		44 H	A	N	T	L	E
45 C	O			46 T	Y	N	E		47 E	R

CROSSWORD PUZZLE ANSWERS

Puzzle on page 29

UNLESS YOU HAPPEN TO BE ONE OF THOSE RARE, LUCKY PEOPLE WHO NEVER DIPPED BELOW STRAIGHT A's when you were in school, chances are that "report" is fairly high on the personal list of dirty words you had just as soon never again hear uttered in your presence. If you are like most of us, you have distinct and unhappy memories of the reception you got after you trudged home with a report card which put you in the sub-moron class as far as math was concerned, and assigned you a grade on conduct which even Bonnie and Clyde would have been ashamed of. It's not the kind of experience you would want to wish off on any self-respecting dog.

So it's a fair bet you have a built-in, instinctive feeling the world would be a far, far better place if nobody had ever thought of reports, and the word itself could be struck out of all dictionaries by an act of Congress. The less said the better. No use crying over spilt milk, right? What's done is done. The thing to do is to try on some good strong positive thinking and look for things to start coming up roses for a change.

It's another odds-on bet you feel the same way about "investigation," a word which brings up unpleasant pictures of old-fashioned cops using rubber hoses to pound the whey out of suspects

Squeeze out all the facts . . .

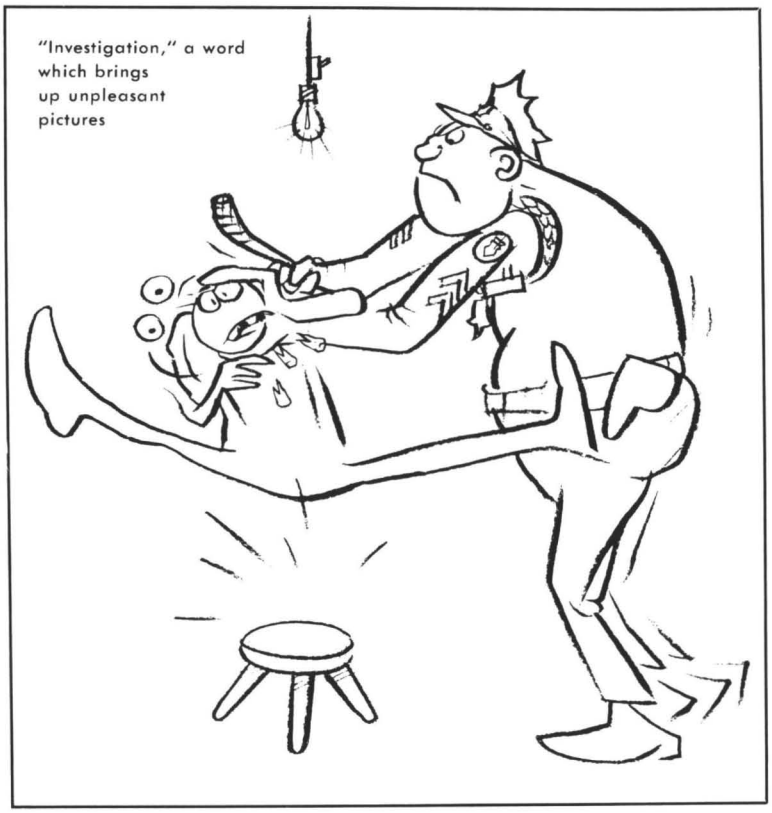
Accident Investigation and Reporting sense

Major Chester Goolrick

down in the basement of the station house, or steely-eyed gumshoes in trench coats prying into secrets you'd just as soon not have spread across the front page of the evening newspaper. After you have gone to a lot of trouble to bury something 6 feet deep and plant petunias on it you want it to stay buried.

There's nothing unhealthy about this. You don't have to be a bank robber, a wife stealer or an ax murderer to have been involved in one or two episodes you don't even like to remember yourself. The town blabbermouth will never win any popularity contests. The man who believes in tending to his own business and letting other people mind theirs is generally hailed as a sterling citizen.

It's entirely probable, though, you wouldn't be where you are today if it hadn't been for those report cards you brought home from school. If report cards had never been invented, few people would graduate from high school and most of us would never have made it through ol' Miss Maggie's sixth grade social studies class. It was after Pop found out from Miss Maggie that your studying had dropped off to the vanishing point, or you were spending all your time mooning over the little redhaired girl who sat at the next desk that he was able to take corrective action which got you



"Investigation," a word which brings up unpleasant pictures

safely through the blackboard jungle.

If you were saved by a good report card when you were in the sixth grade, you can be saved again as an Army airman by a top-flight report which winds up the kind of painstaking, detailed investigation which ought to and should follow every aircraft accident.

DIGGING DEEP

Ought to? *Should?*

Well, to state a simple truth as painful as a gumboil, that's about the size of it. When it comes to words, "ought to" and "should" are as weak as a slug of watered-down scotch in a third-rate honkytonk. Not the kind you'd associate with strong-minded, dedicated professionals who agree with Robert E. Lee that strict attention to essentials is what separates men from boys.

All in favor say "aye." That doesn't alter the unhappy fact that even if there isn't a dissenting vote, aircraft accident investigations too often don't exactly pinpoint the cause of a crash, and that the resulting reports in consequence can be as full of holes as an unmended fish net. A lot of work gone to waste, you can say. And say again.

The reasons for this problem area—and bear in mind always, friends, that "problem area" is just a varnished-over way of saying "deficiency"—take some looking into as a first giant step leading to a solution.

As a starter—*Army regulations specifically provide that accident investigations are not to be used for punitive or disciplinary action.* They are aimed solely at (a) finding the cause of a particular crash and (b) eliminating similar accidents in the future.

Nothing could be clearer. The trouble is, some people don't always believe what they read. They can't clear themselves of the lurking suspicion that once it's put down in black and white, a report becomes a millstone which some poor soul is going to have draped around his neck to the day they give him a farewell retirement party at the officers' club. So they approach an investigation with all the fine enthusiasm of a chap who has been commissioned to tell his best friend that he (a) has bad breath like they say in the television

Dig deep!

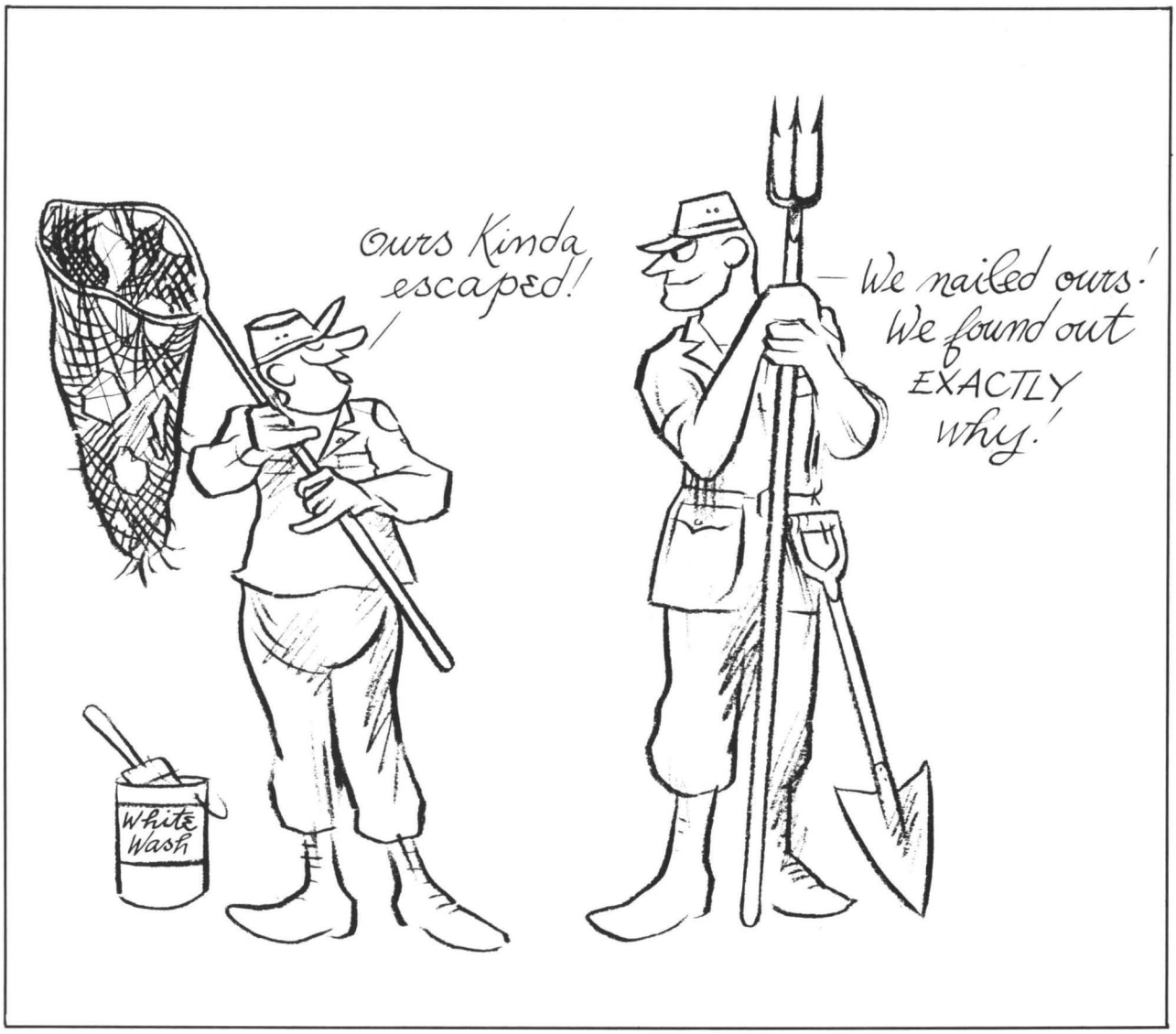
ads, and (b) his wife has run off with a ladies' lingerie salesman named Elmer.

They've not only got it all wrong, they've got it bad. And that, as the line from the old song has it, ain't good. Not for Army aviation, it ain't.

You may be suffering from a touch of Accident Investigation Syndrome yourself. If you have ever been involved in an accident or have been on the fringes of one—who hasn't?—you know the whole investigative and reporting process isn't the kind of thing any sensible person approaches with the same keen relish he looks forward to his annual vacation at the beach. Few people come rushing forward to volunteer their services when an investigation is in the works. Given the choice, most of us would say thanks but no thanks.

AND WHEN A TASK IS APPROACHED WITH RELUCTANCE, OR THOSE INVOLVED DON'T FULLY APPRECIATE THE PURPOSE AND IMPORTANCE OF WHAT THEY ARE DOING, YOU CAN BE DEAD CERTAIN IT ISN'T GOING TO GET DONE THE WAY IT SHOULD BE.

The wheels really begin to turn and take hold, though, when the accident investigating and reporting people come to terms with the basic idea that the only person who can get hurt by their findings is the airman who has the *next* accident—because the board didn't catch the stitch in time that saves nine. Or found the wrong thing.



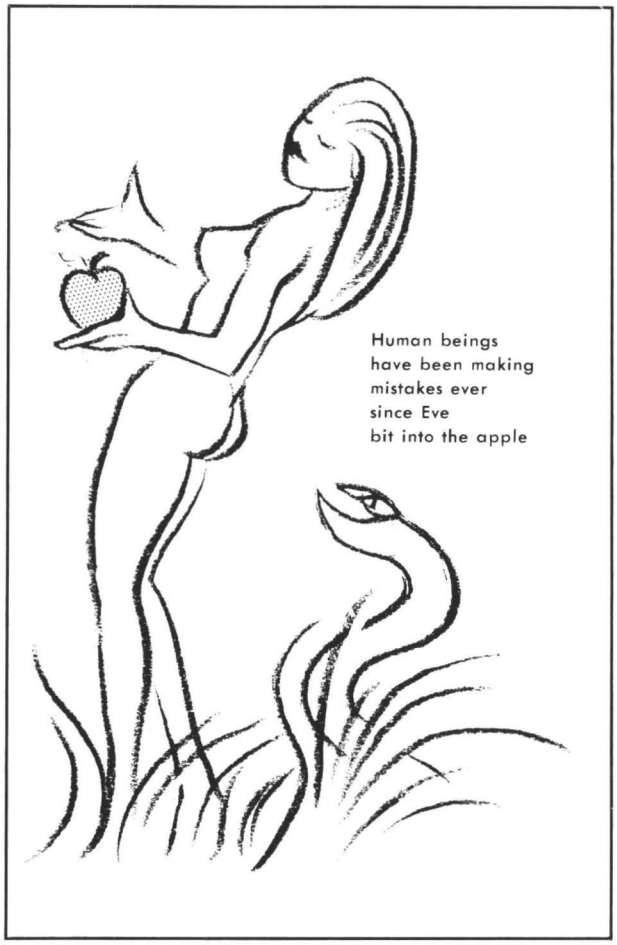
Let's face it, a board's job is a tough one even when it is not done properly, and a real bang-up, A-One job is even harder work. On the other hand, it can be a lot more productive and result in fewer frazzled nerve ends if everybody concerned starts out with a pretty sound idea of where he wants to go and how to get there.

No groping in the dark, you might observe. And you'd be right.

BLINDMAN'S BUFF

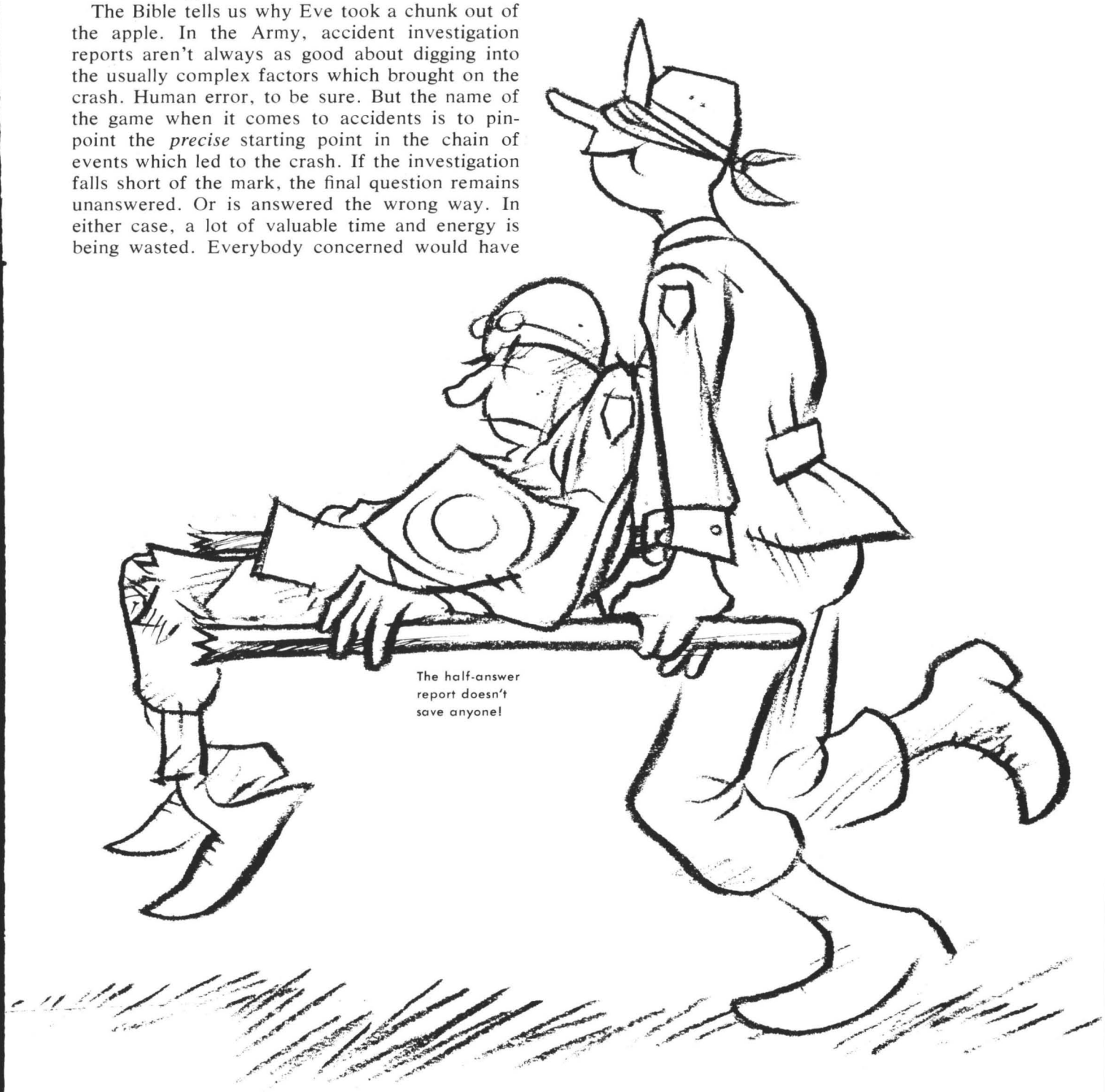
No one is likely to argue that every accident board doesn't approach its task with a real desire to get at the truth. The trouble is that most board members aren't trained investigators to begin with (more about that later if you will just be patient for a minute). They've a few other things on their minds and worries of their own, and they're likely to adopt the view that the sooner the job is finished the better for all concerned. They have never had driven home to them the need for relentless detective work of the kind which would have earned them a well-deserved pat on the back from Sherlock Holmes.

So what happens? They come up with an answer which is at best a half truth. As an important example, it's not enough in most cases to lay the cause of the accident at the door of that old bugaboo, "pilot error," and let it go at that. Sure, almost all accidents *are* caused by men, pilots or otherwise. Machines sometimes let you down if they are misused or given improper care, but they



seldom make mistakes. On the other hand, human beings have been making mistakes ever since Eve bit into the apple.

The Bible tells us why Eve took a chunk out of the apple. In the Army, accident investigation reports aren't always as good about digging into the usually complex factors which brought on the crash. Human error, to be sure. But the name of the game when it comes to accidents is to pinpoint the *precise* starting point in the chain of events which led to the crash. If the investigation falls short of the mark, the final question remains unanswered. Or is answered the wrong way. In either case, a lot of valuable time and energy is being wasted. Everybody concerned would have

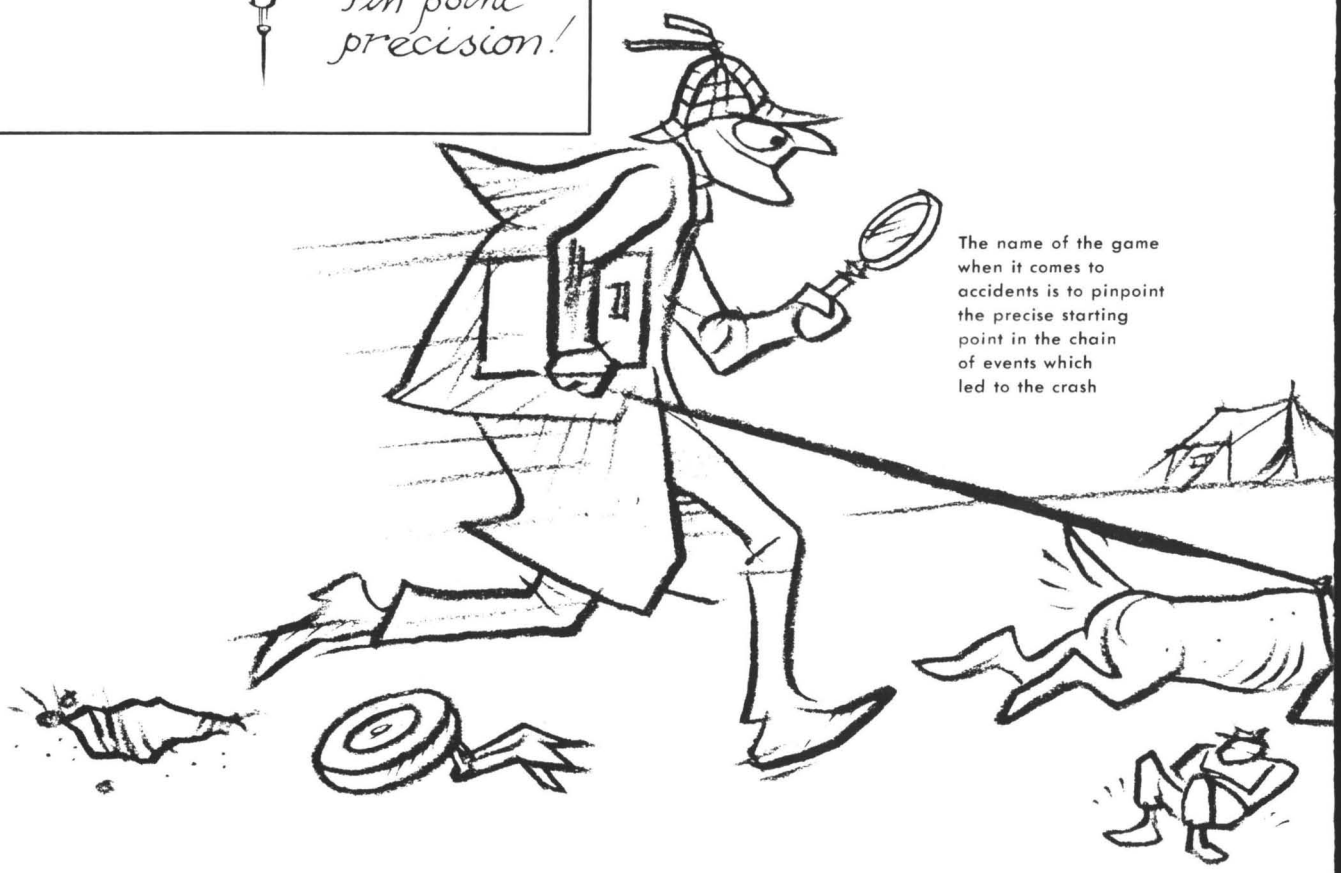


The half-answer report doesn't save anyone!

been just as well off sitting on the banks of the Chattahoochee trying for a mess of catfish.

Let's take a simple example. Here's a competent, experienced pilot who is snagged by a pothole on the runway during takeoff, rips off his undercarriage and piles up his airplane. You could call it pilot error, because after all he was at the controls when his airplane struck the hole. You could, but you'd be stopping considerably short of the goal line. What needs to be brought out in the open is how come the pothole was there to begin with and why it was not filled in. Maybe there is a supervisory angle involved. One thing's for certain—the chain of events which set up the crash didn't start the moment the airplane began rolling down the runway, not by a long shot.

The fact generally is that the causes which lie behind a mature, competent man failing to do something, or doing it improperly are about as complex as an IBM 360 computer. Sometimes a man who commits an error hasn't any business being allowed in the cockpit or holding a torque wrench in the first place. Consider, for a moment, the whole sticky business of flight fatigue, an all-too-common ailment. If an airman is not given adequate rest time, if he is allowed to fly or work on maintenance until his reflexes are slower than an Alaskan glacier and his eyes are burning holes in his head like a pair of brandied cherries, any accident board worth its salt is going to take a



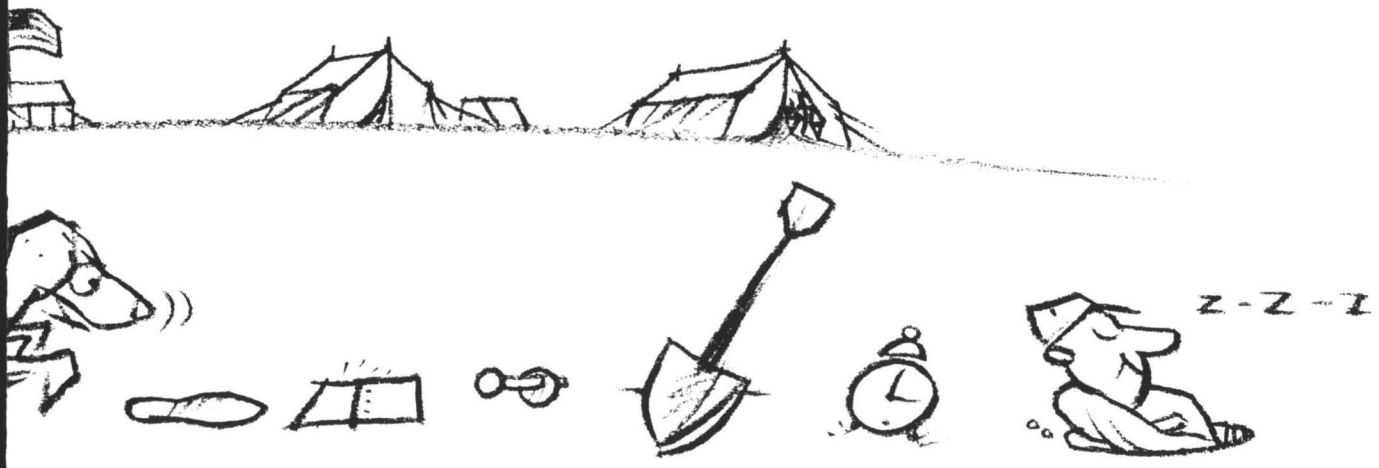
The name of the game when it comes to accidents is to pinpoint the precise starting point in the chain of events which led to the crash

hard look into a possible supervisory angle once he commits the mistake that is certain to occur. True, in an accident of this kind, if you set up an investigation board made up of retired presidents of the Parent-Teachers Association and senior members of the old people's home you might expect them to come up with simple human error as the answer. Professional Army aviators, flight surgeons and the like should carry the ball for additional long and productive yardage.

Put another way, a sound accident investigation is a matter of peeling away protective camouflage until you get down to bed rock. Take accidents which look at first glance as if they happened because some mechanic got careless and left an oily rag in a turbine intake, or installed a component in strict compliance with Murphy's Law. There's a human factor, and one which is hardly the mark of a true pro at that. But if operations fails to give the helicopters the down time they need for proper maintenance, if a supervision program has its shortcomings, or if the mechanic is practically walking in his sleep because of fatigue, he'd be less than human if he felt that somebody else ought to be made to carry a good part of the burden of blame.

UNACCUSING FINGER

When you start thinking about it, "blame" isn't a very good word, either. As far as accident investigations are concerned, the name of the game

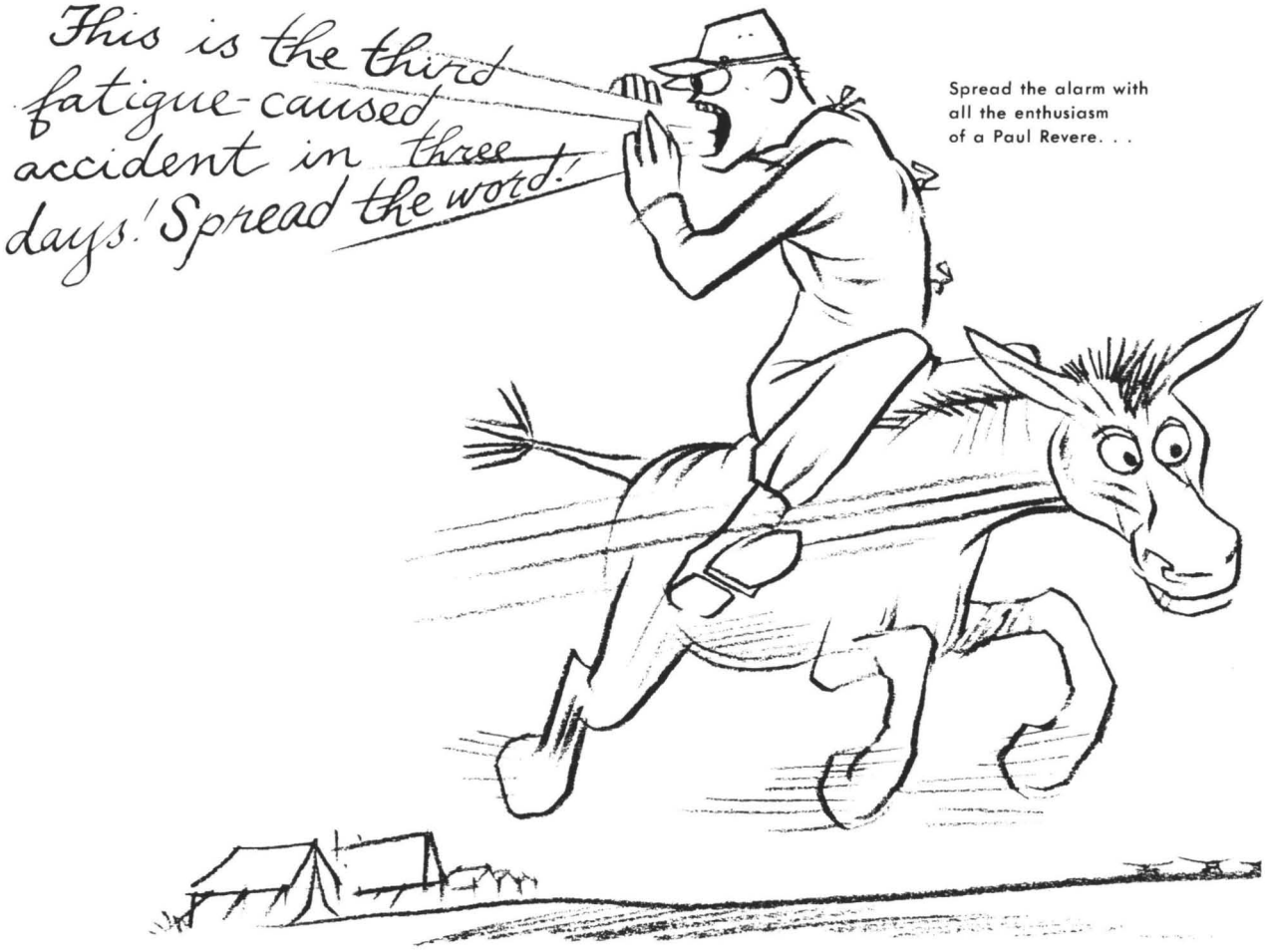


is preventive medicine. Nobody's on trial. Accidents are looked into for exactly the same reason the public health people swing into action when a rare disease puts in an appearance, or too many people start coming down with hog cholera. The idea is to stamp it out before things get out of hand.

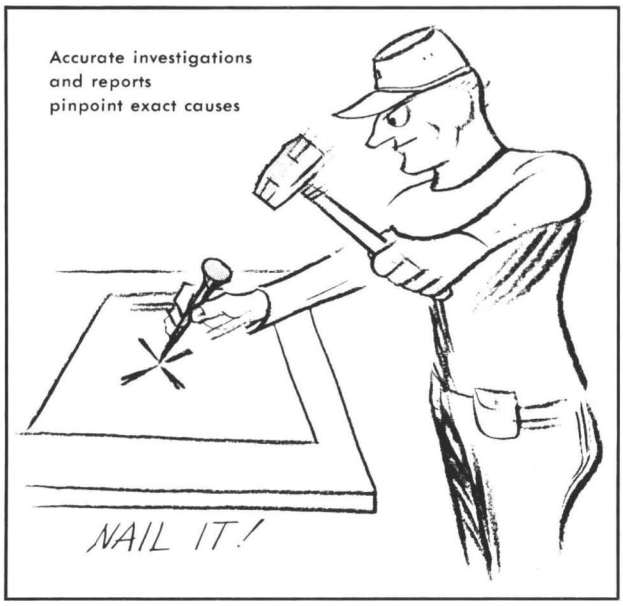
If you have any boots lying around handy, you can safely bet them that when a doctor bumps into some strange and particularly nasty ailment he doesn't keep it a secret. Instead he spreads the alarm with all the enthusiasm of a Paul Revere alerting the folks that the dadburned redcoats are on the march. What follows is an all-out medical mobilization which brings the crisis to an end before it has a chance to develop into an epidemic.

Aircraft accidents in various categories can reach epidemic proportions themselves unless alert and accurate investigations and reports pinpoint exact causes and help bring about safer flying practices. That comes close to summing it up—if reports *aren't* accurate and thorough, if no recommendations regarding corrective action are made, they aren't worth two hoots in a rain barrel.

Suppose a unit has a series of related accidents and the investigations add up to some fairly simple corrective procedures which help eliminate others of the same stripe in the future. This is great, but only so far as it goes. Let's also say, to go a step further, that well-executed reports trickling into USABAAR at Ft. Rucker, Ala., point to an ominous rise in wire strikes or foreign object damage, and that the recommendations forwarded by alert boards all over the world point to a set of solutions which can apply the brakes to a potentially runaway situation. Alarm bells sound. The word goes out to the units in the field—to those who have had a rash of wire strikes or FOD



Spread the alarm with all the enthusiasm of a Paul Revere. . .

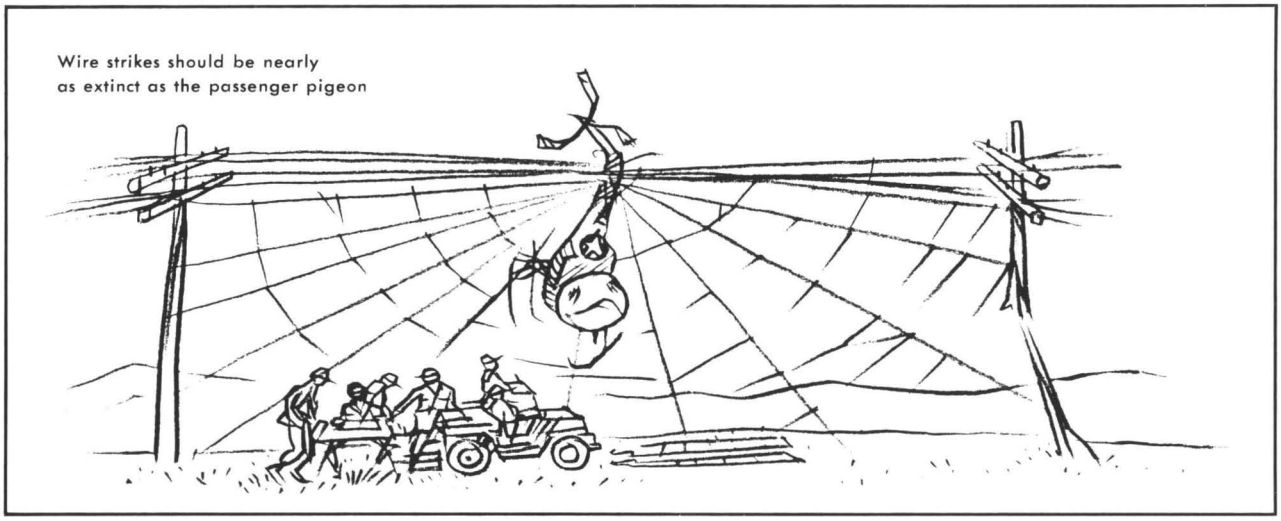


Accurate investigations and reports pinpoint exact causes

ever be entirely a thing of the past. It is fair to say, all the same, they could be whittled down to size if all hands gave them the thoughtful consideration they deserve.

Yet, when an analysis of accident reports on 56 midair collisions was run through the mill recently, it turned up the fact that, despite apparent multiple cause factors, the burden was almost always laid at the door of the hapless pilots involved. The *full* extent of the causes isn't known because many of the boards were willing to accept that old workhorse, "pilot error," without digging deep to see what lay at, or even beneath, the grass roots.

So far, so bad. What was worse was that only 27 positive recommendations were made when a round 100 would have been barely sufficient. On top of that, of the 27 recommendations, five were disapproved, meaning that fewer than one effective recommendation was turned in per accident. In the big leagues of Army aviation that isn't considered a very high batting average.


Wire strikes should be nearly as extinct as the passenger pigeon

and to those who haven't yet had any but which just as easily could. Once they get the picture, safety officers and the COs running the aviation management program are able to take *informed* steps based on *informed* recommendations. Wire strikes and FOD go back to where they should be—nearly as extinct as the passenger pigeon.

Recommendations—or the lack of them—make up a good part of the story. Consider, for a moment, another top-priority problem, the matter of midair collisions. What with skies practically blacked out with helicopters from time to time like Canada geese in the migrating season, it would be too much to hope that collisions will

ALL TOGETHER, NOW

Sound recommendations leading to cures in problem areas are likely to come a lot more frequently when (a) all members understand the importance of the job, (b) interest themselves personally in the problem at hand and (c) take an active part in the proceedings.

An aircraft accident investigation board isn't a one-man band. Every member has a definite part to play. The questions he asks and the views he contributes can make a big difference in the outcome. Maybe, at first glance, an accident can seem to have been caused by some factor such as

fuel exhaustion or a maintenance error. So the flight surgeon might figure he hasn't much to contribute.

Not so, Doc! There may be a clear case of Murphy's Law causing an accident but, lurking behind the mistake, there can be a medical or emotional angle only the flight surgeon is equipped to bring into the open. A man with a toothache which feels as if somebody had booby-trapped his jawbone can't be expected to give a topflight performance. If he is trying to go ahead anyway because he has been scared of dentists since the age of six, he has a problem the surgeon—and his supervisor—should know about.

Granted, this is an extreme example. Just the same, when a board is composed—as it should be—of men of wide experience and professional capabilities, everybody can help build up the wall of evidence which tells the full story. It's a known truth that there are times when clamming up is the best policy, like when they want to know where you were on the night of January 13th, the time somebody hauled away most of the assets of the First National Bank. When you're part of a team burrowing like moles for the plain truth, it's your job (and everybody else's) to stick in your shovel along with the rest of the mining crew.

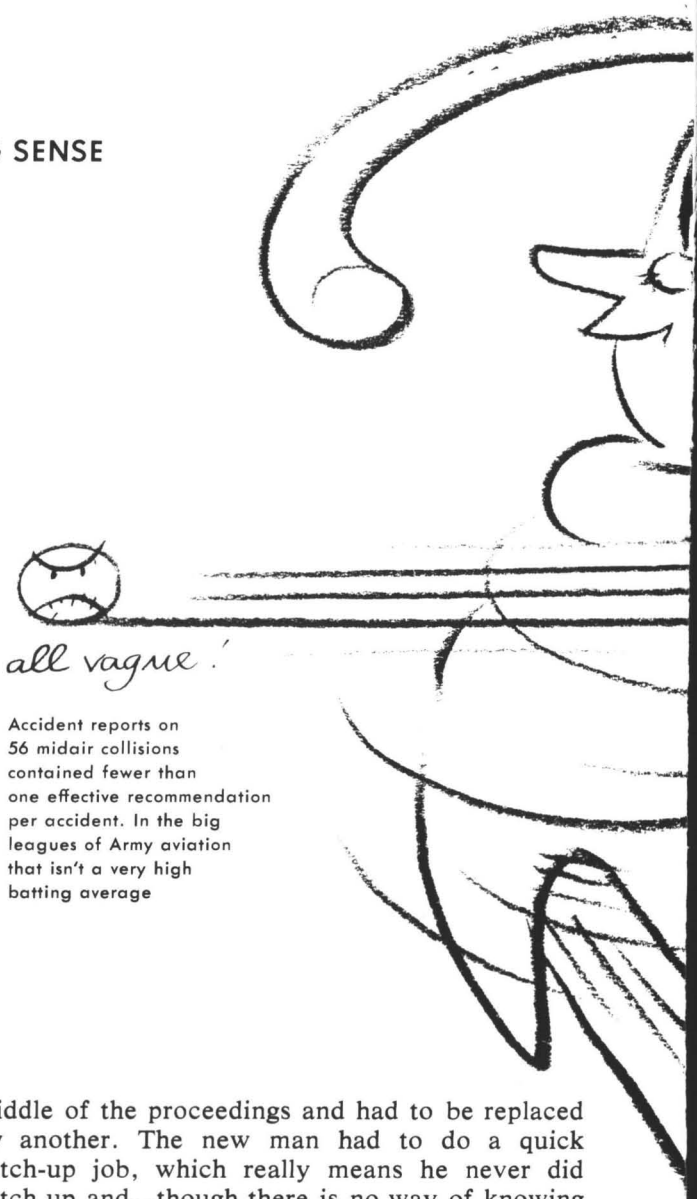
PLAIN AND UNVARNISHED

Plain truth is right. The object is to tell it like it is, baby. A board isn't in the business of making friends. Its job most certainly is to influence people.

Influencing people, as any chaplain can tell you, is about as hard work as there is, this side of moving mountains with your bare hands. To tell the truth, if it weren't for their dedication, most chaplains would probably prefer to take on moving mountains.

All boards can do with a good helping of dedication as much as chaplains. Plus a generous measure of patience and understanding. Any board, for instance, which sets out on its task with a self-imposed time limit (or, worse, instructions from above to get the job done within X number of days) stands a good chance of not getting the job done at all, or at least not the way it should be done.

There's also the matter of personnel turnover on a board. There was one case not too long ago of a board president who went on leave in the middle of the proceedings and had to be replaced by another. The new man had to do a quick catch-up job, which really means he never did catch up and—though there is no way of knowing at this late date—it is at least possible the final report has some missing link we will never know about. Substitutions are helpful and even necessary in some sports events. On the other hand, nobody ever substituted jockeys in the middle of the Kentucky Derby. The same should be true of a well-constituted board.



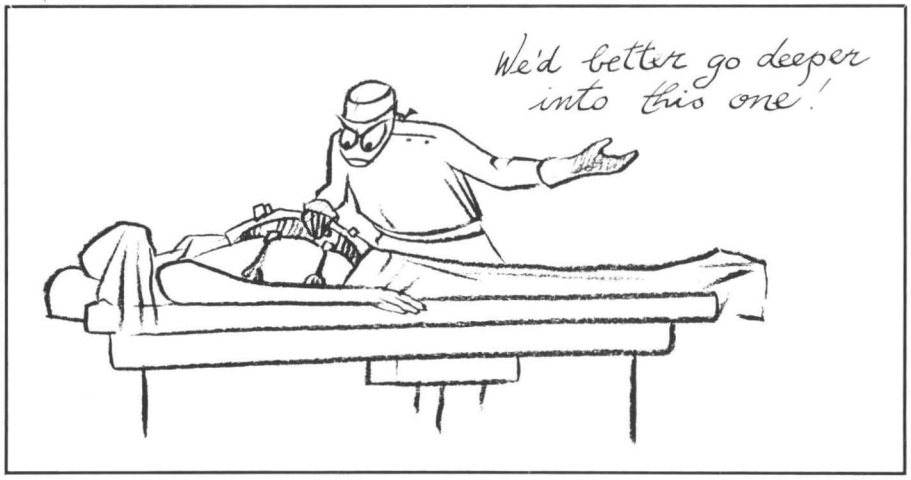
Accident reports on 56 midair collisions contained fewer than one effective recommendation per accident. In the big leagues of Army aviation that isn't a very high batting average

Well constituted? Nearly all accident boards, no matter how carefully set up, have their definite limits. Unless your unit has the rare good fortune to be composed entirely of aviation and mechanical geniuses, there will be times when you will run up against knotty questions you can't find the answers for.

That doesn't mean the answers can't be provided. As an example, a board finally reaches the

conclusion that a particular component of an aircraft failed in flight and caused a crash. Trained technicians available to USABAAR can get at the truth and fire it back in a hurry to the board—*provided the board knows the correct handling procedures for the suspected part.* But only *if.* If a part isn't handled properly *after* the crash, the sleuths in the labs behind their microscopes have no way of saying with certainty what it was like *before* the crash.

The obliging chaps at USABAAR will cheerfully go beyond just peering into their microscopes. When a board finds itself in over its depth, USABAAR can provide experts to descend on the scene to get to the heart of the matter. They'll generally arrive at a solution, too, even if it takes all summer and well into the fall.



In the case of one notable and unusual Chinook crash, it took approximately 3 months. The helicopter had a history of mysterious engine failures and the end came when both engines failed simultaneously. Fortunately, the pilot managed to land it relatively intact and the tanks were virtually empty so there was no fire.

In other words, the investigators had plenty to work with. Almost too much, in fact. From the beginning, it seemed likely there was an electrical malfunction, but since a Chinook has about as much wiring as an average small town, this is like saying the Sahara Desert could be turned into a profitable farm operation if you removed all its sand.

Anyway, the experts finally determined that the fuel valve circuit pins were being fouled by a small sliver of loose metal in a cannon plug connection. This is something no ordinary board

When you're looking for the truth, it's everybody's job to dig deep

would likely have found out in a month of Sundays. But the lengthy probe was worth every day it took. Everybody connected with the affair was left with the definite conviction that (a) there are times when only trained experts can come up with the final answer and (b) when an aircraft has a history of chronic heart trouble it should stay on the ground, no matter what the pressures, until a thorough inspection turns up what is wrong. After an airplane or helicopter has crashed and burned, or has been cannibalized, the job is that much harder.

Sometimes impossible, in fact.

THE LAST MILE

In the sad story of the sick Chinook, the board was savvy enough to call in people who are as trained to get at the bottom of an accident as Scotland Yard detectives are to find out who suddenly and without warning ushered Lord Haw Haw out of this vale of tears. But let's suppose the board had gone ahead on its own, leaped to the wrong conclusions, and its subsequent faulty report was refuted by a teardown analysis further along the line. Would it have been reconvened to turn in a supplemental report and maybe this time send out an SOS for help?

Based on the evidence, the unhappy answer is—probably not. All too few people understand the *absolute* necessity for followups in cases when initial findings are found to be somewhat less than the truth, the whole truth, and nothing but the truth. Once a board has finished its work—or thought it has—and has been disbanded, it is about as hard to get it back together again as it is to hold a full reunion of the Class of 1920 at Daniel Boone High School, Wistful Falls, Ky.

That's a pity, but it's just another side of the picture we've been describing—a picture which can be considerably brightened once everbody has a complete understanding of exactly how important full and correct analyses of the causes of

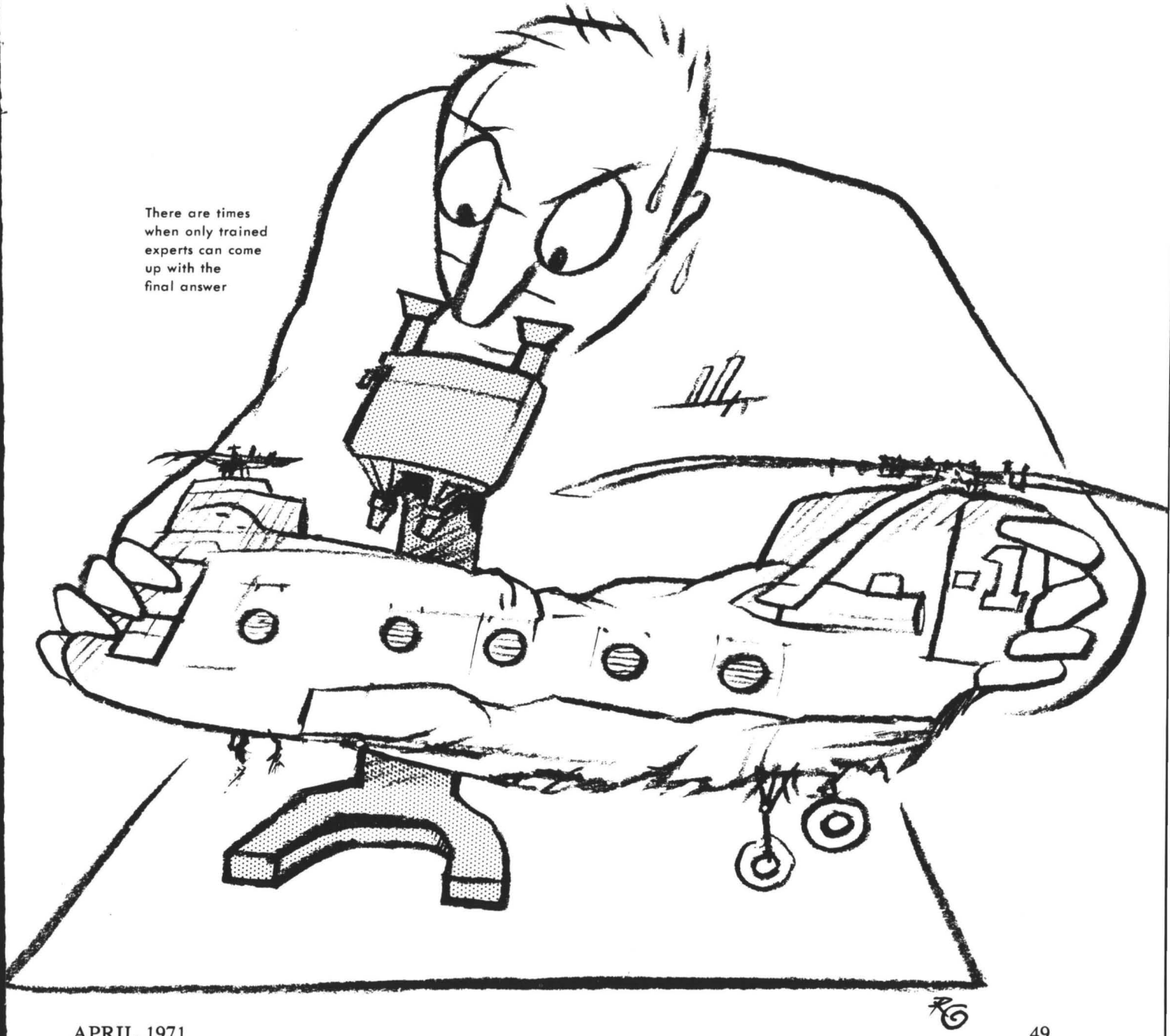
When instructions from above set a limited number of days to get the job done . . . there will be missing links in the final report

Army aircraft accidents really are, accompanied by sound recommendations.

How important? Well, that Chinook crash we were talking about cost in the neighborhood of $1,000,000. Answer enough?

Not exactly. Because of a chain of circumstances which can only be described as sheer Irish luck, nobody was killed in the crash, or even seriously hurt. Somebody could have been, though. It's a sorry fact that every month a few—and in this case one is too many—expert aviators and sterling men are being killed in preventable crashes. It's also a fact that while their own accidents *have* happened and *are* in the past, thorough-going investigation and reporting can help hold down the same sort of accidents from taking place in the future and claiming more lives.

Think about that long and hard the next time you are on an aircraft accident investigation board.



There are times when only trained experts can come up with the final answer

UNQUALIFIED TEST PILOT

AN OH-6A ON A night maintenance test flight crashed, killing the technical inspector aboard, injuring the pilot and mechanic and destroying the helicopter.

Pilot: "At approximately 2120, we conducted a test flight to determine if a high frequency vibration had been corrected. The technical inspector was in the left seat and the mechanic was seated in the back on the pilot's side. We were all strapped in and the technical inspector and I wore flight helmets.

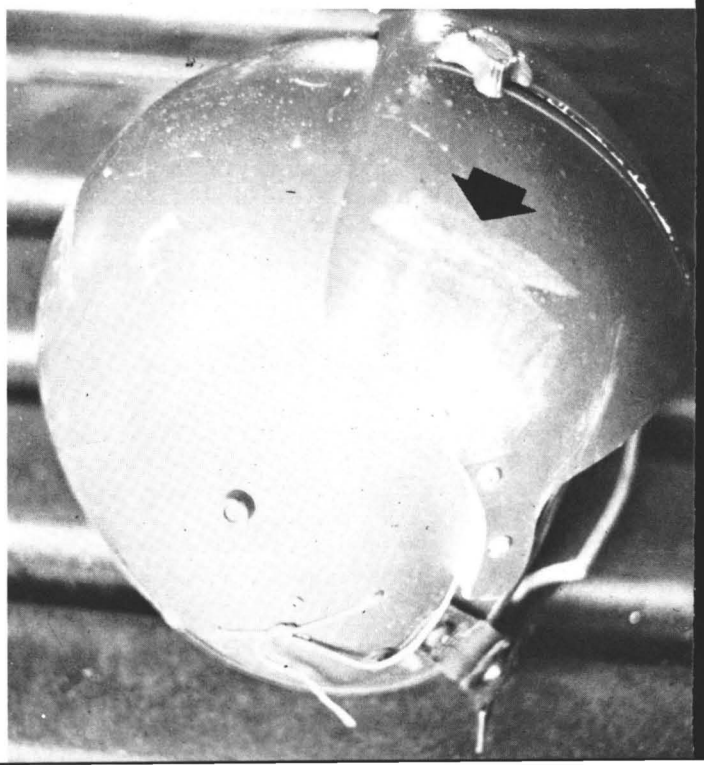
"After a normal start and check of all instruments, we hovered around the maintenance ramp. We did this for several minutes and determined a slight high frequency vibration was still present. We decided to check it in flight so I made a normal takeoff and flew about 10 minutes. The aircraft flew very well and the high frequency vibration did not seem to increase.

"We then returned to the maintenance ramp and began to hover again. I landed and picked up to a hover, testing the pedals and collective. During one pickup, I noticed a slight bind in the collective and discussed it with the TI. He said it was probably just the rod tightening and there should not be anything to worry about, so I set the aircraft down and started another pickup. At that moment the aircraft broke right and from then on I only knew that we were spinning on the ground. My first thoughts were to shut the engine off to stop the spin. This I attempted by rolling the throttle off and pulling the emergency fuel cutoff."

Analysis: "Upon pickup to a hover, the pilot failed to apply sufficient left pedal to compensate for the additional torque and started a turn to the right. He then caused the nose to come up, as the helicopter moved backwards and to the right, by improper application of aft cyclic, power and pedal. This caused the lower stabilizer and tail rotor to impact the ground, severing one blade, then shearing the tail rotor shaft and the aft section of the tail pylon. The helicopter then bounced forward while rolling to the left, striking and shearing one or more main rotor blades. It settled on its skids and, due to loss of the tail rotor and the imbalance in the main rotor system, began to spin rapidly and violently to the right for at least 12 revolutions before the right skid failed, rolling it partially on its right side where it made three or four more turns before coming to rest on its right side, 170 feet from the point of the initial main rotor strike. The engine was still running and the main rotor shaft was turning at this time. The fuel cells were not ruptured and there was no fire."

Flight surgeon: ". . . The fatality occurred when the main rotor blade struck the left side of the cockpit area with collapse of the front portion over the left seat and collision of the rotor with the occupant's head and neck. . . . The passenger was not wearing any protective equipment at all. Fortunately, he suffered only minor injuries.

"Although the lack of survival gear and insufficient quantities of Nomex flight gear did not contribute to injury or fatality, aircraft crews should always have all available safety and protective devices, especially in a combat zone. The unavail-



Pilot's lost helmet shows evidence of heavy blow

ability of adequate supplies of these high priority items can only be condemned.

"The pressures on a maintenance company in a combat zone are appreciated. However, if at all possible, test flights should be scheduled during daylight hours. All test pilots should be the most experienced available. Test flights should carry minimum crews. All aviation units must have all available safety and survival equipment and use it properly. Strict adherence to the basic principles of safety might have avoided much of the injury and death in this accident."

A check of his flight records showed the pilot had a total of 7.5 hours flying time in OH-6As and he had not completed his training in this helicopter.

Findings: "Supervisory error, in that the pilot was allowed to test fly an aircraft in which he was not qualified. The pilot lacked the experience and training to perform test flights at night in an aircraft in which he had so little flying time. He was, therefore, incapable of coping with the normal flight characteristics of the aircraft.

"Pilot error in that he performed the flight knowing he had not met the requirements of paragraph 11, AR 95-5, and Training Circular 1-34."

Recommendations: "That only the most experienced and mature pilots be used for the performance of test flights.

"That all test pilots be required to initially and periodically demonstrate their knowledge and proficiency in each type aircraft by means of examinations and checkrides with experienced test flight check pilots as designated by the commander.

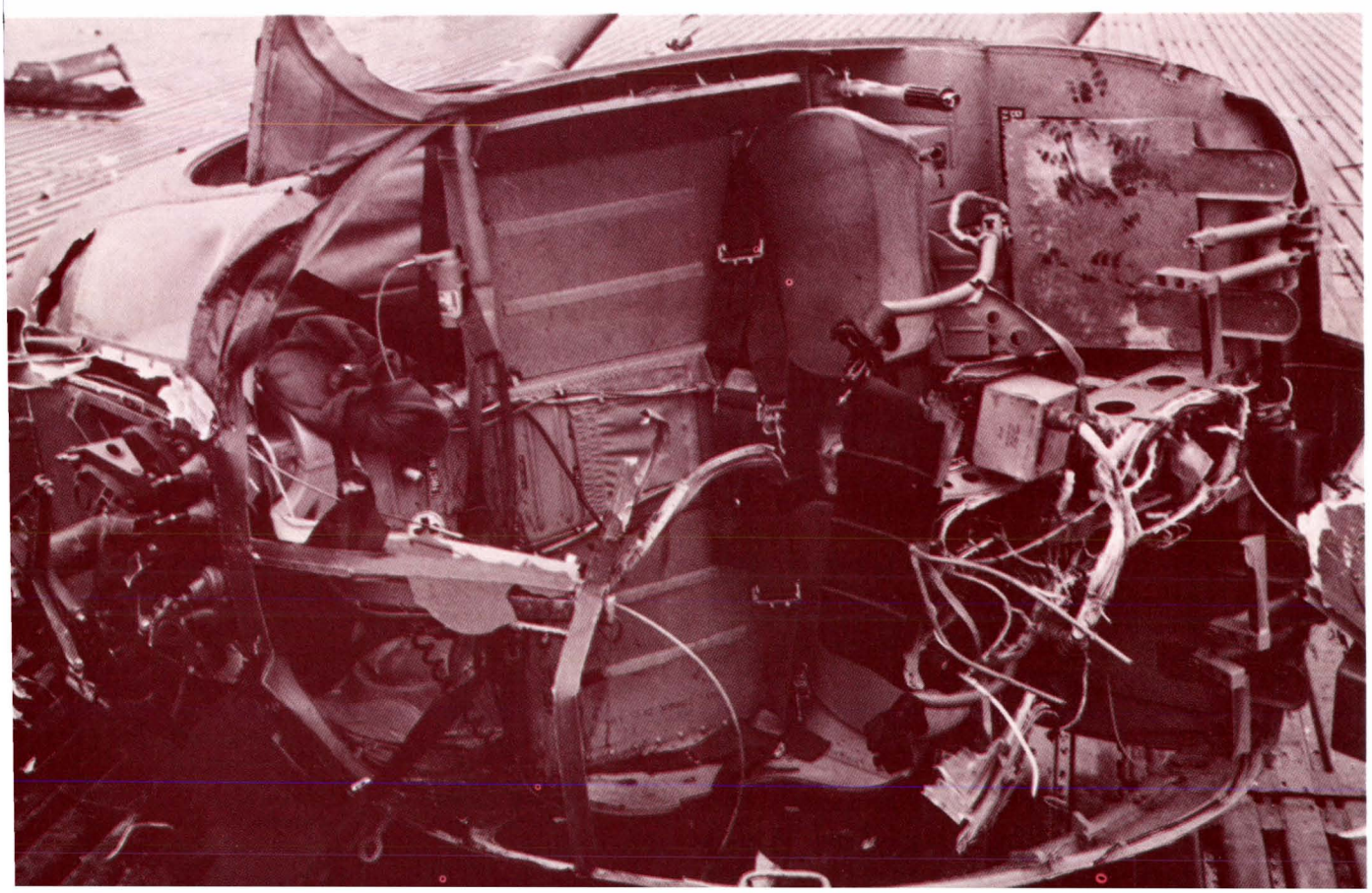
"That test flights be conducted under the safest possible conditions with a minimum crew consistent with operational requirements.

"That all participants in test flights be required to wear fire retardant clothing, gloves, crash helmets and use seat belts or other restraining devices.

"That action be taken to assign or reassign sufficient qualified and experienced test pilots to the company to perform necessary test flights in all types of aircraft supported.

"That test pilots be appointed on unit orders by type aircraft."

Cockpit area after crash. Pilot, seated on right, lost his helmet during ground gyrations and sustained scalp and face abrasions. Rotor blade struck and broke the ear protecting helmet flap of the technical inspector seated on left. Mechanic passenger, seated aft of pilot, had neither gloves nor helmet and sustained multiple contusions



". . . those charged with the responsibility for safety do not necessarily pay the consequences if safety supervision breaks down"

Lieutenant Colonel Richard F. Taylor
Aircraft Accident Review and Analysis Department
USABAAR

SUPERVISOR'S SPECIAL TRUST

INABILITY TO place credence on advice obtained from members of sister services seems to be prevalent among Army personnel. Since I am also guilty of this practice, I was shocked to discover that Colonel G. S. Stewart, commanding officer of Marine Aircraft Group 11, had so amply stated the case for safety supervision. COL Stewart wrote in one of his command messages:

"A successful safety program protects the people it involves, and the people involved also protect the safety program. Safety consciousness, the general awareness by all personnel, is the goal to attain. This is accomplished through supervision. The safety attitude must start from the top echelon and go through the entire chain of command. Here is the irony of the whole aspect of safety; those charged with the responsibility for safety do not necessarily pay the consequences if safety supervision breaks down. The young flight line mechanic or the sharp technician just out of school will pay the price in full for lack of proper and adequate supervision. Constant supervision and correction of safety discrepancies is the only way to keep these plane captains and technicians from those situations where they lose a limb, their vision or their hearing. Your people are concerned with doing their job, and will not practice safety unless you show them, not once, but every time a hazard shows itself, that you will not tolerate a violation of a safety rule.

"All too often the young Marine is ready and willing to take the chance and abandon his safety attitude so he can get his job done. It is the responsibility of those in supervisory capacities to temper the 'can do' attitude with experience and good judgment. How much is a young Marine's hand worth? If you push your safety program, those of responsibility will take this challenge for the protection of all concerned. To witness an unsafe act committed by strangers and correct it is hard to do. To not correct them is a flagrant violation of 'special trust and confidence.' You are a leader. Your decisions get the job done and directly affect the men below you. To ignore a situation that you clearly see as potentially dangerous disregards the responsibility placed upon you.

"The safety program depends on you. You either push it or you let it slide. It's your responsibility, and that young Marine will do whatever you decide."

One statement in COL Stewart's admonition stands out: ". . . those charged with the responsibility for safety do not necessarily pay the consequences if safety supervision breaks down." There has been repeated proof of the wisdom of that statement within the Army this year. At one installation, it wasn't until after the loss of a second Mohawk that supervisory personnel assumed their responsibilities. The second crew paid the full price. The board investigating the first accident had this to say about the supervisor: "The assignment of the pilot to conduct this flight was a serious management error." Here are the facts of both accidents. You decide if the supervisor had been a safety leader.

Accident number one: An OV-1 crashed while the pilot was conducting a maintenance test flight. The pilot and technical observer ejected successfully at low altitude. The pilot was hospitalized

When it has been determined that pilots have not had the benefit of a supervisor who knows and assumes his safety responsibility, pilot error may well be the result of supervisory error

with back injuries and the observer was examined and released for duty. Investigation revealed the pilot was following a worksheet that outlined each maneuver to be performed.

The particular maneuver prior to the crash was a clean configuration stall. As the OV-1 stalled, it fell off on the left wing and entered a nose low attitude. This configuration resulted in a spin to the left. As it continued, the spin became tighter as the pilot attempted recovery procedures. He later described the maneuver as a spiral, yet the procedures used by him to recover were improper to effect normal spiral recovery, i.e., level the wings, reduce power, gradually level the aircraft. In fact, the pilot applied right stick and right rudder, reduced power, then quickly reapplied power, greatly aggravating the spin condition. After realizing the airplane was in uncontrolled flight, the pilot told the observer to eject. Both occupants ejected approximately 500 feet above the ground, landing 100 to 150 yards south of the airplane, which exploded and burned on impact.

The pilot stated he had experienced no flight control problems prior to entering the spin. Flight control systems failures at the scene appeared to have been caused by overstress from the impact forces. However, the flight control systems were recovered with great care to prevent further damage and checked in accordance with applicable manuals. No discrepancies were found.

Weather was a factor in the accident. The ceiling allowed between 3,000 to 4,000 feet to conduct the test flight. This limitation in altitude would seriously endanger the test flight with some maneuvers outlined on the worksheet.

Investigation disclosed that the pilot experienced a self-induced control problem that placed the airplane in an attitude from which he had neither the training nor experience to recover. It was further learned that the pilot did not recognize a spin for what it really was, nor had he any training in spin recovery techniques. He obviously was in a situation that he could not cope with. The election to eject was at the last possible moment. In all likelihood, there would have been no survivors if the ejection had been delayed an additional second.

The assignment of this pilot to conduct the test flight was a serious management error. Flight responsibility at this installation was shared. Maintenance operations fall under one supervisor. There were two OV-1 rated aviators within the maintenance section at the flight line. One was the chief. However, he was TDY the week of the accident. The next senior individual and the only other OV-1 aviator was the pilot of the crashed airplane. He completed fixed wing qualification training about a year before the accident, but had no fixed wing time to speak of when he completed OV-1 transition training. On his next assignment, he flew OV-1s for approximately 100 hours over a 3-month period.

He arrived at this installation and, on the basis of an interview, was assigned to the maintenance section. He was not a school-trained maintenance officer and had flown approximately 8 hours at this installation prior to the crash. He had less than 200 OV-1 hours, of which approximately 75 were flown during transition. Yet, directly across the hangar from the maintenance section, under different supervisors, were 20 OV-1 aviators. One of these had logged more than 2,000 hours in OV-1s. Another had more than 1,000 hours and the remaining 18 had logged an average of 700 OV-1 flight hours. There was an abundance of aviators qualified to conduct a maintenance test flight, without relying on the most inexperienced aviator assigned.

The investigation did not substantiate that the pilot entered inadvertent IFR conditions. However, it is extremely probable that a more experienced OV-1 test pilot with his knowledge of Army regulations pertaining to propeller feathering below 4,000 feet above the terrain would have elected to postpone the test flight, particularly

under the rapidly deteriorating weather conditions present.

Accident number two: A pilot with approximately 200 OV-1 hours was on an OV-1C VFR night mission to train enlisted technical observers in the use of special equipment. The syllabus of instruction defined a specific flight pattern to be flown at 2,000 feet AGL during the period. After flying 50 minutes, the pilot called the tower, reported inbound over a predetermined checkpoint in the mission profile and requested landing instructions. Instructions were given and the pilot acknowledged. Fifty seconds later, he called "MAYDAY, MAYDAY" and reported losing fuel pressure and power. He followed this by reporting all power lost. The tower operator then transmitted, "What is your position? Can you make my location?" The pilot replied, "Negative, cannot make your location. My position is 5 miles south of checkpoint."

The tower made several more unnecessary transmissions, all answered by the pilot. Seconds later the pilot transmitted, "This is it! Get out! Bail out!" No further transmissions were heard. Search and rescue procedures were immediately initiated by tower personnel, but the airplane was not located until the following morning. It had crashed approximately 15 miles north of the installation. The two crew members were killed.

Investigation at the scene revealed the airplane impacted in a nose low, wing level attitude at an approximate 70-degree angle. Impact forces were severe. The observer ejected milliseconds before impact. Due to the attitude of the airplane and lack of altitude he was ejected parallel to the ground at about 5 feet. Although his ejection equipment functioned normally, he struck the ground 120 yards ahead of and in line with the flight path, just as seat separation occurred. The pilot had not activated his ejection seat.

Close examination of the wreckage revealed that neither engine was delivering power at impact. Both propellers were bent backward, indicating they were windmilling when the airplane hit the ground.

There was no evidence of fuel spillage from the main fuel cell area. Both tip tanks ruptured and spillage evidence in the sand indicated a considerable amount of fuel remained in the tanks at impact. The fuel selector switch was found in the "transfer" position. However, it was determined the selector switch was placed in this position after the emergency was declared, based on the large fuel spillage patterns found in the areas of the ruptured tip tanks.

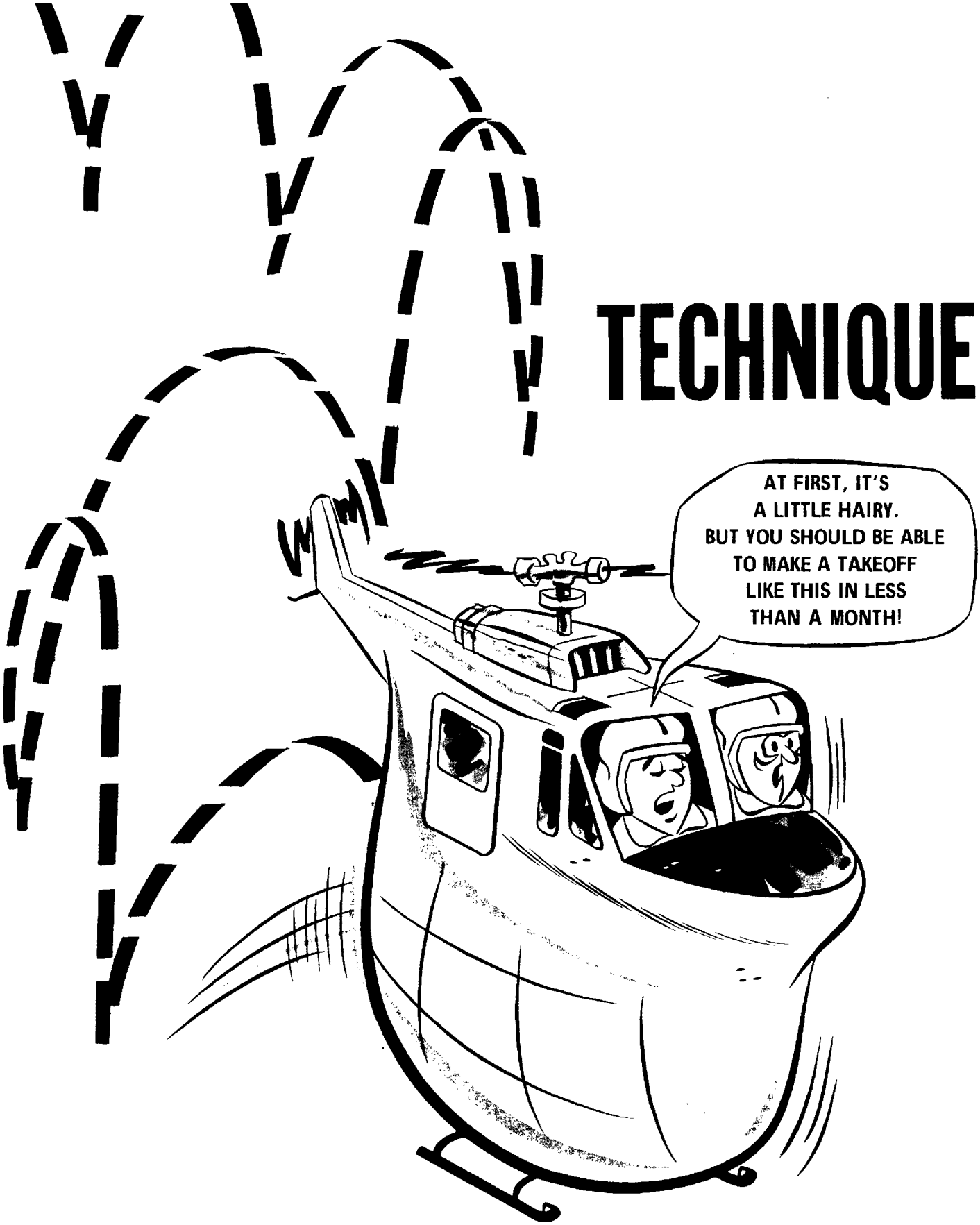
From the time the emergency was declared, it was estimated, by use of the tower tape, the pilot had approximately 50 seconds to eject. However, most of this time was consumed in useless communications by the tower operator. This does not imply the pilot had to reply to these communications. The point is that he did take time to respond. This distraction made successful ejection impossible. After analyzing the tower tape, investigators concluded the decision to eject and the command to eject by the pilot appeared as afterthoughts. The pilot was found in his seat just forward of the wreckage. Clasped firmly in his right hand was the top of the control stick. From examination of the pilot by a flight surgeon, it appeared he was attempting to activate his ejection system with his left hand when the airplane crashed.

The board determined the dual engine failure was caused by fuel starvation. Subsequently, the board discovered there was no standard procedure relative to the transfer of fuel at this installation. Several other pilots stated they sometimes transferred fuel from the start of the flight, but at other times waited until the main cell was down before starting transfer. No real reason was given—just the personal whim of individual pilots.

Supervisory errors in this accident were similar to those in the first accident 5 months before. This time, the board discovered the orientation and training the pilot received prior to becoming operational was substandard. There were other established and contributing causes given by both boards for these two accidents.

These accidents are presented here as living examples of what COL Stewart was attempting to guard against in his command message when he stated: ". . . those charged with the responsibility for safety do not necessarily pay the consequences if safety supervision breaks down." The young and not so young Army aviator will sometimes attempt to do more than he is capable of successfully accomplishing. The supervisor must assume the responsibility for the failure of his command. Pilot error is a command failure. When it has been determined that pilots have not had the benefit of a supervisor who knows and assumes his safety responsibility, pilot error may well be the result of supervisory error. The supervisor's special trust is the correction of safety errors before the fact.

TECHNIQUE


AT FIRST, IT'S A LITTLE HAIRY. BUT YOU SHOULD BE ABLE TO MAKE A TAKEOFF LIKE THIS IN LESS THAN A MONTH!

CW3 Leroy B. Spivey
Aircraft Accident Review and Analysis Department
USABAAR

OR LACK OF KNOWLEDGE?

THROUGH THE early morning haze flight crews were going through their daily rituals, getting ready to fly. Aircraft commanders were leaving operations to return to their ships. I was standing next to one of the Hueys when I overheard the aircraft commander tell his crew their mission was a snap. He said the mission would be an ash and trash resupply to one of the border outposts. Shortly after the crew completed its preflight, a truck drove up with the load they were to carry. The aircraft commander looked at the load and said, "This looks like a three-load mission. With a 1-hour turnaround time, we'll miss chow and they've got the best chow around at that outpost. If we stack the cases right, we could probably make it in two trips."

While the UH-1 was being loaded, the aircraft commander left the flight line to have a last cigarette before the flight began. On his return, he signaled the copilot to strap in and get ready for takeoff. During the engine start and runup procedure, he looked back to see if the crew chief and gunner were ready. All he could see were the cases.

With the runup completed, the aircraft commander picked up to a hover. The rpm promptly bled to 5900 and the helicopter settled back to the ground. Again, he picked it up, this time with a little more care. The rpm bled to 6000 and the UH-1 again settled to the ground. The copilot said, "Maybe we do have too many cases aboard." The aircraft commander smiled and replied, "This is where technique comes into play. I've handled situations like this more than a hundred times!"

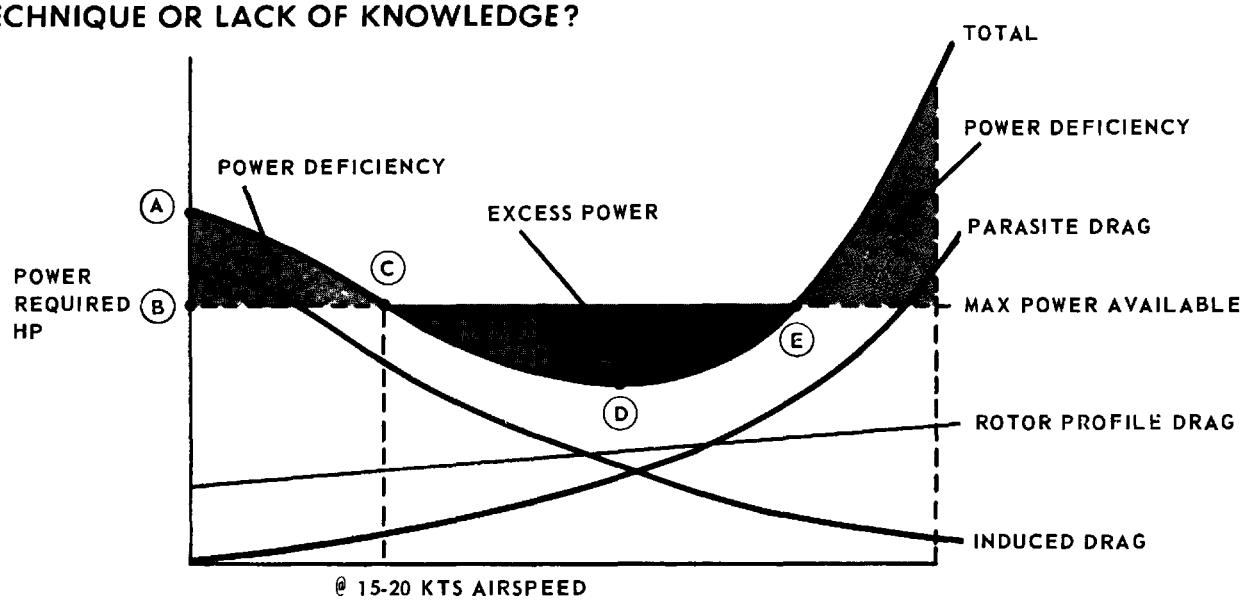
After several tries, the aircraft commander finally repositioned the helicopter on the runway. The takeoff down the runway looked like a frog trying to make it back to its pond. The helicopter skidded along the ground, periodically becoming airborne, then settling back to the ground. Finally, it staggered into the air just before they reached the end of the runway. The aircraft commander adjusted cruise power and began to explain to the copilot the high points of the maneuver they had just performed. "At first, it's a little hairy. But you should be able to make a takeoff like that in less than a month."

The en route portion of the trip was uneventful, though it took a very high power setting to maintain straight and level flight. The crew joked with each other as the aircraft commander navigated toward the outpost. The sun had burned away the haze, and the outside air temperature had increased from 26 degrees C. to 30 degrees C. It was becoming another hot and dusty day.

The aircraft commander pointed to a small ridgeline. "There's the outpost down there at 10 o'clock." It was at the edge of what appeared to be remnants of an old wornout mountain. Visibility was excellent and the helipad had been recently peneprimed, so there was no sweat about dust. With these factors in his favor, the aircraft commander briefed the copilot on the type of approach he would use to make the pad without overshooting, or having to come to a hover and reposition.

Although the aircraft commander planned and explained his approach, he failed to consider the problems he'd had during takeoff. The approach appeared to be a beautifully executed steep one. As he entered the final phase, the aircraft commander flared and applied collective to slow his rate of descent. The helicopter began to shudder and vibrate. The aircraft commander sensed an emergency and attempted to make a go-around. As he added a little more collective, the copilot cried, "We're losing rpm! It's down to 5800!" At this point, control was lost and the helicopter

TECHNIQUE OR LACK OF KNOWLEDGE?



crashed on the side of the ridgeline, killing the crew chief and gunner and seriously injuring the other occupants.

This is one example of many similar accidents reported each year—all due to OVERGROSS CONDITIONS. This condition is responsible for the major portion of pilot error accidents reported. Though many of the mishaps appear in crash facts messages as main rotor or tail rotor blade strikes, close analysis reveals many blade strikes resulted from uncontrollable conditions caused by loss of rpm.

Pilots involved in accidents and mishaps of this type usually complain to maintenance that their engines gave them poor performance at the moment of truth. When maintenance personnel ask, "What was the percent N1, OAT, EGT and torque?" the pilot usually answers, "I was too busy with the emergency to look."

A rotor system will only produce so much lift. Once the system attains this lift, any further demand for additional lift will result in a loss of lift. The question might arise, "How did the helicopter in the accident described ever become airborne in the first place?" The accompanying diagram will help to explain.

When a helicopter is picked up to a hover, as soon as it passes point B on the power required side of the graph (maximum power available), it enters a power deficiency range and a loss of rpm will result. However, in an overgross condition, the helicopter can be taxied on the ground to attain sufficient air speed to reach translational lift. Once this point (C) is reached, it takes less power to maintain flight. As the air speed is increased up to point D, power required reduces proportionally. From point D to point E, as air speed increases, more and more power is required. Beyond point E places the helicopter right back in a power deficiency range. During landing, this process is reversed. If the pilot does not have an area where he can touch down at, or near, the speed at point C, he will end up in a power deficiency range with a loss of rpm.

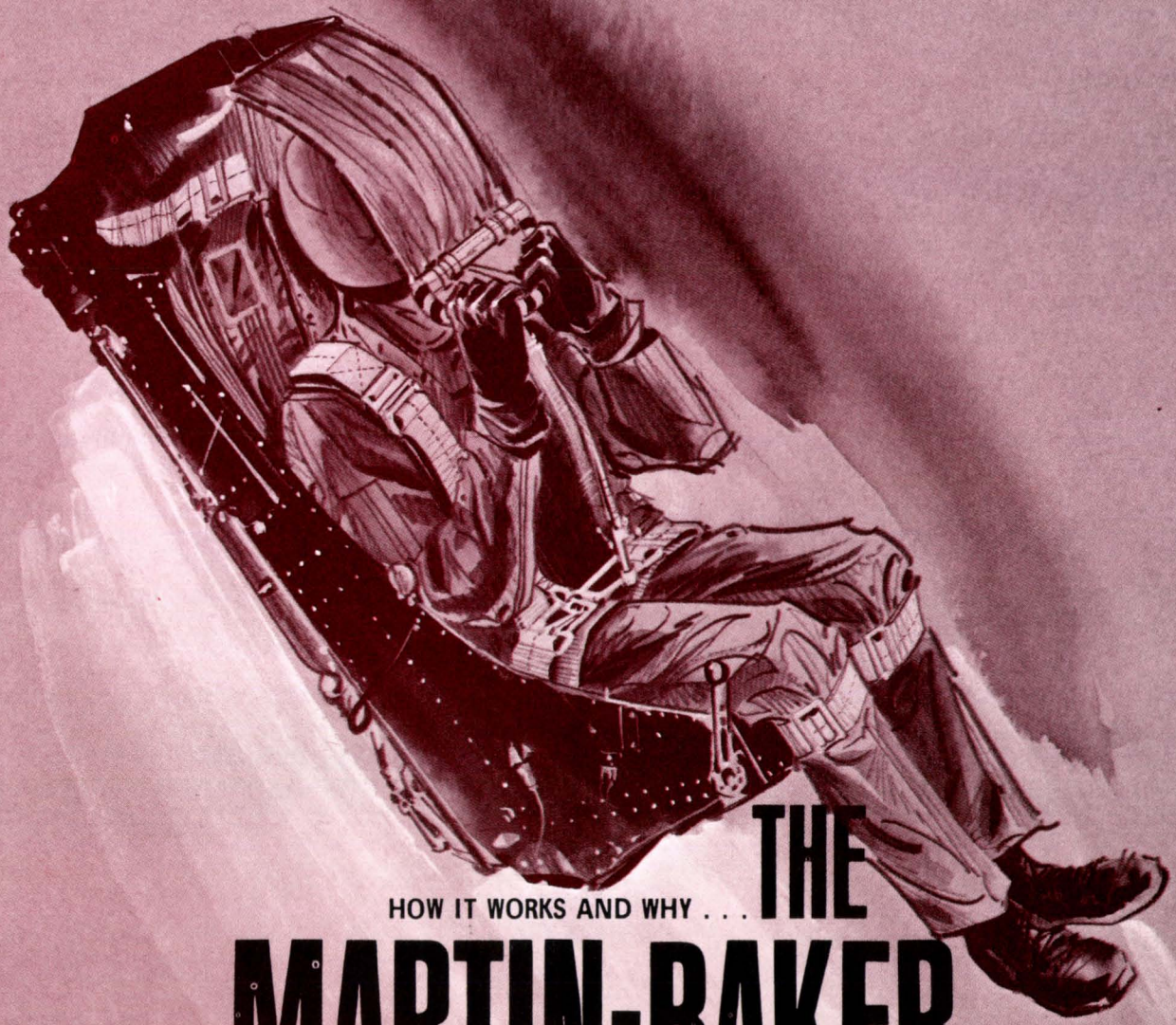
To maintain flight, an airplane must maintain sufficient air speed and a helicopter must maintain rpm. The helicopter, like all other mechanical devices, obeys the laws of physics religiously. Judging from the number of accidents and mishaps we are experiencing from operating in overgross conditions, it appears many aviators don't understand rotary wing performance. Those who attempt to develop what they call techniques to cope with impossible situations are accidents waiting to happen.

The best insurance for staying out of overgross conditions is to know the factors that affect rotary wing performance. They are load/weight, type aircraft, prevailing atmospheric conditions and terrain. Once an aviator has a basic knowledge of his helicopter's performance, he can adequately plan the loads that he can carry in existing atmospheric conditions. There is no excuse for getting caught in a power deficiency range as a result of overgross conditions. But as long as we have aviators who try to accomplish their missions by substituting techniques for available lift, statistics will continue to show a high number of overgross accidents and mishaps. Are *you* asking *your* helicopter to defy the laws of physics?

FT. WOLTERS, TEXAS—Army aviation's Broken Wing Safety Award was given Chief Warrant Officer William H. Bernard at the Army Primary Helicopter School, where he is an instructor pilot. His flight department director, Lieutenant Colonel Fred W. Pierce (left), made the presentation. Bernard was cited for extraordinary flying skill, judgment and technique when he had an engine failure at 350 feet during climbout from a simulated forced landing. He made a 270-degree turn and autorotated to the only available landing area, a field with numerous ridges surrounded by trees, landing with no damage. His award was signed by Brigadier General William J. Maddox Jr., director of Army aviation.

The 22-year-old Army aviator came here last May from a combat tour in the Republic of Vietnam with the 1st Cavalry Division (Airmobile). His decorations include the Bronze Star Medal and the Air Medal. Bernard is the son of Mrs. Ralph Walden, 2621 Gallinghouse St., New Orleans, La. A 1967 graduate of Behrman High School, he attended the University of Southwest Louisiana before entering the Army in 1968. He and his wife Brenda (daughter of Mr. and Mrs. Frank Verdin, 2100 Claire Ave., Gretna, La.) reside in Fort Worth, Tex.

BROKEN WING AWARD



HOW IT WORKS AND WHY . . .

THE MARTIN-BAKER J-5 EJECTION SEAT

SP5 Danny W. Daron
Aircraft Accident Review and Analysis Department
USABAAR

THE FOLLOWING IS an actual happening, quoted from the pilot. "I was scheduled to fly a special OV-1 night mission. The weather in the area was marginal so I delayed my takeoff. At 1930, I called control for the weather in the area where my mission was to take place. Based on the forecast, I decided to start my mission.

"Preflight, takeoff and climb were no different than any other mission I'd flown lately. At my correct altitude in the mission area, I trimmed up and went on autopilot. Control requested a PIREP of the weather in the area and I gave it to them. My observer then informed me the SLAR system was not working. I instructed him to use his airborne system. He acknowledged, but then found it was also inoperative.

"Between these actions, I had requested control to keep me advised of the weather. They issued a severe weather warning and said my home base advised me to return. I requested control to vector me into an area of light weather. Approximately 15 minutes later, I heard a grinding noise. I took the airplane off autopilot. I checked my instruments and everything appeared normal except the amp gauges were above 150 amps. This was approximately 50 amps above normal. Two minutes later, the amp gauges fluctuated from 0 to 450 amps. I smelled burning wires and saw smoke appearing in the cockpit. I informed control about my condition and requested a radar vector to the nearest VFR condition. Control gave me a heading of 200 degrees and told me to descend from 7,000 to 5,000 feet.

"My observer shut down the SLAR system as I switched inverters to emergency and checked my generators. Our condition had not improved. Smoke was steadily filling the cockpit. I told contol I would be off the air a moment while I turned off my radios, hoping to isolate the fire. The smoke in the cockpit continued and I turned my radios back on, reestablishing radar and radio contact with control. My observer asked if we might have to eject. I told him no, not at that moment. Shortly thereafter, the attitude indicator showed us starting in a dive. I cross-checked my air speed, altimeter and vertical velocity. All instruments verified a wings-level dive. I tried to recover with the control stick, but there was no response. The rate of descent continued to increase.

"I decided to eject, since I could not regain control. I notified control and told my observer to eject. After he ejected, I rechecked my instruments and the vertical velocity was 4,500 feet per minute. At this time, I left the airplane because I could not regain control and had only 3,500 feet of altitude remaining. The ejection seats performed their jobs perfectly. We were picked up only a few hours later. My observer had no injuries and I only had two riser burns on my neck."

Many articles have been written about ejections and the pilots who have made them during their moments of turmoil, but very little has been written about the seat itself and the men who perform the maintenance on them.

Modern aircraft make extreme demands of emergency escape devices. The Martin-Baker J-5 ejection seat has done its part well in supplying the OV-1 with an efficient escape device. Of a total of 80 ejections from Army OV-1s, not a single fatality was caused by seat malfunctioning. Equally outstanding is the maintenance record. Only one fatality can be attributed to a suspected maintenance error.

The most critical time for ejections is at low altitudes, especially during takeoffs and landings. With the Martin-Baker J-5 ejection seat in the OV-1, ground level ejection at 100 knots indicated air speed is possible. The occupant need only pull a face blind and the seat does the rest. The J-5 ejection seat incorporates such features as completely automatic operation at high and low altitudes, automatic separation of the occupant from the seat and automatic deployment of the personnel parachute.

While the J-5 ejection seat is fully automatic, it incorporates a secondary manual override system in case the automatic system malfunctions. It contains four cartridges, two percussion and two heat-type firing cartridges. Together, they propel the seat and occupant clear of the airplane at a velocity of approximately 83 feet per second to a height of approximately 60 to 80 feet, placing approximately 16-18 g's on the spine of the occupant. These vary with each ejection, depending on attitude, air speed, altitude and occupant weight. The J-5 contains two automatically deployed drogue chutes, 22 inches and 5 feet in diameter, which control and stabilize the ejection seat and occupant during ejection. It contains an automatic time release mechanism which separates the occupant from the seat and also releases the 24-foot personnel parachute. For high altitude ejections, it has an automatic emergency oxygen system which supplies the occupant with a 10-minute supply of oxygen.

There are four phases, or steps, which take place during actual operation of the J-5 ejection seat. For a ground level ejection at or above 100 knots indicated air speed, these are:

MARTIN-BAKER J-5 EJECTION SEAT

The first thing to take place is phase one, *clearing the airplane.* Phase one actually starts with the occupant pulling the face blind or secondary handle. This action fires a primary cartridge in the ejection gun. This cartridge, in turn, ignites two other auxiliary cartridges in the gun as the ejection seat and occupant start to leave the airplane. With these three cartridges firing, there is sufficient thrust to clear the airplane and attain the necessary height.

As the seat initially moves upward, the leg restraint cords pull the occupant's legs together and his back against the seat to prevent injury by any part of the airplane, such as the eyebrow panel in the OV-1. Also, in phase one, the automatic oxygen system attached to the seat is fired on the upward travel of the seat out of the airplane. The elapsed time for phase one is approximately 1 second.

Phase two involves *stabilization and deceleration.* One second after the seat and occupant leave the airplane, a drogue gun fires a metal piston which deploys a 22-inch controller drogue parachute. The controller drogue parachute deploys a 5-foot stablizer drogue parachute out the head box located on top of the seat. These two parachutes act to decelerate and stop the rotation of the seat in preparation for the deployment of the personnel parachute and separation of the occupant from the seat. The elapsed time for phase two is 1 to 1.75 seconds.

Phase three includes *personnel parachute deployment and seat separation.* Within 1.75 seconds after ejecting, a time release mechanism releases the personnel parachute and all attaching points of the occupant to the seat, such as leg restraints, lap belt and loop strap (the loop strap being part of the inertia reel). Temporary restraint for the occupant in the seat is maintained, after the three points are released, by two spring-loaded sticker clips. These prevent collision with the seat during the separation process and ensure positive separation of the occupant from the seat when the jolt of the personnel parachute opening occurs. This opening shock overrides the clip tension, allowing clean seat and occupant separation. The elapsed time for phase three is 1.75 to 3 seconds.

The last phase is the one all pilots who eject look forward to—*safe and normal descent.* The 24-foot parachute further decelerates the occupant until ground contact is made. The elapsed time for phase four is approximately 3 to 6 seconds. This is a normal sequence of a ground-level 100-

knot ejection. The four phases will be the same, but the time may vary during ejections under different circumstances.

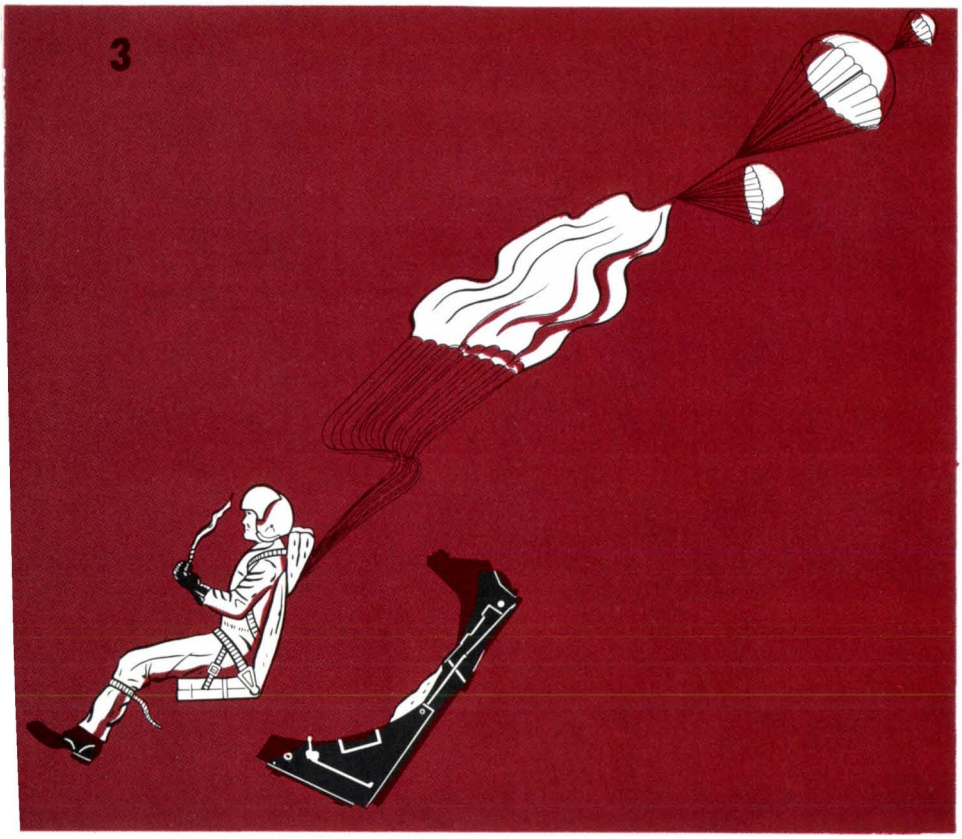
For survival, the seat contains a survival kit under the seat pad assembly which descends with the occupant until ground contact is made. The three kits used in the OV-1 are cold climate, hot climate and overwater. The overwater kit, for example, contains a one-man raft, water, food, tarp, dye marker, shark repellent and other items vital to water survival. Other survival gear may be worn by the seat occupant in a survival vest.

Since the J-5 ejection seat is not maintenance-free, it takes trained personnel to keep it in shape to perform its vital job. Personnel are trained for ejection seat maintenance at Ft. Eustis, Va. This course is approximately 5 weeks long. Other OV-1 maintenance courses, incorporated throughout the Army system, also teach the J-5 ejection seat to OV-1 crew chiefs.

To make you familiar with the normal day-to-day job of the ejection seat specialist, you must understand the required maintenance of the seat itself. Every 30 days a visual inspection of lines, safety lines, covers, parachutes, etc., is made. A complete and thorough inspection is made every 90 days. During this inspection, the seats are removed from the airplane, brought into the seat shop and torn down to the frame and bucket assembly. All three parachutes are removed, dried, inspected and repacked. Cartridges are checked for expiration and damage. The time release mechanism and drogue gun are timed, spring-checked and pressure-checked for accurate tolerances. All survival gear is removed, inspected and repacked. If an overwater raft is included, it is inflated and checked for leakage.

After reassembly and rigging, the seat is inspected again for any possible mistakes made during reassembly. This is called the preinstallation inspection and it is accomplished by the seat specialist.

After the seat is reassembled, inspected and all requirements met, it is taken to the airplane where it is installed and armed. Here again, another inspection is made by the specialist. This is called the after-installation inspection. It is another check to ensure that all trip rods and leg restraints are connected and no possible errors made. After all these checks are made, the seat comes under the scrutiny of the TI for his further inspection and approval. As you can see, the ejection seat specialist is constantly rechecking his work. He must be sure his work is right because his work and the J-5 ejection seat have a vital job—to save lives.



USAASO Sez

The U. S. Army Aeronautical Services Office discusses

A Voice For Army Controllers: Do you know that you can participate in the development of air traffic control procedures? No. Can you stand one more acronym? Let's risk it. It's called COPCOM. What is COPCOM? It stands for "Controller's Operations/Procedures Committee."

The Federal Aviation Administration established the COPCOM program to encourage the participation of controllers in the development of air traffic control procedures through organized collection of views and recommendations directly from representative groups of working level controllers.

With the belief that COPCOM can be a tool with which the ATC system can be improved, USAASO has organized an Army COPCOM consisting of the following members:

MSG Eugene H. Thaden—Autovon 886-3831
Office of DARR, FAA *Central Region*
601 East 12th Street
Kansas City, Mo. 64106

MSG Stephen C. Drown—Autovon 938-3696
Office of DARR, FAA *Eastern Region*
Federal Bldg, JFK International Airport
Jamaica, N. Y. 11430

MSG Dewey M. Jackson—Autovon 431-1767
Office of DARR, FAA *Southern Region*
P. O. Box 20636
Atlanta, Ga. 30320

SFC Joseph B. Bateman—Autovon 733-1496
Office of DARR, FAA *Southwest Region*
P. O. Box 1689
Fort Worth, Tex. 76101

MSG Rlyn L. Pitt—Autovon 898-3875
Office of DARR, FAA *Western Region*
5651 W. Manchester Avenue
Los Angeles, Calif. 90045

If you have any ideas on how procedures or phraseology can be improved, contact your regional representative. He will present your suggestion to the regional COPCOM for consideration and dispatch to FAA for presentation at the national COPCOM meeting.

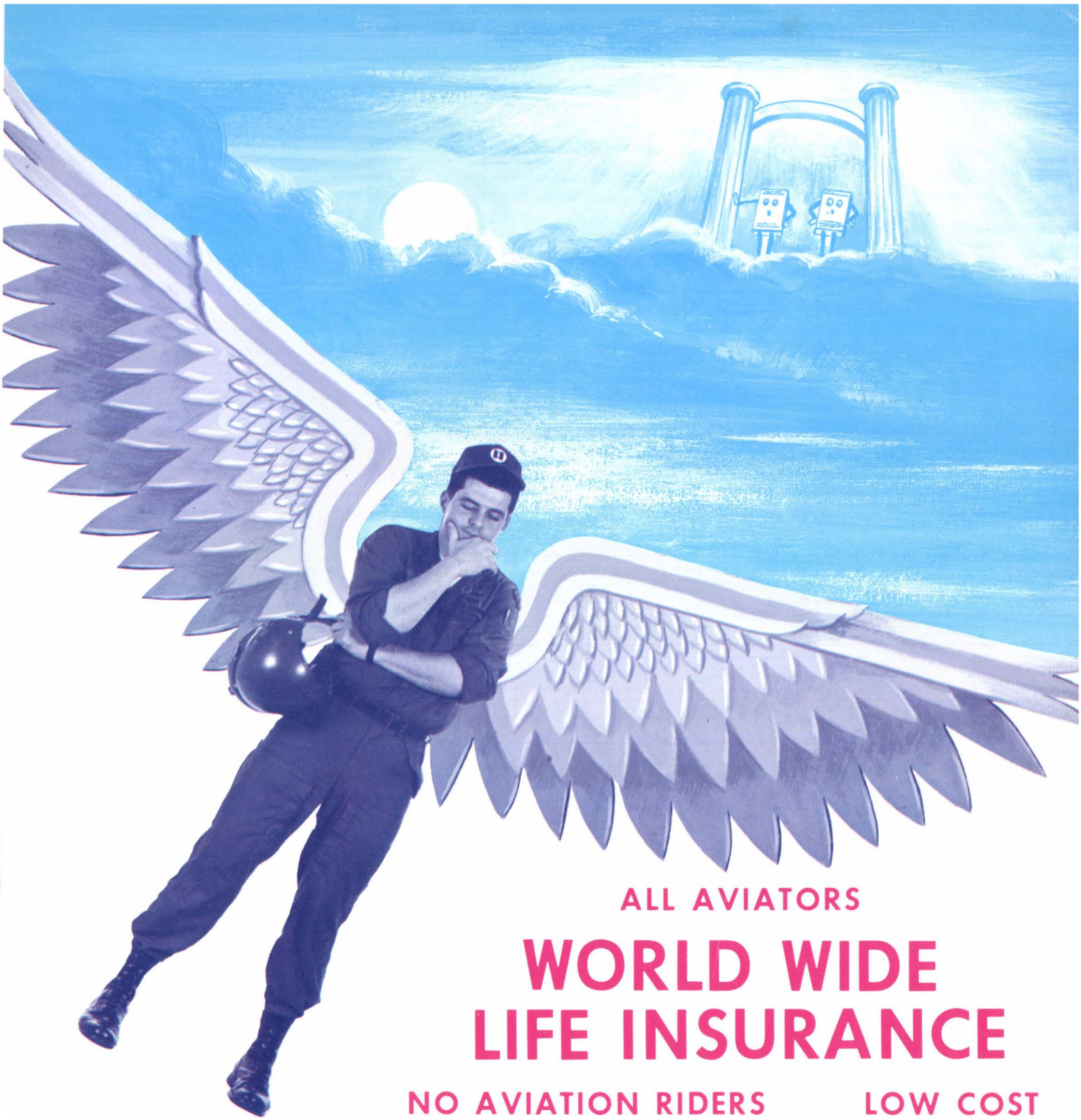
Here's your opportunity, controllers! Let your regional representative hear from YOU! By the way, the regional COPCOMs are meeting this month. Don't let your suggestion/recommendation be left out.

FLIP Procurement Procedures: There seems to be some confusion as to procurement procedures for Flight Information Publications (FLIP). The first step in obtaining FLIP is to refer to AR 95-14 and the DOD Catalog of Aeronautical Charts and Flight Information Publications to determine quantities of FLIP your activity is authorized to receive. Then contact the Director, U. S. Army Aeronautical Services Office; ATTN: AI Division; Cameron Station, Alexandria, Virginia 22314, by letter containing justification for the specified number of FLIP. Telephone requests also may be made by calling Autovon 224-7773/4 or commercial OX4-7773/4. However, if a phone call is made, we need a follow-up letter containing justification before an automatic distribution account can be established.

A lead time of 30 to 45 days is needed on requests for FLIP since this office does not physically make distribution but controls distribution through the Aeronuatical Chart and Information Center (ACIC) in St. Louis, Mo. They, in turn, make initial distribution and contact publishing contractors to set up automatic distribution for the requesting activity.

To reiterate, this office *controls* distribution but does not physically make distribution. Consequently, in order for us to provide better service and more expeditious processing of requirements, notify us at least 30 days prior to any change. Any correspondence affecting your account should contain the ACIC account number which appears on the address label outside of the envelope or box in which FLIP are received. As an example: A12345.

If further clarification is needed on procurement procedures, please do not hesitate to contact us at the above address or telephone number.



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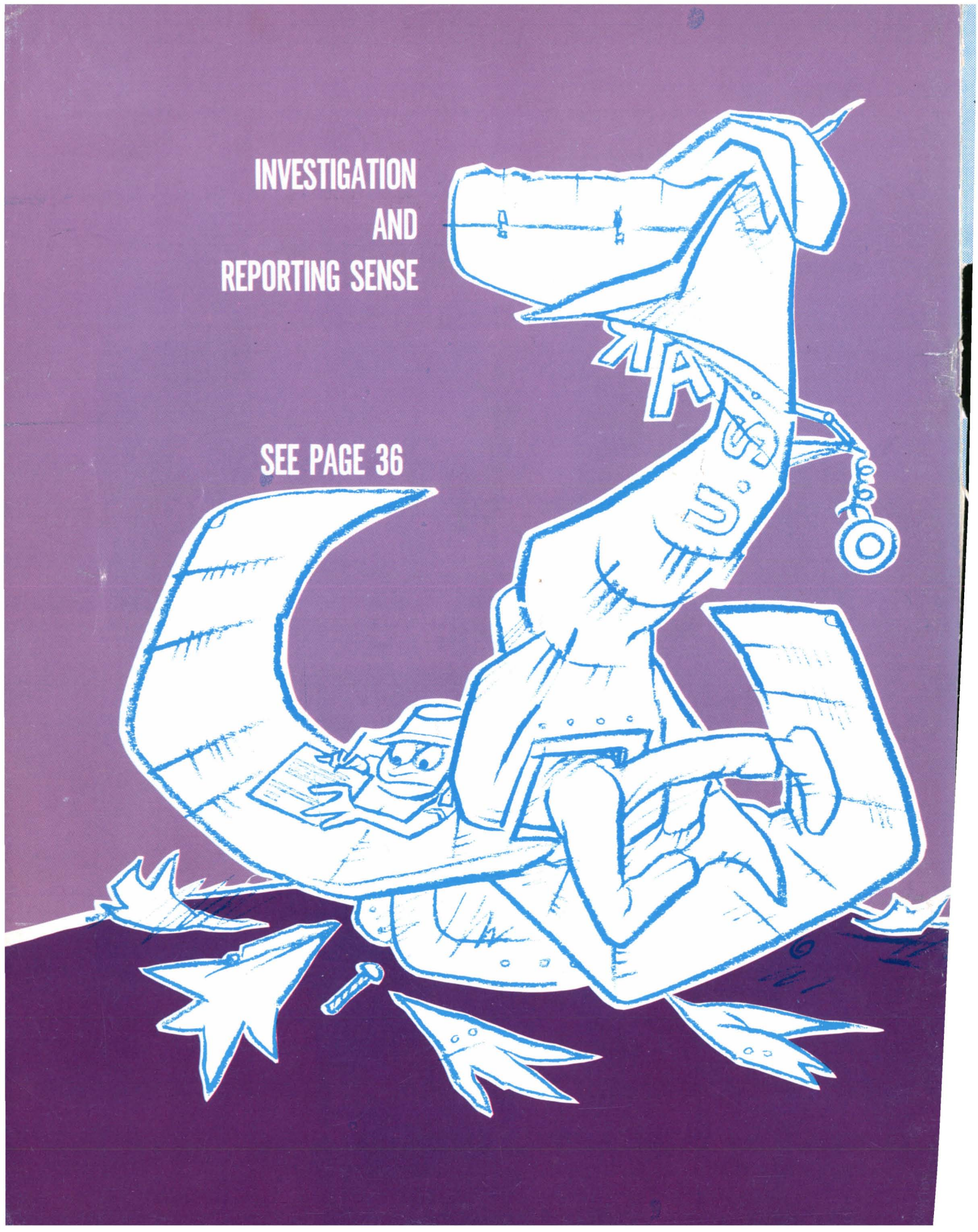
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