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FEBRUARY 1969

AVIATION DIGEST

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UNITED STATES ARMY AVIATION DIGEST

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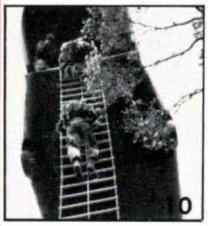

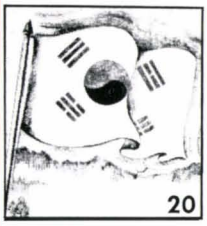

FEBRUARY 1969 VOLUME 15 NUMBER 2

VIEWS FROM READERS 1
EXCEDRAIN HEADACHE #7,000 2
MAJ Alvin W. Cartwright
NONAEROMEDICAL EVACUATION CREW 6
CPT John D. Colvin
AIRMOBILE STYLE — RAPPEL AND TROOP LADDER 10
COL Kenneth D. Mertel
FIREFLY TACTICS AND THE CARDINAL RULES 14
CPT Glenn A. Smith II
LET US NOT GIVE UP THE FLARE, CW2 Bobby D. Smith 17
TEAM EFFORT, MAJ Warren R. Silva 18
INSTRUMENTS IN THE ROK, CPT Robert D. Chaplin III 20
OVEREAGERNESS, LT Dana D. Evans 22
RELATIVE WIND SENSOR 24
A WINK, A NOD AND A SMILE 28
MAJ Donald J. Mascia
THE BEGINNING OF A TEAM 32
MAJ Charles H. Miller
CRASH SENSE 36
A PILOT LOOKS AT VISIBILITY 52
CPT Richard H. Beck, TWA
YOU'D BETTER BELIEVE IT! Ted Kontos 59
PEARL'S 62
USAASO SEZ 64
U. S. ARMY AVIATION MUSEUM Inside Back
KNOCKOUT FOD Back Cover

ABOUT THE COVER

Qui Nhon Army Airfield in the II Corps area of RVN. Our thanks to CW4 J. P. Ervin who took the photo.

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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VIEWS FROM READERS

• The U. S. ARMY AVIATION DIGEST has been getting the cold shoulder from aviators assigned in the more frigid areas of the globe. It appears we erred in a December 1968 article, entitled "Icing."

MAJ Jack Eppard, 1st Army Flight Detachment, Ft. Meade, Md., brought to our attention an error in the last paragraph of the article, published on the inside back cover. The article states Army Regulations prohibit flight into moderate or heavy icing conditions.

AR 95-1 points out aircraft equipped with proper de-icing/anti-icing equipment may fly in light or moderate icing, but never into known or forecast heavy icing conditions.

We hope we didn't frost too many readers. — The Editors

★★★

Sir:

In order to support the maintenance requirements of Army aircraft operating in Vietnam, a program called "Depot Cyclic Maintenance" has been established at the U. S. Army Aeronautical Depot Maintenance Center and other repair and overhaul facilities in the continental United States (CONUS). Under the program, helicopters are returned to CONUS for all periodic inspection and repair. The helicopters are selected for this repair according to the damage they have received or other maintenance needed, resulting from high accumulation of flight time.

Sometimes in Vietnam when a temporary shortage exists, a serviceable part is taken from a helicopter that is due to be returned to the U. S. and is replaced by an unserviceable part. The maintenance personnel in the U. S. are unable to determine the serviceability status of those components unless DA Form 2408-16 is properly completed or DA Form 2410 initiated. When these forms are not sent with the helicopter properly completed the serviceability of TBO components can not be reconstructed without complete overhaul causing much unnecessary scrapping of finite life items.

Also needed is DA Form 2408-15 which records the history of failure, damage and maintenance of the aircraft and its major components. Without this form every component must be tested to make sure all are serviceable.

Will you please ask your readers in Vietnam to send completed DA Forms 2408-15 and 2408-16 with the helicopter. Also ask them to make an extra effort to return the main rotor blades with the helicopter or at least send complete and accurate DA Form 2410.

I realize that aviation personnel in Vietnam are operating under very adverse conditions but these records are very important. With the proper information we can increase our efficiency, reduce maintenance costs, reclaim many critical finite life items and return helicopters to them in much less time.

Allen M. Pyle
Chief, Pre-Shop Analysis Division
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★★★

Sir.

There has been criticism lately concerning the Army's student helicopter training. As a member of the Department of Tactics at the Army Aviation School, I know that our mission and that of the rest of the Aviation School is "to provide the Army aviation unit commanders in Vietnam with replacement aviators capable of immediate employment in operational units." Some critics of the program say that the program is not doing this. My own opinion is that it is virtually impossible to train an individual for "immediate employment." Each unit in Vietnam is fighting a different type of war with each unit facing different obstacles and therefore using different techniques to accomplish their own particular mission. Therefore, "immediate employment" would demand as many flight schools as there are aviation units in Vietnam. This, of course, is unrealistic. So the Army compromises by averaging out these various techniques and methods and comes up with a training program which they hope will make the new aviator qualified to transition into the various aviation units in Vietnam in a minimum amount of time. So you see that "immediate employment" is virtually impossible but the school has indeed minimized the time it takes for an aviator to become an aircraft commander or to take on a mission in Vietnam by himself. Yet let's not become complacent because there is a great deal of room for improvement.

The Army's techniques and methods of defeating the enemy are constantly changing and improving. Therefore, the school should be changing and improving. But is the Aviation School improving? A live troop lift has now become part of FEX training in tactics at Ft. Stewart. The students in instrument training at Hunter AAF use nondirectional and stagefield beacons named after and set up in the same relative geographic position that they are in Vietnam. However, there are many things that are possibly unrealistic. For example, in tactics, the basis for all maneuvers is the Flight Maneuver Guide which states that one of the requirements for a high circling approach is that it be made from "enroute altitude." The Operation Order states that the enroute altitude is 800 feet. Therefore, the approach is made from 800 feet. This is entirely unrealistic because this type of approach in Vietnam is usually performed anywhere from 1,500 to 2,500 feet, depending upon the situation. I use this example because as a member of the Department of Tactics I am more familiar with the tactics training. But other

Continued on page 31

Excedrain Headache #7,000

(or The Pink Card Renewal Dilemma)

Major Alvin W. Cartwright

Army aviation is about to have a "beautiful" headache — in fact about 7,000 of them with more to come. It must be decided which cure will be swiftest with the least side effects

WE HAVE ALL seen the various TV commercials depicting hammers hitting the head — the "BLAHS," — yelling little "rug rats" nagging mother — or the animated man with numbers all over him, showing you the "ole 1, 2, 9, 5 combination for headaches."

Each of the headache remedies show how their products can relieve the "built up tension, knots in the stomach, that nagging headache."

Army aviation is about to have a "beautiful" headache. Would you believe about 7,000 of them — AND MORE TO COME. There are several kinds of relief which can be taken to get rid of these headaches. Which one will cure the headache quickly and have the least side effects?

Excedrain Headache # 7,000: Approximately January 1965 the U.S. Army Aviation School began the Rotary Wing Tactical Instrument Program. This program became a phase of the Warrant Officer Rotary Wing Aviator Course (WORWAC) and the Officer Rotary Wing Aviator Course (ORWAC). The Tactical Instrument Program began when the greatly increased demand for aviators in Vietnam became apparent. It continues to the present, as 600 rotary wing aviators graduate each month from the sister aviation schools at Ft. Rucker and Ft. Stewart. In FY 1969, the Army Aviation School is programmed to graduate 7,000. The majority of these new aviators normally are assigned after graduation to the Republic of Vietnam.

At some time during the 12 month tour, the basic procedures learned during the tactical instrument phase have benefited the individual and his unit in overcoming less than desirable weather conditions and accomplishing the assigned mission. Also, at one time or another, his ability to fly basic instruments possibly saved lives when he inadvertently entered weather.

The tactical situation, the continual demand for "mission ready" aircraft, the already overburdened flying hour program in RVN and lack of qualified personnel in each unit to administer a tactical instrument renewal flight examination have created an almost monumental problem. Many "rotary wing only" aviators return to CONUS, WITH an "expired" Rotary Wing Tactical Instrument Card. The impact of 7,000 of these aviators with expired cards returning over a year's time can readily be seen. This problem will be magnified each month as the newer rotary wing aviators complete their tours in Vietnam and return to CONUS to assume duties as instructor pilots at Ft. Rucker, Hunter AAF and Ft. Wolters or normal unit duties at other aviation assignments. At Ft. Rucker alone, there are approximately 780 rotary wing instructor pilot slots authorized, including Department of Rotary Wing and Department of Tactics, plus the many slots authorized at Ft. Wolters and Hunter AAF.

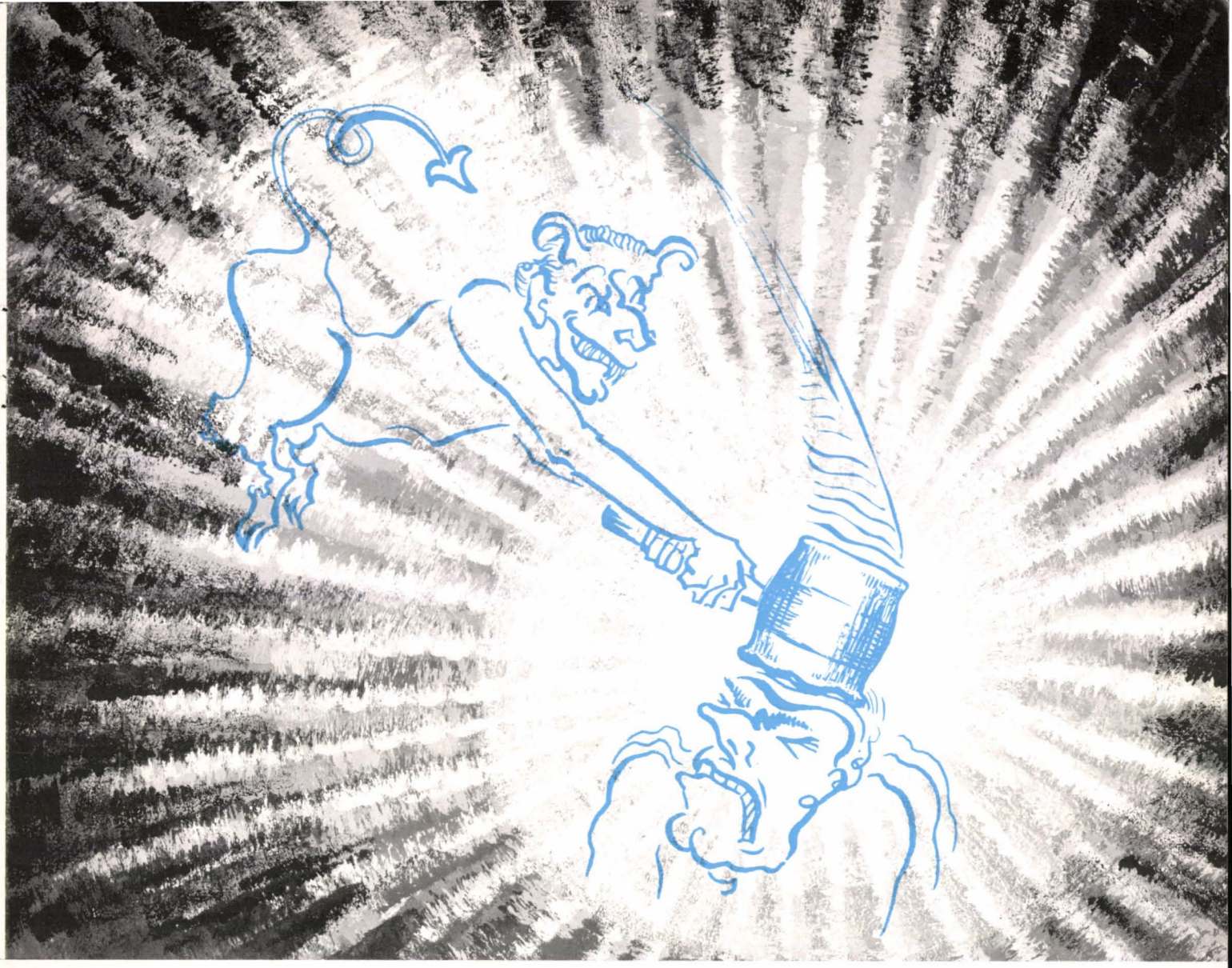
It would seem realistic to assume that a large portion of these instructor pilot slots would eventually be filled by an ever increasing number of Vietnam returnees with expired tactical cards. Some of the IP duties require a standard instrument rating which is awarded upon completion of the usual MOI course. However, many returnees are used as contact or tactics instructors with tactical cards. An example of this:

One of the training elements at Ft. Rucker, as recent as 10 months ago, had a total of 14 instructor pilots with tactical instrument cards. This element now has 144 instructor pilots with the "Pink Card."

AR 95-63 states that maintenance of instrument qualifications is mandatory for all instrument qualified aviators unless exempt under circumstances outlined in Paragraph 2 of AR 95-63. Normally, this instrument qualification must be re-established within 90 days from expiration date. However, TWX, DA 765017, subject: Army Aviator Instrument Qualification, grants aviators returning from SEA (Laos, Vietnam, Thailand) six months to re-establish instrument qualification, rather than 90 days as stated in Paragraph 2c, AR 95-63.

The Beautiful Headache Grows: In addition to the basic start of this headache, the following items contribute to making this TAC Ticket headache a real "beaut."

• Normally, it could be expected that our "returning hero" would



have to renew his tactical instrument qualification twice during the expected 18 month tour that Department of the Army is trying to stabilize at the aviation schools and other CONUS assignments. Of course, this would depend on the nearest birthdate of the individual during the six month period allowed to re-establish instrument qualification.

• As a minimum, six to eight hours of practice hooded flight or synthetic trainer would be necessary in preparation for the instrument renewal ride and the actual administering of the check ride. This would be for each renewal! The hooded flight time indicated would normally be in the "Huey," the aircraft the aviator is most likely current and proficient in because of his recent assignment. The UH-1 also fits the description of the aircraft to be utilized in the instrument flight examination as outlined in AR 95-63.

Renewal of the "TAC Card" in other type aircraft (such as the TH-13T) would vary from individual to individual, dependent upon his experience and transition or qualification requirements. However, it would be justifiable to say that the flight time required would be at least equal to and in most cases greater than the flight time required in the UH-1. With the exception of Ft. Rucker and Hunter AAF, the TH-13T is not available in most areas of CONUS.

• If the individual renews his tactical card within six months of his arrival at his CONUS duty station and again within the following year (dependent on birthdate), he could conceivably return to Vietnam with an expired tactical card or a card that would expire during his tour, again creating the same basic problem upon arrival back in CONUS. Sort of a recurring migraine, isn't it!!

• The aviator is prohibited by regulations from utilizing this "TAC TICKET" under actual instrument conditions while in CONUS. He may only use it under actual tactical environment or simulated tactical environment out-

Excedrain Headache #7,000

side of controlled zones or areas.

• Rotary wing instrument examiners needed to administer the flight examination to the number of expirees anticipated are at a premium. The aviator input to the Helicopter Instrument Flight Examiner Course has been far outstripped by the greatly increased student input to the ORWAC and WORWAC classes. Although there may be a greater concentration of helicopter instrument examiners at the aviation schools, you could expect many of them to be saddled with students or, if field grade, desk bound or in duties which preclude examining on a frequent basis.

• Aircraft available for practice and renewal purposes are quite limited. The continual demand for aircraft in Vietnam and the number required for student training make it a real problem to obtain aircraft for tactical instrument renewal purposes.

• Airspace available is extremely restricted, especially at the aviation schools. The ever-increasing number of aviators who will need to renew their cards may magnify the problem of safety in the already "crowded sky" of the high density student training areas.

• At Ft. Rucker and its sister school in Georgia, the aviator assigned to an instructor pilot slot is presently exempt from maintaining annual minimums, under provisions of USCONARC letter dated 26 July 67. This letter, subject: "Waiver of Annual Minimums for Instructor Pilot Personnel," waives the maintenance of annual minimums as prescribed by AR 95-32, with the exception that the aviator must fly a total of 80 hours annually. This 80-hour requirement is met very easily by instructor pilots in training their students. The night and cross-country requirements even though waived, are usually fulfilled by student training requirements. This leaves the instrument minimums to be waived, but alas; an aviator must fly over half of the hood requirements during the 18 month period mentioned in order to be proficient enough to renew his tactical instrument qualification.

The ingredients of Brand X offer temporary relief

The Retention Blahs: It is a recognized problem that a large segment of the commissioned and warrant officer aviators are electing to serve only the mandatory three year obligation after completion of flight training and then return to civilian occupations. This attrition rate may vary but can be closely pegged at 80 percent. Army aviation is retaining 20 percent of its aviators past the three year obligation. Basically, the three years can be broken down into three phases: (1) Upon completion of flight school, a leave enroute and subsequent tour in RVN; (2) The completion of the RVN tour and return to CONUS with leave enroute to new duty station; (3) Assumption of duties for normally 18 months. This accounts for 32 months of a 36-month obligatory service agreement. This means that 80 percent of the 7,000 aviators mentioned (or 5,600) are renewing their tactical instrument qualification (some twice) for a card that they cannot use in CONUS and certainly not in civilian life. This figure can be substantially in-

creased when considering the number of graduates from ORWAC or WORWAC classes since the program began in 1966.

Brand "X": This "X" offers temporary relief from that nagging headache. The ingredients:

Hold the expired Rotary Wing Tactical Instrument Card of the Vietnam returnee in abeyance until the individual is on orders to return to SEA or other combat areas. At that time, as a matter of POR qualification for overseas shipment, the individual would receive instrument refresher training and renew his tactical instrument card. This renewal/refresher training could be on a proficiency basis. By receiving this training as a POR requirement, he will have received the most recent, tactical procedures and training available. The item to note here is that this type program is concerned only with the 20 percent of the aforementioned aviators that the Army retains. The other 80 percent have already departed for civilian endeavors. The POR refresher/renewal program would insure that the aviator returning to combat can step right in and complete the mission, under adverse weather conditions, with a current instrument card which can only be used in that area.

The Best Remedy? Our ultimate goal is to have 100 percent of the Army aviators instrument rated. This is a must in order to continue the outstanding support for which Army aviation has become so well known. Looking ahead it is anticipated that Army aircraft will be complex to the extent that a pilot will have to be instrument qualified in order to fly them.

The tactical instrument program is good. It fulfills an immediate need to provide a qualified aviator to the units in Vietnam. The tenacity and courage of "our daring young men in their flying machines," is undisputed. Eighty percent of these men return with a "job well done" and after their tenure in CONUS, prefer to return to civilian life.

This prescription offers long-lasting relief

At this point, it would look like we would need a prescription that offers more long-lasting relief.

The remaining 20 percent who elect to remain in the service (our professionals) should be programmed through the Helicopter Instrument Flight Course sometime during their stateside tour or enroute back to an overseas area.

This may not be a cure-all, but it would provide a big step toward outfitting 100 percent of our professional aviators with an instrument rating that can be used in CONUS, combat or other areas. This program would provide the necessary instrument training needed for the sophisticated aircraft now in the mill for future Army aircraft inventory.

The money saved by not requiring the large number of aviators who are "hanging up their flight helmets" to renew their tactical card twice before their departure from the service should be adequate to support a standard instrument program for the "lifers."

The ultimate goal of a completely professional aviator can be met more easily.

The 7,000 rotary wing aviator graduates mentioned are for one year. As each year goes by, this headache keeps coming back and much stronger.

You have seen the commercials! Which remedy do you buy?

Nonaeromedical Evacuation Crew

Aeromedical evacuation is the secondary mission of all Army aviation . . . it is your responsibility as an Army aviator to know where to take casualties and what treatment your crew can or cannot administer

Captain John D. Colvin

AN OUTSTANDING record for preventing loss of life or limb has been established in Vietnam. Much credit has been given to the aeromedical units known by their call sign "Dustoff" but their efforts frequently are augmented by the "slicks" and gunships already in the area when the need for evacuation of wounded personnel arises.

Aeromedical evacuation is the secondary mission of all Army aviation and the speed and efficiency with which it is accomplished can mean a great deal to the Medical Corps at our treatment facilities and to their success in preventing the loss of life or limb. It is your responsibility as an Army aviator to know where to take the casualties and what can or cannot be accomplished by your crew during the flight. In another light, you and your crew may be down in some remote area and need first aid — will you know what to do?

Casualties picked up in the forward areas may already have received first aid treatment by the unit's "medic." In this case the best procedure for evacuation is to

properly load the patient and insure his wound and previously applied treatment are not disturbed. If a patient's condition becomes worse during the flight to a medical facility it may become imperative for your crew to apply other first aid measures. A review of the four life saving steps will provide a guide to follow while monitoring the patient's condition during flight.

The first step is to stop the bleeding. This will more than likely have been accomplished if the patient was treated prior to your evacuation. However, a second wound may not have been discovered or the dressing originally applied may not have been adequate. Steps to control or stop bleeding include: elevation (raise the wound above the level of the heart when possible), direct pressure (placing a dressing directly over the wound holding it firmly with the hand), digital pressure (applied with the fingers on a pressure point between the wound and the heart), tourniquet (applied between the wound and the heart and left in position with tension until the patient is seen by medical personnel), clamping (used to stop bleeding from a major vessel but requires equipment not normally available to nonaeromedical evacuation crews).

The second step is to clear the air passageway which basically means to remove foreign matter from the mouth and throat. It is also possible for a patient to attempt to swallow his tongue which can block the airway. Clearing the airway may be accomplished by placing a finger in the patient's mouth and visually checking for foreign objects when the patient's position permits. A good point to remember is that a patient's dentures can become lodged in his throat so they should be removed when discovered and put in the patient's pocket. The opening of an emergency airway should not be attempted unless a complete block is experienced and all attempts to dislodge foreign objects have failed.

The third step is to protect the wound. Once again, this will normally have been accomplished if the patient received prior first aid treatment thus your main concern is that the protection is not disturbed. In the case where a new wound is discovered or a previously applied dressing becomes inadequate, a dressing should be applied to keep out foreign matter and/or to provide support to prevent the movement of a limb which might increase the severity of a wound. In any case, an attempt to cleanse the wound should not be made if it could disturb any of the scabbing process that may already have occurred. In a situation where a wound requires additional dressing it is best to apply the new dressing over the original rather than attempt to remove the latter.

The fourth step is to prevent or treat for shock which can be a common result of battle casualties. There basically are two types of shock — psychogenic and wound. The former is caused by other than physical means (such as seeing a buddy fatally wounded). The wound shock is caused by loss of large quantities of blood. In this case the body's ability to transport oxygen to the brain is decreased.

Some of the symptoms associated with shock include: pale skin, cold and clammy, hands have a blueish cast, low blood pressure and mental confusion. The last two symptoms will be more easily detected by medically trained personnel but should not be neglected by the less experienced crew.

A few steps to follow in order to prevent or treat for shock include: stop the bleeding (as discussed above), raise foot of litter (not in the case of chest or head wound), keep patient warm, relieve pain (the use of morphine will be discussed later), replace blood volume and give oxygen. The last two steps will not normally be administered by the nonaeromedical evacuation crew due to lack of equipment and training .

The four life saving steps outlined above, if understood and practiced prior to their need, should provide the nonaeromedical evacuation crew with sufficient knowledge to efficiently administer inflight monitoring and/or treatment of battle wounds.

In addition, there are some special wounds and their treatment which should be included in the working knowledge of the nonmedically trained crew. A few of these are as follows:

- Sucking chest wound — causes a lung to collapse. Primary treatment is to seal the wound thus preventing the loss of air from the chest cavity. Application of vasoline around the edge of the wound and then covering with the foil liner of a first aid packet should be sufficient. Hand pressure to hold the foil in place will be adequate for the flight to medical facility. Use of the patient's body weight to hold the seal in place should suffice if the crew must attend to other duties or patients. Placing the patient in the shock position (feet raised) and the use of morphine are not recommended in the case of sucking chest wounds.
- Belly wounds in which the intestines are exposed. Do not try to move or replace the intestines unless this is necessary for transporting the patient. Morphine should be used to reduce pain only if the abdominal wound is visible.
- Jaw wounds in which extensive bleeding is normally found due to the extensive vascular network around the facial area. The bleeding is stopped either by digital or direct pressure or both and placing the face down on the injured side. Do not use morphine in the case of jaw wounds.
- Head wounds are difficult to treat because shock is common and

Nonaeromedical Evacuation Crew

the feet cannot be raised to prevent or treat for shock. The other steps such as stopping the bleeding, keeping the patient warm and comfortable, etc., do apply.

• In the case of burns the primary concern during flight is to prevent shock using the normal steps. The use of morphine is advisable when the patient is not in shock.

• Fractures are common in battle casualties as well as outside the combat zone. If the fracture is simple or closed (no penetration through the skin) the treatment is to immobilize the fractured limb. When the fracture is compound (break is through the skin) the bleeding should be stopped before an attempt is made to immobilize the limb. No attempt should be made by nonmedically trained personnel to reset the fracture. This could result in compounding a simple fracture or causing greater tissue damage to an existing compound fracture.

The above should provide a general working knowledge for nonaeromedical crews that can be used while transporting wounded personnel. The equipment for applying the four life saving steps is contained in the aircraft's first aid kit. These kits are installed in Army aircraft on the basis of one per five occupants or one per crew compartment. Their location must be known by each crewmember and their presence, condition and contents should be checked prior to each flight. The kit is sealed by medical personnel after its inspection. The aircraft crew should inspect the kit for the presence of a lead seal during each daily preflight. If the seal is found to be missing or broken the kit should be immediately exchanged for one in the proper condition. A kit without its complement of components could mean the loss of life!

Briefly, one aircraft first aid kit contains the following:

• One four inch compress bandage

• Two medium size and one small size dressing used to stop the bleeding and protect the wound

• Bandaids

• Iodine water purification tablets

• Benzalkonium chloride tincture which is used as a disinfectant

• Gauze dressing impregnated with vasoline for use on sucking chest wounds but *not* for burns

• A tourniquet

The use of the contents of the first aid kit have been generally discussed in the four life saving steps. Administration of morphine warrants special attention for its improper use can cause unconsciousness and can be lethal when administered in certain quantities. Morphine should not be used in the following cases:

• Patient unconscious

• Head injuries

• Breathing injury (sucking chest wound)

• Patient has abdominal pain without visible wound

• Patient shows symptoms of shock

• Second injection should not be given within two hours of previous injection

• Patient breathing less than 12 times per minute

The controlled use of morphine is extremely important. In order to prevent giving a patient excessive amounts some means of recording an injection must be utilized. If a patient has a disposition tag attached to his clothing a notation should be made on the tag — in plain sight! The used syrette can be attached to the patient's clothing in some manner. This may not be adequate and may go unnoticed when the patient's clothing is re-

Fixed and rotary wing aircraft have med evacuation roles

moved at the treatment facility. When making a notation, the time and amount of the injection should be recorded. Even when a written notation is made the medic receiving the patient at the treatment facility should be told that morphine has been administered.

Proper loading of patients at the pickup site is extremely important to insure proper positioning and comfort during flight. The aircrew must "take charge" of the loading, especially in a case where there is more than one patient to be evacuated. Troops on the ground are often unfamiliar with the loading of patients and may try to get the patients on in any way possible.

The problem is amplified when the unit is under fire at the time of evacuation. Time naturally is essential but the proper loading of patients may prevent further damage and allow for inflight treatment. Most "slicks" and gunships are not equipped with litter racks, consequently their patient carrying capabilities are reduced. Whenever possible, a patient should be carried as ambulatory (sitting on a seat or the floor) in order to leave the remaining floor space or litter racks for litter patients.

An unconscious patient should be loaded face down and the head slightly lower than the remainder of his body so he does not drown in his own fluids. The most seriously injured should be loaded last so they can be unloaded first. Patients should be positioned so their injury is readily available. When litter racks are installed the litters should be loaded from top to bottom.

The information covered thus far for the nonaeromedical evacuation crew hopefully has pointed out some of the advantages of our air evacuation capabilities. Speed and flexibility are probably the most apparent along with enroute treatment. However, if the patient is handled properly from pickup to unloading, comfort can also be a great advantage. The overall picture and process can be an enormous morale booster for both those who are injured as well as those who were more fortunate.

The speed and relative ease of aeromedical evacuation compared to the older means has one major drawback which is brought into the system by those doing the flying — you the pilot. There is a chain of facilities set up to provide what medical treatment is necessary for a patient depending upon the severity of his wound. This is not cut and dried to the point that a facility further to the rear would refuse a patient with a wound less severe than those that the facility is designed to treat. However, the fact that a patient may not need the degree of care a particular facility can provide does deserve consideration. One patient may temporarily "tie up" a facility for a patient with a more severe wound.

The above points out the disadvantage of our speed and flexibility in that the tendency is to over-evacuate. This tendency can be reduced by the pilots flying the evacuation — all pilots — knowing both the location of and the capabilities of all the medical facilities in their area of operation. There is no way of knowing when the call for evacuation of wounded personnel may come to a nonaeromedical crew. Therefore, it is imperative that all crews thoroughly understand the evacuation system, the facility locations and their frequencies and call signs. You would expect that of a crew evacuating you!

There is no guarantee but it is a pretty good bet that sometime during your aviation career you will be required to evacuate an injured person. It is possible that this might be your mission sometime outside the combat zone. Will you as pilot have briefed your crew on their duties related to aeromedical evacuation? Will they be familiar with the first aid equipment in the aircraft? The responsibility is yours.

The aircrews must take charge of the loading

Airmobile Style

Rappel and Troop Ladder

The first combat use of the rappel and troop ladder method occurred near An Khe in 1965. A reconnaissance platoon rappelled into small openings between treetops and seized an area below. They were quickly reinforced by troops who arrived aboard Chinooks with troop ladders

Colonel Kenneth D. Mertel

AIRMOBILE COMBAT forces can land in Vietnam with little regard for terrain. Landing zones (LZ) are usually available in sufficient numbers to land troops; however, in jungle and in other inaccessible terrain, there are other methods to bring in airmobile forces to destroy the enemy.

A new idea, the combined use of rappel and ladder techniques (introduced in the 11th Air Assault Division in 1964-65) was initiated into its first combat action in 1965 by the 1st Airborne Brigade of the 1st Cavalry Division (Airmobile). These techniques provide for landing men on top of jungle covered mountains, employing team action and tactical airpower to blow holes in the jungle canopy. While UH-1D assault helicopters hover overhead, troops rappel ranger style through the opening to the mountaintop; trooper ladders dangle from hovering Chinook helicopters while platoons and companies climb down swaying flexible ladders to reinforce friendly forces on the hilltop.

Thus an airmobile company or battalion can be emplaced on a jungle-covered mountain in inaccessible terrain easily and quickly. This tended to dismay enemy forces who, first, did not expect United States troops in that area; second, did not believe they could come by airmobile means; or third, expect them to land on top of a mountain and be able to fight downhill, attacking their enemy defenses from the rear. In comparison, the usual technique was a landing in accessible LZs on the valley floor and fighting uphill against prepared enemy positions.

How does this new system operate?

A mountaintop, preferably not too sharp or steep, is selected for an LZ even though covered with a heavy jungle growth. It is chosen as any other LZ to meet the needs of the unit in carrying out its particular combat mission. The only difference is entry of troops onto this jungle covered mountain. First step is to employ tactical airpower of the Air Force, Navy or Marines, who with precision, employing 500- or 750-pound bombs, blow a hole through double and triple jungle canopies so a rope can be suspended from a hovering helicopter to the ground.

As soon as the hole is blasted in the jungle canopy, additional firepower may be used to destroy or discourage enemy forces remaining on top of the hill, employing tube artillery within range, aerial rocket artillery and armed helicopters. Transport helicopters, escorted by the armed helicopters, hover over the hole created in the jungle. Infantry troopers slide down dangling ropes in seconds, in a manner similar to rappelling off a cliff, ranger style. With a platoon on the ground, the hilltop is secured and any enemy quickly destroyed. A call is made by radio to waiting Chinook helicopters, each carrying a rifle platoon. The Chinook comes in and hovers over the same opening in the jungle canopy. Troops carrying their equipment rapidly climb down to the ground from ladders dangling from both aft and midship.

In this manner a trained platoon can climb down two ladders in three or four minutes. The remainder of the company can be brought

During Operation Cedar Falls, troops of the 1st Engineer Battalion, 1st Infantry Division, clear a helicopter loading zone after having rappelled into the area from a CH-47. At right, a Chinook of the 1st Cavalry Division (Airmobile) arrives with a bulldozer at a landing zone which will be improved to allow helicopters to land

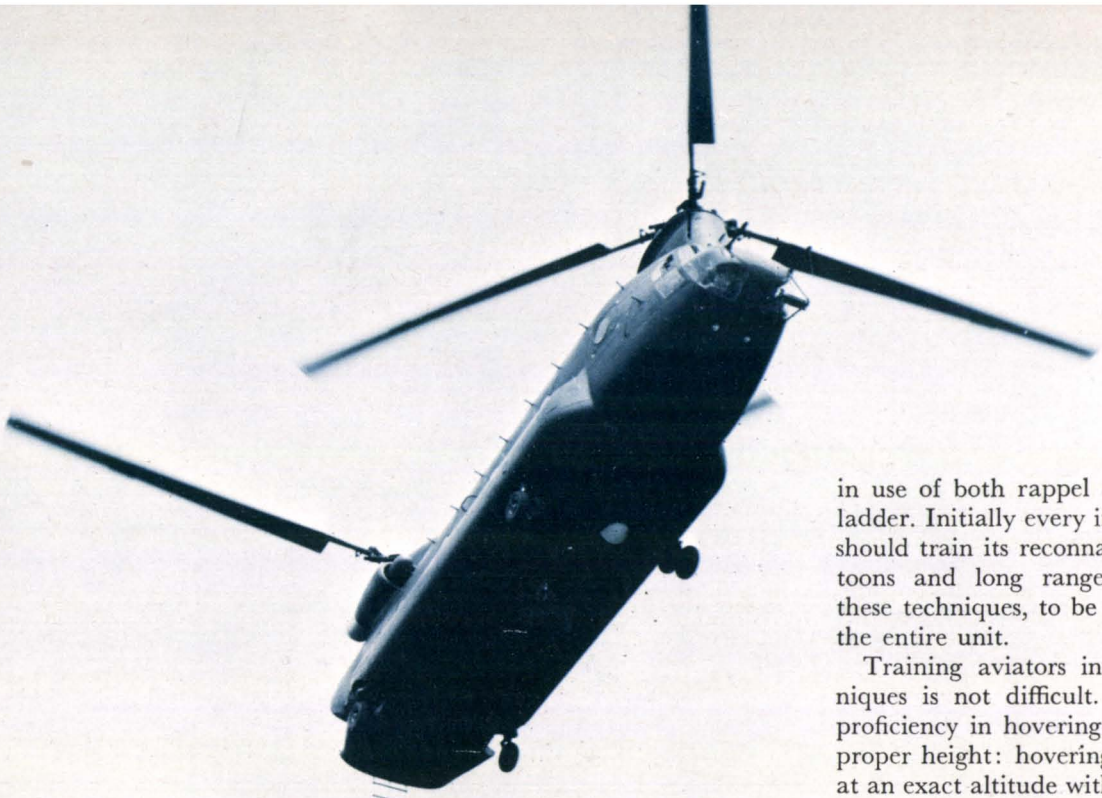
in rapidly as well as the rest of the battalion if necessary. All the time Chinook helicopters are under gunship escort. Tactical airpower and both tube and aerial rocket artillery are used to preclude enemy firing at Chinooks or other interference. UH-1D helicopters can also be equipped with trooper ladders; however, they carry a smaller load.

Many times one or more holes may be blasted in the jungle canopy in a simultaneous operation. Two or three hilltops may be used. Once the troops are on the ground, the operation is conducted like any other airmobile operation. Additional troops and resupply may be brought in, using the Chinook helicopter with its winch and cable to lower a sling load through the trees to the ground. When elements of the battalion reach suitable terrain, an LZ can be established so both the UH-1D and the Chinook may execute a conventional landing. Until that condition does exist, all resuppply and reinforcement, including evacuation of casualties, can be conducted from the holes in the jungle canopy. Once troops are on the ground, engineers can improve this opening in the trees, making it larger to facilitate operations.

The first mountain peak operation in Vietnam was conducted by the 1st Airborne Brigade, 1st Cavalry Division (Airmobile), November 1965 in the Binh Khe area. There operation in mountainous terrain would have been disastrous had United States forces been required to land in the valleys and fight uphill against skillfully dug in enemy positions. In this case bald, sharply peaked mountains presented excellent LZs for helicopters, even though on some of the peaks the helicopters were able only to rest skids on top of their knife edges to dismount troops. This operation was the first of its kind.

First combat use of the rappel and trooper ladder method took place 18 miles south of An Khe in December 1965. Here for the first time troops of C Company, 1st Battalion, Airborne, 8th Cavalry (Jumping Mustangs), executed a combat rappel into an area where LZs did not exist. It was not necessary to blow holes in the canopy. There were sufficient small openings between treetops to drop dangling ropes from hovering helicopters. The reconnaissance platoon of the battalion and a platoon of C Company rappelled in and seized the area. They were followed by Chinooks with trooper ladders.

This first trooper ladder combat operation did not have the opportunity for practice on the ladder. C Company's only training had been a demonstration in a rear area by one squad, as it climbed up



and down the ladder to illustrate the technique. However, the exercise was a success. Every soldier climbed down the ladder without difficulty. Later on in the exercise, remaining companies of the battalion made climbs down the ladder and were later retrieved using the same technique.

In the Bong Son campaign in February and March of 1966, the 1st Cavalry Division on several occasions employed rappel and trooper ladder technique combined with blowing holes in jungle canopy by tactical air. An operation known as "Pistol South, East, West and North" employed this technique with several battalions of the division.

In "Pistol West," two peaks were used. Holes were blasted simultaneously in the jungle canopy by the Air Force. Tube artillery preparations were fired on both. When fire lifted, a rifle platoon was sent in to each, rappelled down from hovering UH-1D helicopters. The areas were secured and followed by simultaneous lifts by trooper ladder equipped Chinooks. The operation was conducted throughout the day, with troops retrieved by trooper ladder at pickup points four miles away. During the operation casualties were recovered on two occasions by using the Chinook cable, winch and wrap-around basket.

The winch, cable and wrap-around basket is most effective for medical evacuation. It can be employed not only on any normal operation where the unit is operating in inaccessible terrain but is also excellent for recovering casualties and prisoners on long-range patrol operations. Resupply can be provided in the same manner for small units operating in an inaccessible area. This technique was employed by the 1st Cavalry on numerous operations.

Training in the rappel and ladder techniques is not difficult for a motivated, highly spirited unit. Within a unit of proper spirit, leadership and motivation, sufficient training can be given in a short time to make a unit proficient in use of both rappel and trooper ladder. Initially every infantry unit should train its reconnaissance platoons and long range patrols in these techniques, to be followed by the entire unit.

Training aviators in both techniques is not difficult. It requires proficiency in hovering the bird at proper height: hovering motionless at an exact altitude without lateral, forward, or rearward movement. This is particularly true of the Chinook ladder, because it does take a few more seconds for troops to climb down the ladder. Ladder technique requires the pilot to observe one side and to visually lock onto some fixed point on the terrain to ease his job of hovering and prevent lateral movement. The pilot may also fix his eyes on a terrain feature to the front to maintain proper altitude; however, altitude control is not as critical as lateral movement.

Training of aviators within the 1st Cavalry aviation units did not present major problems, even for new aviators arriving from the United States. Combined training with infantry and aviators is effective if aircraft are available, because they can both see each other's problems and iron out difficulties as a team working together.

Rappel and trooper ladder have been excellent combat techniques — born in 11th Air Assault days and combat tested in Vietnam. There will be increased employment of both techniques in the future.

Firefly Tactics

and the cardinal rules

Armed helicopter pilots should have a thorough knowledge of the rules and should use them when appropriate

Captain Glenn A. Smith II

FIREFLY IS an armed helicopter search and attack night mission which has been very successful on the many waterways of the ARVN III and IV Corps areas in the Republic of South Vietnam. The 197th Armed Helicopter Company was exclusively responsible for the Firefly (then called Lightning Bug) tactics and operations in the III Corps and a small part of the IV Corps until the spring of 1966. The 13th Aviation Battalion conducted Firefly operations in the rest of the IV Corps area.

In 1966 several other units were equipped with large helicopter searchlights and began conducting Firefly operations of their own. The Firefly team uses the artificial illumination provided by a cluster of seven aircraft landing lights mounted on a bracket in the cargo door of a UH-1B armed helicopter. The light is mounted on the bracket in such a manner that the door gunner/light operator can swing

the light beam fore and aft, and move it a limited amount away from or close to the ground track of the lightship.

The mission of the Firefly team is to find and attack the Viet Cong at night. Operations are closely coordinated with friendly troops near the search areas. This coordination includes landing and making personal contact with the major headquarters being supported, and then maintaining radio contact with that headquarters throughout the mission. Firefly search missions are not normally conducted within proximity of friendly ground troops, but can be done so very effectively, such as when the combination of the searchlight and armed helicopter firepower are used to stop Viet Cong attacks on friendly outposts and hamlets. Normal search missions are over areas of known Viet Cong activities. In these areas, the friendly ground headquarters usually clears the Firefly team to attack any detected boats, trucks, etc.

The 197th conducted Firefly (then called Lightning Bug) operations over almost every type of terrain found in Vietnam, including delta rivers and canals, highland jungles, lowland jungles, coastlines and saltwater swamps. Although some slight success has been experienced in all these types of terrain, by far the best results have been achieved in the delta areas where boats and sampans are the major means of Viet Cong transportation. In most other types of terrain the Viet Cong has time to conceal his equipment and hide, after he has seen the searchlight or heard the helicopters approaching his area. Large boats and sampans, on the other hand, are hard to hide on just several minutes notice. As for detecting individual VC soldiers or units, they normally need only to remain motionless to escape detection in the daytime because of their superb camouflage. Therefore, they are almost impossible to find with the Firefly searchlight at night, because it does not even approach daylight illumination.

Often the team was directed to an area where intelligence reported a Viet Cong company or battalion location. The only way the enemy was ever detected in these instances was when the Firefly team would place intense fire into the area and fool the VC into thinking they had been seen. This trick did not work all the time, but occasionally the enemy would return the fire and thus give away their positions.

Artillery in the search area must be completely stopped or, preferably, placed under control of the Firefly team. In many instances one of the gunships would direct artillery on a target while the rest of the team returned to base to rearm. In fact, this alternation has sometimes gone on all night, giving the enemy no chance to escape. Then at dawn, Air Force fighters were brought in to finish off the remaining VC who had too much cover for the gunships' armament.

The 197th normally conducted Firefly operations with three armed helicopters, although successful missions were conducted with two and four aircraft also. The most preferable organization started with a normal M-16 equipped gunship with the large searchlight mounted in the right cargo door. Next a "Frog," an armed helicopter equipped with rockets and an M-5 40 mm grenade launcher with 150 or more grenades, was used as the lowship in most formations. Last a UH-1B, with only a .50 caliber machinegun mounted in the right cargo door for main armament, usually rounded out the organization.

An armed lightship was preferable to an empty lightship because after the other gunships had expended on a target, the crew could turn off the light and attack like a normal gunship. The M-5 weapon system of the Frog was found to be much more effective at night than it was in the daytime. It is a very low muzzle velocity and fairly short range weapon. The concealment afforded by darkness allowed the crew of the Frog to close to very short range when firing the M-5. The close range accuracy and tremendous destructive force of the 40 mm grenades made them a real favorite against boats and automatic weapons at night.

Another advantage of using the M-5 at night is the pilot's ability to see all of the grenades burst. The 40 mm grenade explosion is hard to spot from the air in the daylight, but at night it is a quick, bright flash. By observing the flashes on the ground or water, the grenades can be walked right into the target on the first firing pass.

The .50 caliber gunship was used for covering the other gunships during a search, and could quickly destroy targets once they were fixed. A regular M-16 equipped gunship could be used for this purpose, but we found the .50 caliber machinegun preferable.

Now that friendly coordination, the nature of the enemy, the nature of the terrain, supporting arms, and organization have been described, I will discuss some of the 197th Firefly formations. All of the tactics, including formations, differed greatly from daytime tactics. They didn't just start that way. The 197th Armed Helicopter Company flew Firefly missions almost every night for 18 months, and I assume the reorganized, renamed unit, 334th Aviation Company (Escort), is still conducting such operations.

Many different tactics were tried on these missions and were discussed thoroughly by all members of the crews after every mission. The best tactics on a Firefly operation, or any military operation, are those that yield the best results. They cannot be stereotyped

Firefly Tactics And The Cardinal Rules

and must constantly change to take advantage of the enemy's tactical changes. Many of our initially successful tactics had to be changed after Charlie adapted to them. I assume Firefly tactics are still evolving.

The first cardinal rule, "Avoid target overflying," is extremely important during the daytime, but is not as critical at night when you are concealed by darkness. During a Firefly search the target was often overflown because it was not discovered until the lowship was almost over it. Once the target had been detected, however, the target was not overflown. Firing passes were pressed to a very close range, but target overflying usually meant that the attacking gunship flew through the large searchlight beam, thus stripping the crew of their concealment and night vision.

The second rule, "Avoid flight in the deadman zone," is almost exclusively a daytime rule. The "deadman zone" is generally decribed as the airspace between 50 feet and 1,000 feet above the ground. This airspace was so named because of the proportionately higher number of enemy hits taken while flying between these altitudes. During Firefly operations, there was also a higher number of hits taken at the lower levels. However, the nature of the night attack mission must be considered before condemning those altitudes. At night, virtually no targets can be detected from above 1,000 feet. Therefore the search and the attack must be conducted from a low level, or the night operation might as well not be conducted at all.

The third rule, "Avoid flying the 180 degree wing position," is primarily a daytime rule but applies somewhat at night. If one gunship does get directly behind another at night, there is usually a large difference in their altitudes. In the dark night search for example the Frog, or lowship, is often directly behind the lightship which is about 500 feet above him. However, he must be in this general position to detect camouflaged targets illuminated by the searchlight.

Like the second rule the fourth, "If possible, make a high reconnaissance first," is exclusively a daytime rule. At night next to nothing can be seen from a high reconnaissance; also the high reconnaissance further announces the helicopters' presence and gives the Viet Cong more time to hide their boats.

An armed light ship is preferable to an empty light ship, because when the regular attack helicopters have expended their ordnance, the Firefly crew can turn off the light and attack like a normal gunship

The fifth and sixth cardinal rules are just as important during Firefly missions as they are during daytime operations. **"Always assume that the area is hot,"** and areas assigned for search are almost always hot. **"Avoid firing until the friendly forces are positively located"** is an absolute must both in the daytime and at night. Although Firefly search and attack missions are usually self-contained and independent, it is imperative that every member of the team knows the location of any friendly patrols or outposts.

The seventh rule, "Avoid flying parallel to terrain features that, if occupied by an enemy unit, would provide that unit with an observation and firepower advantage over the armed helicopter team," is particularly applicable during the daytime when the armed helicopters are naked to the view of anybody on the ground. When conducting a Firefly search of a river or a canal however, gunships almost have to fly parallel to the terrain feature. If there is something that the lowship wants to see on the water at a specific point, the pilot can make his pass perpendicular to the river, but this is not normally the situation.

The last five cardinal rules are equally as valid at night as they are in the daytime. **"Avoid firing from over the heads of friendly troops"** deserves special mention at night, because friendly ground troops are usually more apprehensive at night. **"Conserve ordnance and use it wisely," "Know the situation," "Brief all elements to a man,"** and **"Take your time"** are all very important rules during Firefly operations.

No self-imposed urgency should be used as an excuse to slight these last four rules in any kind of armed helicopter operation. For example, if an emergency does not allow time for a detailed crew briefing on the ground, radios, intercom systems and other means must be used until every man in every crew has been briefed and thoroughly understands the situation and mission. Briefing the crews must continue throughout the mission to make sure every man is aware of changes in the situation.

Some of the cardinal rules obviously do not apply to Firefly missions which are special operations conducted during the hours of darkness. All armed helicopter pilots, however, should have a thorough knowledge and understanding of the rules and use them when they do apply in order to accomplish the mission while at the same time minimizing friendly casualties.

Let Us Not Give Up The Flare

CW2 Bobby D. Smith

DURING THE last year or so there has been considerable discussion about helicopters using lights for search and destroy night operations in Vietnam but there has been very little mention of the Mark VI Flare. Have our commanders pushed aside an excellent weapon without knowing its full capabilities?

One of the main reasons most commanders give for not using the flare is its lack of reliability which of course is an excellent reason. I know, as many of you do, that we have numerous problems in Vietnam with flares but let's not completely disregard the fact that they were designed many years ago and in most cases manufactured in 1943 and 1944. The new flares, however, have proved themselves to be extremely reliable. For a true evaluation we must compare the advantages and disadvantages of each.

First let's discuss the illumination device normally mounted in the cargo door of a UH-1 aircraft. This device at the time I used it in Vietnam consisted of seven C-123 landing lights mounted in a cluster. The mounting allowed them to be moved about in a small arc, pointing down almost vertically and they could be focused for a large or small spot.

The primary advantages of this system are dependability and ease of operation. The disadvantage of this system is the aircraft must be flown low over the target area in order to supply sufficient light and must remain there during the entire operation. This not only makes the aircraft and crew vulnerable to hostile ground fire for sustained periods but requires the armed aircraft striking under it to maneuver unnecessarily at times to prevent placing fire on the searchlight ship.

Due to the limited area the searchlight will cover many targets have been lost when it was first turned on. The enemy had adequate time to seek concealment. Another problem is the IFR condition it creates in the cockpit during damp and hazy nights. The only satisfactory solution we found was to have a pilot in another aircraft literally vector the searchlight ship over the target. This of course is a very demanding situation for all concerned and is still very slow and uncertain.

On the other hand flares can be dropped from any given altitude and allows the aircraft used for dropping them to stay well outside small arms range. The flares can be set to ignite at any altitude — preferably so complete burnout will be accomplished below the minimum altitude established for the attacking aircraft. The dropping aircraft can time the drops to provide continuous target illumination without endangering himself or the attacking aircraft. The candlepower supplied by one flare far exceeds that of the searchlight ship and immediately lights a much larger area. Provided the armed aircraft are in a position to begin their firing passes as soon as the flare ignites there is little chance for the enemy to escape.

It is not my intent, to make the flare sound like something Godsent, it certainly has its disadvantages. From the commander's viewpoint the unreliability is the most important. However, with proper storage and care by qualified personnel they can be made 95 percent reliable. This is as good or better than we can expect of the aircraft carrying them.

Most important to the crew carrying flares is the fact that if fired into by small arms they have the potential of turning the aircraft carrying them into an inferno. However, flares can be carried outside the aircraft on a device originally designed and built by CW3 Kenneth LaMonte, which offers excellent protection to the crew. This device consists of a piece of pipe approximately four feet long mounted to the universal gun mount on each side of the aircraft. It has six bomb shackles secured to the bottom side of each pipe. This allows 12 flares to be carried at a time with no excess drag on the aircraft. When properly wired the flares can be dropped by the pilot by an electrical switch on the cyclic (preferably wired to the switch used for firing the M-6 weapons when they are stowed) one at a time, in pairs or salvoed in case of emergency. In case of an electrical failure the crewchief and gunner can jettison them mechanically. This is of course a "jury rig" system to show that flares can be used if energy and imagination are applied to develop a dispersing system.

An aircraft equipped with a suitable navigation system and the flare device is capable of providing accurate illumination with no difficulty.

This article is not intended to descredit the searchlight system. It has resulted in many, many highly successful missions. I do wish, however, to encourage further exploration of the capabilities of the flare.

Team Effort

Major Warren R. Silva

IT WAS 2145 hours on a cloudless night with a full moon when things started to happen. We were in a T-41B at 5,500 feet about 15 miles north of Abilene, Texas, en route to Mineral Wells from which we had departed five hours earlier on a proficiency cross country. I was flying as pilot in the left seat with a total of about seven hours in the aircraft. The main purpose of the flight was to get night minimums. My copilot had about 100 hours in the T-41 but

between us were approximately 12 years and 5,000 flying hours of Army aviation in both fixed and rotary wing aircraft.

We had been commenting on how bright the moon was when all of a sudden the engine surged. Since all the engine instruments are located on the right side of the panel the copilot immediately started a close watch of the gauges while I continued to fly the aircraft. All gauges remained in the green with the exception of the engine tachometer which was surging between 2,400 to 2,800. As the surging continued, I started a gentle 90-degree turn to the south while notifying Abilene radio of our position, problem and intentions. The initial call was made to Abilene radio because I had just given them a position report 10 minutes prior. We received a quick "Roger" from them along with instructions to contact Abilene tower on a given frequency. While I headed south towards the municipal airport and made the radio calls, the copilot continued monitoring the gauges and making adjustments with the mixture and prop controls in an attempt to smooth out the engine and prevent an overspeed.

I called Abilene tower and gave them our position, problem and declared an emergency. They came right back and stated they had us on radar 13 miles northeast of the field. He then cleared us for a straight-in to runway 17 and turned the approach and landing lights up full bright. I immediately picked up the runway and told Abilene that I had it in sight. The next four minutes were spent in relative quiet. The copilot continued to work with the mixture and prop while I flew the aircraft.

At 100 mph indicated I was losing about 200 fpm. We were at 5,500 feet when the engine started to act up and as the ground elevation was approximately 2,000 feet we were about 3,500 feet above the ground. As the aircraft passed through 4,100 feet we experienced two or three severe shudders from the engine along with a shower of sparks from under the engine cowling and then complete quiet. I eased the nose down a little, looked over at the copilot and asked, "Do we go or stay?" We were all chuted up and ready to go. Captain B said "I've got a good-looking road down here on my side. Let's give it a try."

I said, "OK with me. You've got it," and just that easy the change of duties took place. Captain B became the pilot and started flying as I called off airspeed and altitude. I made a call to Abilene tower and told them the engine had completely quit and we were going to attempt a forced landing. They rogered and said we were nine miles northeast of their field on the 040 radial off the Abilene VOR.

You might wonder why the change in duties at this stage of the flight. Up until the time the engine completely failed I had no problem in flying the aircraft. After the engine quit for good and the decision was made to attempt a landing, the situation changed 180 degrees because Captain B was undoubtedly better qualified in the aircraft than I and he had the proposed landing area in sight.

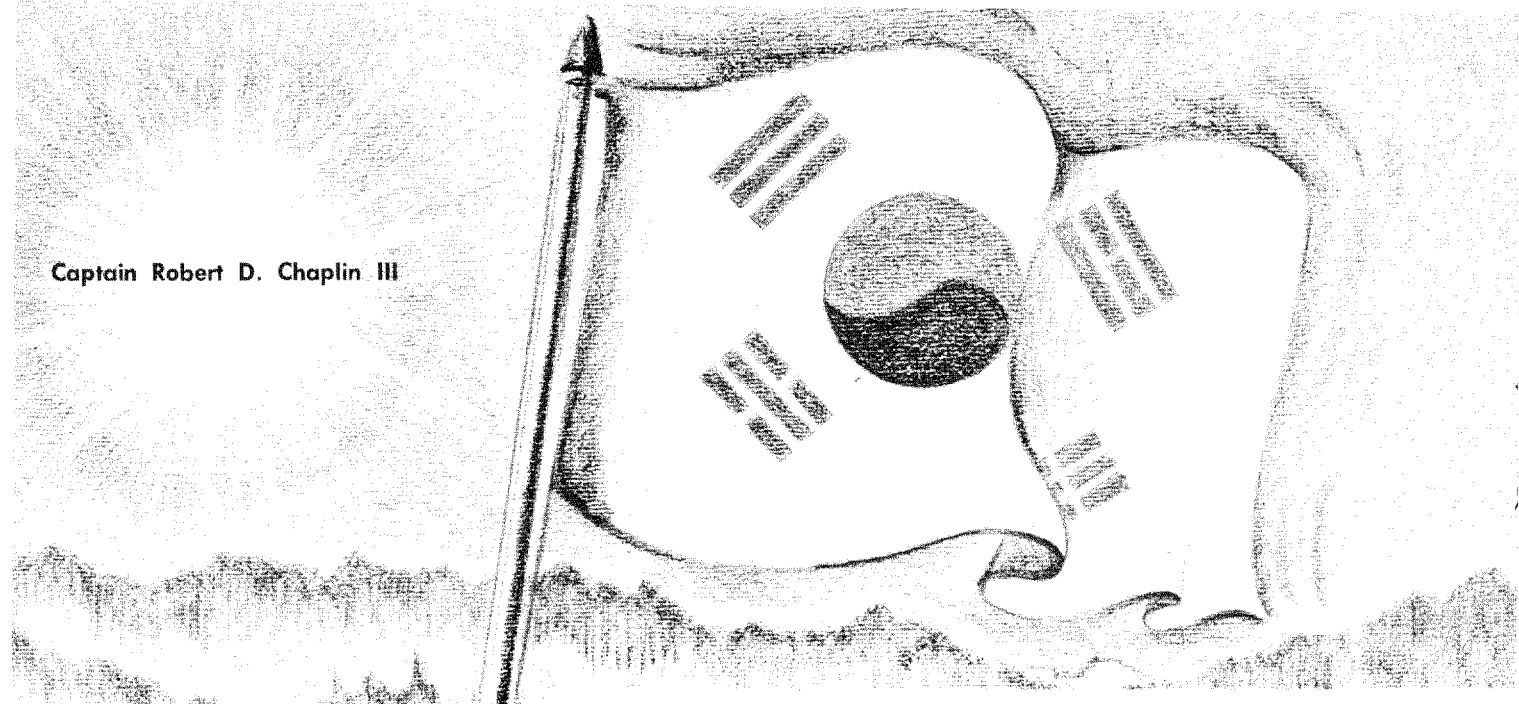
Another question that has probably been on the tip of your tongue is, why did we try to put it down instead of jumping? This is a solid question as most of us have been taught to leave a nonflying aircraft at night. In this case the decision was based on the weather. It was a cloudless night with 60 miles of visibility and the full moon was giving off so much light that the shadows of utility poles could be clearly seen across the main highways.

The conclusion of this flight was very fast and uneventful. Two "S" turns set us up on final for a straight gravel farm road about 2,400 feet long. Touchdown was at 80 mph and after a 1,100 foot rollout, there we were — slightly scared but with a feeling that we had made the right decision and as a result of past training and experience had turned what would have been the loss of an aircraft into a standard forced landing.

Two notes of interest in this little episode should be mentioned. When the engine failed I reached down and flipped the mags to "off" and the entire aircraft was plunged into darkness. I rechecked to insure I had turned off the right switch and found I had — the mags were off and the master switch was on. As the prop had frozen, I flipped the mags back on and we got our electricity back. We needed the panel lights especially so I could monitor the airspeed and altitude. To date I have no explanation for this condition.

The second note of interest was the value of the strobe light which I had and carried in the leg pocket of my flight suit. After we landed, all switches were turned off and we exited the aircraft. Standing on the road I saw a large aircraft approaching from the south at approximately 3,000 feet. As we had good radio contact prior to setting down I figured it was possibly a search plane, so I activated the strobe light and holding it in my hand pointed it towards the aircraft. After about 10 seconds the aircraft, which turned out to be an Air Force C-130, made a slight turn directly towards us and turned on about six strobe lights that were mounted in the normal navigation light positions.

They made a low pass over us with their landing lights on and set up an orbit over us. About 20 minutes later we were picked up by the state highway patrol. They said could see the strobe light five miles away as they were driving towards us.



Captain Robert D. Chaplin III

Instruments In The ROK

THE YOUNG lieutenant grew increasingly nervous as the controller read back his clearance for the third time. Each time, however, the clearance was read louder and more garbled. This time the IP punched his mike button and read it back correctly. He then smiled and said, "You'll get used to them pretty soon."

For the young aviator just completing flight school with a new instrument ticket in his pocket, Korea presents both an interesting and challenging assignment.

The first major obstacle is becoming accustomed to hearing Korean controllers. While English is used for all ATC communications the accent of many controllers makes them extremely difficult to understand initially. During times of stress the problem of aviator/controller communication becomes more difficult. For this reason all instrument rated pilots assigned to Eighth Army are required by regulation to undergo an instrument orientation ride with an instrument instructor pilot. Only after he has met this requirement is an aviator allowed to file an IFR clearance.

With the proximity of the demilitarized zone (DMZ) to Seoul, Eighth Army has restricted IFR operations to the area south of the tactical zone. The bottom edge of the tac zone is a line running east to west just north of Seoul. The only exception to this rule are tactical flights under the control of Air Force GCI.

Weather also can pose some serious problems for the instrument pilot especially during the winter months. Although the weather forecasting and observation facilities in the Republic of Korea are very good, there is a lack of information from areas outside the Republic of Korea and some areas inside which are not adequately covered. Pilot reports of enroute weather are essential.

Most of the Korean weather phenomena come from Manchuria and Siberia. However, not enough information is received from stations in these areas. Air Force weather detachments are located at all major U. S. Army airfields with the central facility at Yongsan compound in Seoul. U.S. Air Force weather stations are at Kunsan, Osan and Kwang-ju. ROK Air

Force facilities are at Kimpo, Suwon and Taegu. ROK Air Force weather facilities are tied in by teletype and report from all Korean airfields and major units.

As previously mentioned, the winter months are the most hazardous for flying of any kind. The "jet stream" which comes out of Siberia and China blows east toward Korea and Japan with winds at speeds up to 175 knots. Gusty surface winds are a problem at some airfields but the most significant result of these high winds is mechanical turbulence at flight altitudes. Turbulence is caused by the high winds blowing across the mountainous terrain. Winds as high as 60 knots may be encountered at 4,000 to 5,000 feet. With the cruise speed of a U-6 only 105 knots, a 40 to 50 knot headwind can pose problems. Surface winds, especially along the coast, are difficult to handle when only one runway is available. Pusan on the southeast coast is probably the worst. With a mountain located beside the runway, wind may be different on each portion of the runway. For this reason three windsocks, each located about 1,500 feet apart, are installed near the runway.

In October the freezing level starts to work its way down. During the months of December, January and February the freezing level usually is on the surface. This of course presents a great problem to instrument flight, especially for those aircraft not equipped with de-ice or anti-ice equipment.

Haze is also very prevalent in the ROK, especially in the vicinity of large population centers. Smoke from numerous coal fires contributes to the problem. In some cases it may be necessary to file IFR due to haze at altitudes up to 10,000 feet.

All navigation facilities in Korea are of the low frequency beacon type. There are two experimental VOR stations, one located south of Kimpo near Seoul and the other at Pusan. Neither is suitable for IFR operations; however, the station at Kimpo has a practice VOR approach available.

Minimum enroute altitudes (MEAs) are quite high due to the mountainous terrain in the area. They vary from 4,000 feet in the Seoul area to 8,400 feet southwest of Taegu. On the most heavily traveled routes — Seoul, Taegu, Pusan — one can expect an MEA of 6,000. Normally Army aircraft are cleared at between 6,000 and 9,000 feet.

In Korea, air traffic control is provided by a few approach control facilities and the Air Route Traffic Control Center at Taegu. The approach control facilities at Kimpo, Osan and Kunsan have radar capability. The greatest congestion is in the Seoul area — with two major airports, including Kimpo International, and an instrument approach close to the DMZ.

All major airfields except for Seoul Airport (K-16) are serviced by at least one ADF approach. Those of us who are accustomed to 400 feet and 1 mile as minimums for an ADF approach are in for a great surprise. Some airfields have minimums above that required for VFR flight.

Many ADF approaches use a holding pattern letdown. This insures protected airspace in which to lose altitude. Generally the inbound heading for the holding pattern is not the same as the final approach heading. In this manner, aircraft are kept in valleys rather than over mountainous terrain, allowing lower holding altitudes and less altitude change once on final. Approaches used by U.S. aircraft are periodically checked by the Federal Aviation Agency.

The only ILS approach in the country is located at Kimpo. It has all components including approach lights. GCA units are located at Kimpo, Suwon, Osan, Kunsan, Kwang-ju and Taegu.

As a backup emergency system, Air Force GCI sites provide a vital service. Covering the entire country, GCI can vector aircraft and give assistance in event of ADF receiver failure. It must be remembered though, GCI is not an ATC facility and cannot issue clearances.

Alternates may be difficult to find especially during periods of extended bad weather. The narrowness of Korea means that one weather mass can cover the entire country at once. Under certain weather conditions alternates in Japan may be used. However, single engine aircraft may fly over water in flights of two or more only.

Several major U.S. airfields do not have published instrument approaches. The U.S. strip at Taegu (A-805) does not have an approach but does have three instrument departures. Aircraft wishing to land at A-805 during IFR conditions must either land at K-2 on the other side of town, or cancel IFR after breaking out and continue special VFR to A-805. With A-805 located against the side of a mountain and relatively short compared to K-2, special VFR is not recommended unless the weather is 300 to 400 feet above minimums at K-2.

Pusan represents another problem to the instrument pilot. With an ADF approach over the Sea of Japan, the pilot is faced not only with low ceilings but also with severe wind conditions.

A tremendous amount of experience can be obtained during 13 months in the ROK. The young aviator must, however, be conscious of major differences between instrument flying in CONUS and in the Republic of Korea. If he is aware of these differences, he will enjoy a rewarding and safe tour in the ROK.

Overeagerness

I had to autorotate through 800 feet of stratus knowing I had only about 200 feet at the bottom to pick a field

Lieutenant Dana D. Evans

THIS ARTICLE IS designed to show the aspiring young aviator what not to do when he arrives at his first duty station — in all probability — the Republic of Vietnam. For the experienced aviator this story might bring back some unpleasant memories.

I arrived in Vietnam as a new warrant officer; one fresh out of flight school with a pink instrument ticket in my pocket, shiny wings on my chest and plenty of enthusiasm plus slightly more than a twinge of apprehension. After the normal in-country orientation period, I was appointed an aircraft commander in the UH-1D.

On the "day of reckoning" I was assigned a psychological warfare mission in support of the 1st Infantry Division near Dau Tieng north of Saigon. The day started out the same as any other; up before dawn, eat breakfast, check the weather, file the flight plan and preflight the aircraft. The weather was forecast normal for this particular time of year, clear with patchy ground fog after sunrise.

We departed for Di An about daybreak to pick up the psy-war team and the fog was just starting to form. I wasn't too concerned about the fog because it had been thin and patchy for the previous week. I had no reason to doubt on this particular day it would be any different. (This proved to be my first mistake in a day full of mistakes!)

In the 30 minutes or so it took to load our passengers and equipment, the fog had thickened somewhat but was still patchy and had lifted to about 100 feet above the ground. We departed for the operational area and became involved with the mission. I failed to notice or fully realize the impending danger that should have been indicated by the necessity to climb to 2,500 feet to remain VFR! I was to find out much too soon that the "patchy" ground fog had become a solid layer of stratus 800 feet thick.

While we were flying around in circles with the speakers beckoning the VC to give up, I had been checking with the tower at both Dau Tieng and Tay Ninh for their weather and any PIREPS. Both were reporting ground fog with "numerous holes," ceilings varying from 200 feet to 300 feet, visibility from 1 to 1½ miles. Fuel was available at both Dau Tieng and Tay Ninh so I elected to remain on station another 15 minutes; my fuel gauge indicated 600 pounds. When my fuel gauge indicated 500 pounds, I called Dau Tieng tower and asked for landing instructions. To my dismay the controller reported the field was now "ZERO-ZERO!" This was the first time during the entire morning that I had been conscious of the weather conditions. I then turned toward Tay Ninh, the only other refueling point within range, with the remaining 400 pounds of fuel. I made some quick mental calculations based on previous flights over the

same route and determined that we would have no more than 150 pounds of fuel remaining on arrival at Tay Ninh.

I switched to Tay Ninh tower frequency and heard numerous aircraft operating into and out of the field. I called the tower and requested the weather and landing instructions. They advised that the ceiling was between 200 feet and 300 feet variable, visibility 1½ miles in patchy ground fog, PIREPS — numerous holes to the north of the field. By this time the 20 minute fuel warning light had been on for about five minutes.

When we arrived over the point which I hoped was where the "numerous holes" had been reported there was a solid layer of white with no holes in sight! (We had Decca navigational system on board, but it was not working because of all the sand and dirt that had blown into the mechanism.) I called the tower to see if the NDB was working — it wasn't!

I had no alternative but to take a bearing off the mountain and line up where I thought the airfield should be and descend. We broke out about 200 feet above the ground and no airfield was in sight even though visibility was about a mile. I was afraid of getting too close to the Cambodian border so I climbed back on top and advised Tay Ninh of our situation which was now critical with 15 minutes on the 20 minute light! One of the arcraft which had been operating out of the field offered to climb through the cloud layer and lead me home.

No sooner had the savior concluded his transmission than my pilot announced that we had been on the 20 minute light for 20 minutes! With that the engine surged once and quit! I thought I had a problem a moment before trying to locate the airfield; now I had to autorotate through 800 feet of stratus knowing that I only had 150 feet to 200 feet at the bottom to pick a field and try to make a successful landing. Fortunately we were over open fields when we broke out 100 feet above the ground and I somehow managed to put the ship on the ground with no damage and no injuries. We were found within five minutes by a light fire team and a Chinook. We drained some fuel from the Chinook, got our aircraft cranked and flew a two minute flight to the refueling point at Tay Ninh!

Looking back, since hindsight is much better than foresight, I can see a number of errors I made that directly contributed to the making of this NEAR TRAGEDY. Among them are:

- Overeagerness in my desire to accomplish the mission.
- A false sense of confidence and overconfidence in my ability as an "instrument rated" aviator.
- Ignorance — due in part to my meager experience.

Most new pilots learn as much about aviation and their role as an Army aviator in the first few weeks they're in Vietnam as they did during their training in flight school. I was no exception, but I learned much more in a shorter period than most — that period being the "eternity" of the one minute it took to autorotate through the clouds. I learned to fly within and according to my capabilities and limitations!

It was not my intent here to expound on the virtues and shortcomings of the teaching methods used at Ft. Wolters and Ft. Rucker. Instead I wish to point out the problems that I encountered when I first started my flying career in the hope that a few will be able to learn from my errors.

To the four T's that a student pilot is taught when he goes through advanced instrument training, I have my students add a fifth T at the top. That T, the secret to the success and safety of any mission, is — THINK!!!

Relative Wind Sensor

the rocket tubes are aligned with the target, but how about the relative wind?

Until recently there has been no accurate means of detecting relative wind since it constantly changes and is exactly opposite the travel of the aircraft. But a new device which adapts to the standard sight used for rocketry (left) has overcome this problem

FEW AVIATORS experienced in firing the 2.75-inch folding fin aerial rocket (FFAR) will dispute the fact that relative wind is the most critical factor affecting accuracy. No matter how perfectly aligned the rocket tube is with the target, if the relative wind is not perpendicular to the vertical and horizontal axes of the launch tube, a deviation of travel will occur.

Major George O'Grady, who conceived the idea which led to the development of the relative wind sensor, points to one of the four ports for sensing direction of relative wind

For instance, if the aircraft is in a right-hand slip while the aviator is dead on target, the ordnance will hit somewhere short and to the right of its objective. The degree of error will be directly correlated to the degree of slip.

The reason for this harrying phenomenon is a simple one. When the ordnance is launched the finned aft area becomes the greater surface of the rocket. With the center of gravity somewhere near the middle of the object, weather vaning occurs. Thus if the aircraft was in a right-hand slip, the relative wind would be from lower right to upper left, pushing the rear of the missile up and to the left. The direction of travel then would be altered to a more declining, right-hand path.

Until recently there was no accurate means of detecting relative wind since it constantly changes and is exactly the opposite of the travel of the aircraft. However, a recent innovation conceived by an Army aviator and developed by the Del Mar Engineering Laboratories, provides this means of accurate measurement. It also signals the aviator when the relative wind is perfectly aligned with the launch tubes.

Relative Wind Sensor

Known as the 2H98 Relative Wind Sensor, the device gives an indication of relative wind through use of a visual display of lights. This display is given to the aviator actually firing the rocket as an integral part of the XM-60 reflex infinity sight. An additional unit can be mounted as an instructor's display when used for training purposes.

The standard reticle of the XM-60 sight is replaced with a new one identical in appearance. In addition to the pipper in the center of the sight there are eight triangular red lights arranged with two above, two below and two on each side of the pipper. Only the illuminated light is visible to the viewer. A ninth light, this one green, is located in the four o'clock position from the pipper and indicates conditions are ideal for firing. The IP display is similar but is mounted on a box in open view.

Practically applied, if the aircraft misaligns with the relative wind by at least 1.5 degrees but less than 3 degrees in a downward position, only the first light from the bottom of the pipper will be illuminated. If while trying to compensate for this error the pilot assumes a position of 3 or more degrees high and at least 1.5 degrees right, the bottom light will go out, both lights above the pipper will come on, and the first light on the right of the pipper will be illuminated. The aviator has a visual display that he is 3 or more degrees high and 1.5 or more degrees to the right. When his alignment with the relative wind is perfect, those lights will go out and the green light will come on.

With the obvious increase of effectiveness this provides, a second innovation for training purposes arose — again as the result of a conscientious Army aviator. This capability of insuring proper alignment with the relative wind made it appear feasible to use a less expensive tracer munition for a portion of the student aviator's rocket training. Up to this time the dissimilarities between rockets and nonfinned, high velocity ammunition prevented a substitution. However, the 2H98, in addition to giving its visual indications, promised to allow a capability of arming a weapon only when it was perfectly aligned with the relative wind. This led to the investigation of using the M8C .50 caliber spotting rifle for a portion of the training instead of the rockets which are considerably more expensive. The system is currently being used at Ft. Rucker with a great deal of success and optimistic estimates are that it eventually can result in an annual savings of more than $1 million.

Training with the .50 caliber instead of the 2.75" rocket could result in an annual savings of over $1 million

The M8C can be used for this purpose effectively only when combined with the relative wind sensor. Relative wind is the only factor creating a deviation of accuracy between the .50 caliber and rockets and can be controlled by the sensor. Since it automatically controls the arming of the rifle, it will not fire unless the aviator had made proper adjustments for relative wind. If he has made the adjustments it is merely a matter of shooting the projectile in a perfectly straight line, whether .50 caliber or 2.75-inch FFAR. The .50 caliber was chosen since it has a tracer burnout of 1,500 meters, about the same as the 2.75.

The entire weight of the sensor device is approximately seven pounds. It uses the 28-volt electrical system of the XM-60 sight and consists of five components.

The control box is mounted on the sight mount arm and includes switches and a rheostat for controlling the intensity of the lights in the sight.

The sensor operates through a relative wind probe which is a 2-inch sphere on a 12-inch arm, adjacent to the UH-1B pitot tube. It has four ports with two on the vertical axis and two on the horizontal axis. Each of the four ports is directly coupled to a signal conditioning unit by flexible plastic tubing.

Difference in air pressure between two ports, vertically or horizontally, created by relative wind misalignment will cause the transducer to apply current to the appropriate lights in the displays. There is a similar system for the AH-1G using the N-9 or XM-73 reflex infinity sight.

At the present time the U. S. Army Aviation School has 14 UH-1Bs equipped with the wind sensors and 10 with the .50 caliber training devices. There are eight AH-1Gs equipped with the sensors at Hunter AAF.

The greatest difficulty thus far encountered has been readjustment of those aviators who have fired rockets without the assistance of the sensor. As is the case with most new aids of this type, there is an inherent reluctance to place reliance in the "new way of doing it."

For those who have accepted it and have used the sensor as it was intended to be used, there is no turning back.

Thanks to the relative wind sensor, rocket training now can be effectively simulated utilizing a .50 caliber spotting rifle instead of the more expensive and bulky rockets

A Wink, A Nod And A Smile

Does this story sound familiar? Have you encountered "virtuosos" like the Baron and Sparko? This is the second article by the author on this theme and he makes the point that the proper use of checklists is still a problem whether it be in Vietnam, Korea or Bavaria. After reading this article be on the lookout for more information on the new Department of the Army standardized checklists and user oriented aircraft operator's manuals (dash 10s)

Major Donald J. Mascia

BEFORE MY DEPARTURE to Korea, my life was happy and complete. Solidarity was the keyword in my family.

Now, after my return from the "Land of the Morning Calm," I live a very stoic existence. My wife will not speak to me. She serves all my meals in the spare bedroom on a TV tray. My two beautiful daughters ignore me like I have the plague. Close relatives do not telephone or write anymore and my neighbors have built high fences around their yards.

Allow me to give you the complete details and then you be the judge of my actions. The operations officer scheduled me to fly a colonel and three others from Seoul to Taegu. Takeoff was 0800 and as usual it was a wait and return mission. When I departed the mess hall the crowd had already assembled around the operations building. I knew they were all waiting to see if I had any empty seats. They loved to fly with me! Just about everyone in Korea had heard about "Sparko" (the Army's best crewchief) and the "Baron"! Our flights were quick and flawless; unequaled by other crews. Once we were airborne a word was never spoken in the cockpit. Every action and movement was rehearsed, preplanned and smooth as glass.

As I approached operations the crowd cheered and applauded. I modestly waved and gave them a confident smile. After shaking hands and signing a few autographs I entered operations and filed a quick flight plan. The weather line was busy so I didn't waste any more time on that requirement. I could climb through the haze and be on top in no time flat. I've done that day in and day out.

I greeted my passengers in the lounge and gave them a general briefing. I assured them that at no other time would they have such a skillful crew guiding them through the towering cu's. After a few minutes of small talk we proceeded to our aircraft.

After passing several fixed and rotary wing aircraft we came upon it— the U-6 Beaver!

I gave the wheels a few sharp kicks. "Solid looking job," I said to my passengers.

"How's the engine?" the colonel asked.

Sparko winked. I knew that standard signal. "Engine's just fine, sir, and the runup is complete."

"I mean how much mileage does it get per gallon of gas?"

"Frankly, sir, Korea is so small that fuel consumption is seldom, if ever, computed."

I immediately displaced to the other side of the aircraft to prevent further exposure to probing questions from my passengers.

Sparko assisted the passengers into their seats and gave special attention to the colonel.

I vaulted into the cockpit, adjusted my harness and gave Sparko a nod. He knew the prop was coming through. She coughed lightly and hummed into action. I had already saved the passengers 15 minutes!

Sparko struggled into his seat as I made my way down the ramp. My smile was Sparko's signal to check the flaps, gauges and set all navigation equipment.

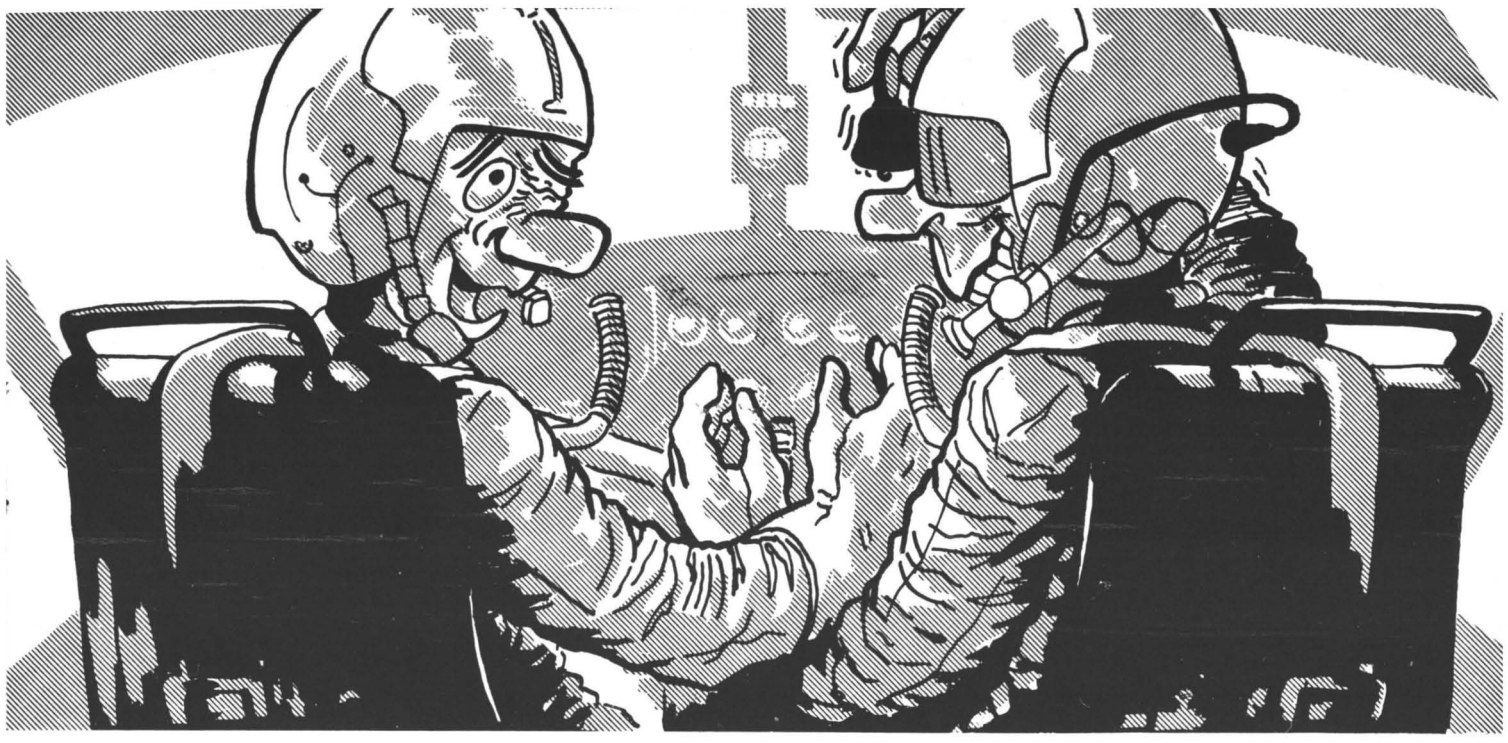
The tower gave me a green light — they knew I didn't like to waste time on the radio!

Sparko nodded and I taxied onto the active. Sparko pulled his visor down. That signal meant "gauges in the green and flaps at climb."

As I became airborne, Sparko gave me the signal — a cough and I responded with a sharp turn to the right.

What finesse! Any other crew would still be on the ground running through their checklist. From the movement in the rear I could tell that the passengers were straining in their seats attempting to watch the gesticulating virtuosos in action. Not a word had been spoken.

Sparko continually adjusted the carb heat and when I finally reached 8,000 feet he keyed the mike button, the signal that he had the controls. With great skill he reduced power and trimmed the craft beautifully.



I knew I wouldn't have to touch the controls again until short final.

One last glance at the colonel indicated he was mesmerized by our talent in the cockpit.

I tuned in Taejon AFR (Al Hirt's LP sounded great) and settled back to enjoy the flight. Java, Sugar Lips, Cotton Candy . . .

I must have dozed off because Sparko was giving me an unusual signal—beating on my right shoulder. A new signal??

Sparko broke our traditional silence with a shrill voice, "We're IFR!"

"No sweat Sparko, I have it," I said.

After tuning in 321.0, I called our brothers in blue.

"Osan GCA, this is Army 54-1733, 8,000, over."

"Army 733 Osan, read you loud and clear."

"Army 733, request GCA, heading 180 degrees, position unknown."

"Roger 733, Osan GCA, turn right 270 degrees, maintain altitude for radar identification."

"Ah, roger! Turning to heading 270 degrees at this time." (I noted my passengers were azure in color — if they only knew who was at the controls. Really, I should be flying multi-hued 707s.)

"Osan, Beaver 733, heading 270 degrees."

"Roger, Beaver 733, Osan, reply mode 3, code 04, over."

Sparko broke in, "Sir, the transponder is inop!" (No sweat, I thought. How long will it take Sparko to realize who is at the controls — it's me, the Baron!)

"Ah, this is 733, the AIFF in this aircraft is inoperative."

"733, Osan, what is your present altitude?"

"This is 733, altitude 8,100." (Much to my surprise I had gained a few feet!)

"Roger, 8,100, what is your present heading and approximate position?"

"Present heading 270. Location unknown."

"733, Osan GCA, be advised we have negative contact. Turn left to heading 230, maintain altitude for radar identification."

"Roger, turning left 230 degrees, maintaining."

"Army 733, Osan GCA, can you maintain VFR?"

"733, negative. That's why I wanted a GCA approach." (Is he questioning my IFR conditions? The fool!)

"733, roger, GCA advises negative radar contact, report over Romeo Echo heading 270 degrees. Over."

"This is 733." Sparko broke in again! "Sir, the ADF is inoperative. I wrote it up yesterday."

"No sweat," I stated in my normal confident voice. "Osan, I've lost my ADF. My only nav aid is my omni."

"Roger, 733, you are lost at present time. Is this affirmative?"

"733, that's affirm." (Wise guy, he could have used a euphemism like "misoriented.")

"733, roger, what is your present heading? Over."

"This is 733, wait." What now I thought. My gyro was revolving wildly. Sparko broke in again. "Sir, we had low suction pressure which I wrote up yesterday." I looked at him incredulously! Was this my crewchief, Sparko?

"733, this is Osan, what is your present heading?"

"Osan, 733, present heading 080. (How did I end up with this heading? 190 degree change and exceeding my assigned heading of 230 degrees by 150 degrees.)

"733, thank you, turn right to heading 140 degrees, maintain

He was hanging on the prop, crying like a baby

8,100 for identification. Over."

"This is 733, wait." My instrument flying isn't as sharp as I thought. Maybe I should have flown it rather than logging it to meet that minimum.

"Army 733, Osan GCA, advised we have negative radar contact. What is your present heading?"

"733, my present heading is 210 degrees." (My voice seemed to have a higher than normal pitch.)

"Army 733, we have negative contact. Request approximate position, please."

"This is 733, I'm in severe turbulence. I'm unable to determine my position." Again, I noticed my voice was high and strained. It took physical effort to say that short phrase.

"733, roger, what is your present heading, again, please?"

"This is 733, wait." I was having a rough time; the turbulence and gyro were driving me wild. Also, I was suffering from vertigo!

"Army 733, Osan GCA, over."

"Army 733, Osan GCA, over."

I was perspiring excessively and I felt nauseated. The airspeed was moving rapidly past 180K and I felt as though I couldn't move a muscle in my body! Suddenly, I heard a ripping sound and the tail fishtailed violently. I looked at Sparko for assistance but he resembled a manikin — lifeless and speechless!

The airspeed was pegged. I glanced at the vertical speed, pegged also!

I was sure everyone in the aircraft could hear my heart — it was pounding like a trip hammer. Instantly, it seemed there was a blinding light.

We were VFR and closing rapidly on a rock-studded ridge line. Many thoughts raced through my mind in those few seconds.I could see the company commander hanging on the curled prop crying like a baby (he loved 100 percent availability). The executive officer was standing like a piece of marble looking incredulously at the twisted airframe. The crowd stared disbelievingly — it couldn't be the virtuosos!!

I yanked back the yoke and chopped the throttle and mixture. It was too late! I braced myself for the end!

Thump, thump, thump! "Sir, wake up, we're on final for 27."

I couldn't believe it. I looked out suspiciously and a broad smile came upon my face — good old Sparko! I had thought my days were over. For the first time in 11 months it was good to be in Korea.

Since that infamous day I have made the metamorphosis from a pseudo "Baron" to a logbook, checklist using aviator. Many say I am "loquacious" in the cockpit.

At home I have acted accordingly: My new Chevrolet and old VW each has a logbook and I have attached checklists to the oven, bicycle, air-conditioner, color TV and sundry other items that require more than one step. Daily, my family is chastised for not using the required literature. They don't understand!

But I still continue to rant, rave and holler, "Read the logbook, use your checklists."

"I've warned them all: If they do not use the logbook and checklists, I'll spank them from the beginning of their "exterior" check to the end of their "after operations" check!

So, am I wrong when I scream and yell, "Read your logbook and use your checklist?"

VFR continued from page 1

such discrepancies exist in other phases of student training.

IPs, flight commanders, branch chiefs and the rest of the people connected with flight training — are you looking for ways to improve the course of instruction, or are you just putting in your time? If you are just putting in your time, then you are not doing your job. Remember YOU are responsible for that student's well being and the well being of others entrusted to him when he leaves flight school. You know as well as I do that a majority of aircraft accidents which occur could have been avoided. I cannot help but feel that somewhere in flight school this man did not learn how to prevent or correct the situation from which the accident occurred.

In the past, a lot of the change in the training program has come as a result of student critique sheets. Does the student really know what is important to get out of the instruction? How much he likes the course or how good he thinks the course is depends greatly on how well he got along with his IP. For this reason I feel that the IPs should critique their particular course of instruction. They are the ones who have just come back from Vietnam and know what needs to be taught.

Something that is not helping the student is the fact that the IP is afraid to show the student more than he has to, or to repeat a maneuver from a previous flight period for fear that if something were to happen he would be held responsible, whether it was his fault or not, because he was performing an unauthorized maneuver for that flight period. This fear is caused by accident investigation boards who have seemingly at times forgotten their original purpose and now use their investigation as a means of finding fault and fixing blame. The IPs' superiors are also fearful of giving their IPs too much latitude for fear that if something happened it could be a supervisory error. As a result, the student is the one who loses.

I feel that what the student training program needs is a constant updating and a required periodic reevaluation of its training program to keep pace with the Army's changing needs. I also feel very strongly that more proficient and better prepared aviators can and need to be produced. Although good flight instruction depends greatly on the IP, he does need a good basis from which he can work.

CPT Roger P. Kalinger
USAAVNS Element
Hunter AAF, Ga. 31409

★ ★ ★

Sir:

I would like to show some thoughts about reducing the size of classes and increasing the output of qualified aviation repairmen! Make sense? It does at the U. S. Army Transportation School which has come up with a solution to help meet the Army's increasing demand for LOH repairmen (see photo below).

The school's OH-6A Section found it necessary to completely change the program of instruction to fit the number of trainer aircraft available for student use. With a requirement for approximately 1,200 OH-6A repairmen for fiscal year 1969, a "daily start" program was developed to obtain maximum utilization of the present resources of instructors and equipment. Under the program, one five-man class will start a tightly scheduled program of instruction every morning at 0800 hours. When the course becomes "saturated" with 19 inresidence classes, then a class will start every day and a class will graduate every day.

When the students enter the Transportation School, they all take the General Subject Apprentice Repairman instruction for the first 15 days of the course. Then the students are divided into groups to continue in advanced training into a specialized aircraft field. Those selected for light observation helicopter training attend 19 days of specialized training on the OH-6A in groups of five men each.

An abundance of work went into the detailed preparation of "flowing" the schedules, equipment and instructor personnel. Maximum use of OH-6A equipment was arranged so none was left idle. Intensive training was undertaken to qualify instructors in the different phases of instruction.

Class liaison officers and NCOs in the OH-6A Section keep the massive flow of grading sheets going in the right direction, coordinate testing material, in addition to the task of supervising all instructor personnel in a very complex organization.

What is the end result of such a new program? How does it affect the Transportation School's mission of producing a highly trained technician? The daily start program provides a greater utilization of specialized instructor personnel and equipment, more individual attention is afforded each student with respect to individual learning capacity, and the end result is a highly qualified, technically competent light observation helicopter repairman.

Colan W. McRae, Jr.
Aviation Maintenance Tng. Dept.
U. S. Army Transportation School
Ft. Eustis, Va. 23604

The Beginni

The Department of Tactics School, Ft. Rucker, Ala., has its efforts toward securing c tion between slicks and suppo took the first positive steps operation between fixed and

Major Char

"GUNSLINGER 21, this is Shotgun, I have a target for you, over."

"Shotgun, this is Gunslinger 21, identify your target, over."

"This is Shotgun. Target is a squad of VC dug in vicinity of an abandoned APC hull. Coordinates FK158832. I will mark with red smoke. Friendlies are 800 meters north. Run in heading 190 degrees, with a left break. Are you ready to observe mark? Over."

"This is Gunslinger 21, mark your target, over."

"This is Shotgun, roger, wait."

"Gunslinger 21, this is Shotgun, from the red smoke, 11 o'clock, 60 meters, over."

"This is Gunslinger 21, target identified. Rolling in now."

"Knight 31 this is Panama Control. I have a change of mission for you. Are you ready to copy? Over."

"This is Knight 31, ready to copy, over."

"This is Panama Control. Proceed direct to XBR radio beacon. Contact Batman on FM frequency NLI for vector to LZ. Emergency medevac. Over."

"This is Knight 31, roger, out."

"Batman, this is Knight 31 estimating XBR at 40 for medevac mission, over."

"Knight 31, this is Batman. Report departing XBR heading 200 degrees, 1,200 feet MSL for vector, over."

Sounds like a normal day in SEA, doesn't it? That is exactly what it is, a normal day in SEA — South East Alabama, that is! Now don't get excited! Charlie hasn't gained a foothold in the Wiregrass. If you really want to know what is going on, just ask

ng of a Team

at the U. S. Army Aviation been directing a large part of lose coordination and coopera- rting gunships. Recently DOT to secure the same close co- rotary wing aviators

es H. Miller

any recent graduate of the Fixed Wing Aviator Course. He will tell you those pilots are potential fixed wing aviators receiving tactics instructon at Ft. Rucker. Hey, wait a minute! Weren't some of those birds helicopters? True enough! Would you believe, potential rotary wing aviators receiving tactical instruction at Ft. Rucker? But aren't the fixed wng and rotary wing courses taught by different departments? Right again! Initially they are, but in the last four weeks of training all students come under the Department of Tactics for the final tutoring which makes them Army aviators. But why are they receiving the same training when they have entirely different missions?

Army aviation, as everyone knows, exists to support the ground forces. To do this effectively and efficiently Army aviation must work with, and for, the various ground forces and other agencies that support those ground forces. This principle has long been a major consideration in selecting the type of training presented by the Department of Tactics. From the start, Army aviators were taught to work with the major combat arms, the supporting arms and the Air Force too. The end product was a well rounded aviator, capable of performing almost any task.

A new need became apparent with the spectacular growth of Army aviation. No longer was it a case of a single aircraft, or a few aircraft of the same type, performing a single mission for a ground unit. Now we have many types of aircraft performing a multitude of missions for the same ground unit.

The Beginning of a Team

A typical day in the field could see an infantry battalion being controlled by a battalion commander airborne in an LOH. Below him, a "slick" company is lifting a rifle company into a blocking position. Supporting gunships work over the LZ. A Chinook, escorted by gunships, is delivering a load of barrier material for use in the battalion night position. Over it all orbits an artillery observer, in an O-1. All aircraft are in communication with the supported unit and are responding to its every request. The commanders of these various aircraft have to be able to work closely with each other to accomplish their individual missions in a manner which will enhance accomplishment of the overall mission.

Once the problem area had been recognized and sufficiently defined, the Department of Tactics began a search for solutions. Initial efforts were directed toward securing close coordination and cooperation between "slicks" and the supporting gunships. In the summer of 1967 the first positive steps were taken to secure closer cooperation between fixed wing aviators and their rotary wing cousins.

It was decided that most contacts between fixed wing and rotary wing aircraft would occur in situations where an aerial observer was required to direct helicopters to a specific location and assist them to perform a mission at that location. To create this situation, at Ft. Rucker, it would be necessary to bring a fixed wing student (in an O-1) and a rotary wing student (in a UH-1) together at a rendezvous point, then give them a situation that would cause the fixed wing pilot to vector the helicopter to another point where the rotary wing pilot would perform a mission.

To understand how these objectives were accomplished, a basic understanding of the tactics flight program is essential. Fixed wing tactics students habitually operate out of TAC-1 auxiliary airfield. During their first two weeks of tactics instruction, rotary wing students also operate out of TAC-1. The common vehicle used for training tactics students is a round-robin low level navigation course. At intervals along the course, the student is given specific tasks or maneuvers to perform.

To set the stage for the vector mission, the fixed wing student is given a requirement to proceed to, and recon, an LZ for suitability for helicopter operations. After completion of the recon, he is told to proceed to a low frequency radio beacon, to arrive at a specific time. Inbound to the beacon he contacts "Panama Control," the radio facility providing flight following for solo tactics rotary wing students. He requests that "Panama Control" provide him a helicopter for an emergency medevac mission. "Panama Control" contacts a helicopter student (who is also flying a low level navigation route) and instructs him to divert to the medevac mission. The helicopter proceeds to the low frequency radio beacon and contacts the O-1. From there he is vectored to the LZ previously reconned by the O-1 pilot. Enroute, the O-1 pilot briefs the helicopter on the mission and the LZ. After the simulated pickup is made, the helicopter is given instructions which will put him back on his original course and return him to the control of his principal instructor. The O-1 then continues his own mission.

The O-1 pilot is the chief beneficiary of this mission. He will come away from it with a good idea of the minimum requirements for a safe one-helicopter LZ. He will gain the experience of giving instructions to a helicopter, and observing the helicopter's reaction to them. He will determine, through communication with the helicopter pilot, whether or not his instructions were sufficient to enable the helicopter to complete the mission in a safe, satisfactory manner. He will get a good idea of the helicopter's capabilities and limitations. He will have a chance to encounter new situations, react to them and evaluate his reaction. Possibly most important of all, he will have an opportunity to develop faith in his ability to perform a mission of this type.

The UH-1 pilot on the other hand will be exposed to the problem of having to take instructions from the O-1 pilot and translate them into actions. He will have to form a landing plan based on a word description of the LZ and confirm or modify the plan when he arrives over the LZ. He will get additional practice in radio aids navigation, communications procedures and landings at field sites. He too gains confidence in his ability to perform a mission of this type.

Thus far, the mission has been extremely satisfactory — at least in terms of benefits realized. This is not to say that there have not been problems! There have been many! Considerable difficulty has been experienced in getting all birds to the rendezvous point at exactly the right time. This is because of the many variables (weather, maintenance, individual reaction times, etc.) that influence such an operation. There will always be problems in this area. Another problem is getting the O-1 and UH-1 paired off and on course to the LZ. Occasionally they have difficulty in finding one another, or a stray UH-1 appears in the vicinity and complicates things. Faulty communications may also delay or

prevent the rendezvous. In spite of these difficulties, experience indicates that careful planning and close supervision can achieve better than 90 percent mission completion.

In cases where a linkup is not made, the fixed wing student is given a simulated vector mission wherein the IP makes the responses expected from the helicopter, and gives the student a word picture of where the helicopter is and what it is doing. This technique is quite effective and prevents the mission from being a total loss.

Plans for the future call for the mission to continue in its present form, with continuing efforts directed toward achieving 100 percent certainty of linkup.

In late fall of 1967 the second step toward better fixed wing-rotary wing cooperation was taken. Fixed wing students receive a period of familiarization with target marking techniques using 2.75 inch folding fin aerial rockets. In addition, they receive classroom instruction on how to direct the fires of helicopter gunships. By the simple addition of a gunship (or two) the rocket familiarization mission could be expanded into a realistic and profitable opportunity for the fixed wing student to actually direct a gunship strike.

After receiving a briefing on firing procedures and safety criteria, and a practical exercise on rocket loading, the student and IP make their takeoff and enter a holding pattern. When their turn to fire comes, the IP demonstrates the firing pattern, arming and firing sequence. The student then makes one or more dry runs to learn the technique. When all is ready, the O-1 contacts the gunship (which has been orbiting clear of the impact area) with a simulated fire mission. The gunship pilot observes the impact area while the O-1 makes its firing run. After pull-out the fixed wing student observes the strike of his rocket and gives the gunship a target location in reference to the point of impact. The gunship makes a firing run on the designated target. This gives the fixed wing student a chance to observe the results of his efforts. While the aircraft are returning to their starting positions for the next run, the IP (and the gunship pilot, if he wishes) critique the student's work.

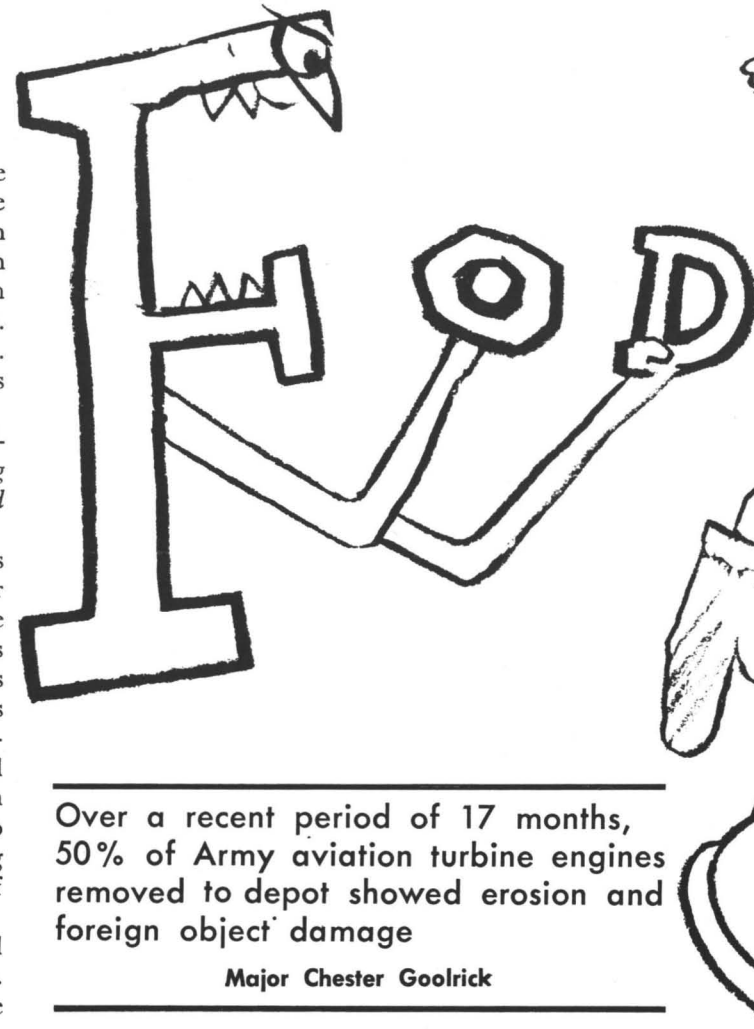
Each student gets a minimum of four rockets to fire. Of course, he is not expected to be an ace after so few tries, but he will have a good idea of what is required to mark a target and get fire on it. A little practice on actual targets will finish his training.

The gunship supporting the mission is used to train gunnery IPs, give refresher training, and maintain proficiency of gunnery qualified pilots. The fact that rotary wing students are not flying the gunship actually enhances the training of the fixed wing students since they get to work with combat experienced gunship pilots.

Have we exhausted all possibilities for integrating rotary wing and fixed wing training? Almost certainly the answer to that question will have to be "no." The two missions discussed herein comprise less than 10 percent of the tactics flight hours of a fixed wing student. The percentage of a rotary wing student's time is even less. Within the remaining hours lie many opportunities for developing missions which would bring the two programs together. All that is required is a decision that more training of this type is needed.

Do we need more training of this type? There is no easy answer to that. The current objective of the Department of Tactics is to present training which will be of greatest benefit to an aviator in Vietnam. As conditions in Vietnam change, methods of employment change with them. If the school is to keep abreast of these changes, it must make periodic changes in the instruction presented. The integrated training now presented, seems to be a fair balance between what is needed and what there is time for. In short, it does not represent the ultimate in training for teamwork, but it does at least give us "the beginning of a team."

Fixed wing students are familiarized with 2.75" rockets



Over a recent period of 17 months, 50% of Army aviation turbine engines removed to depot showed erosion and foreign object damage

Major Chester Goolrick

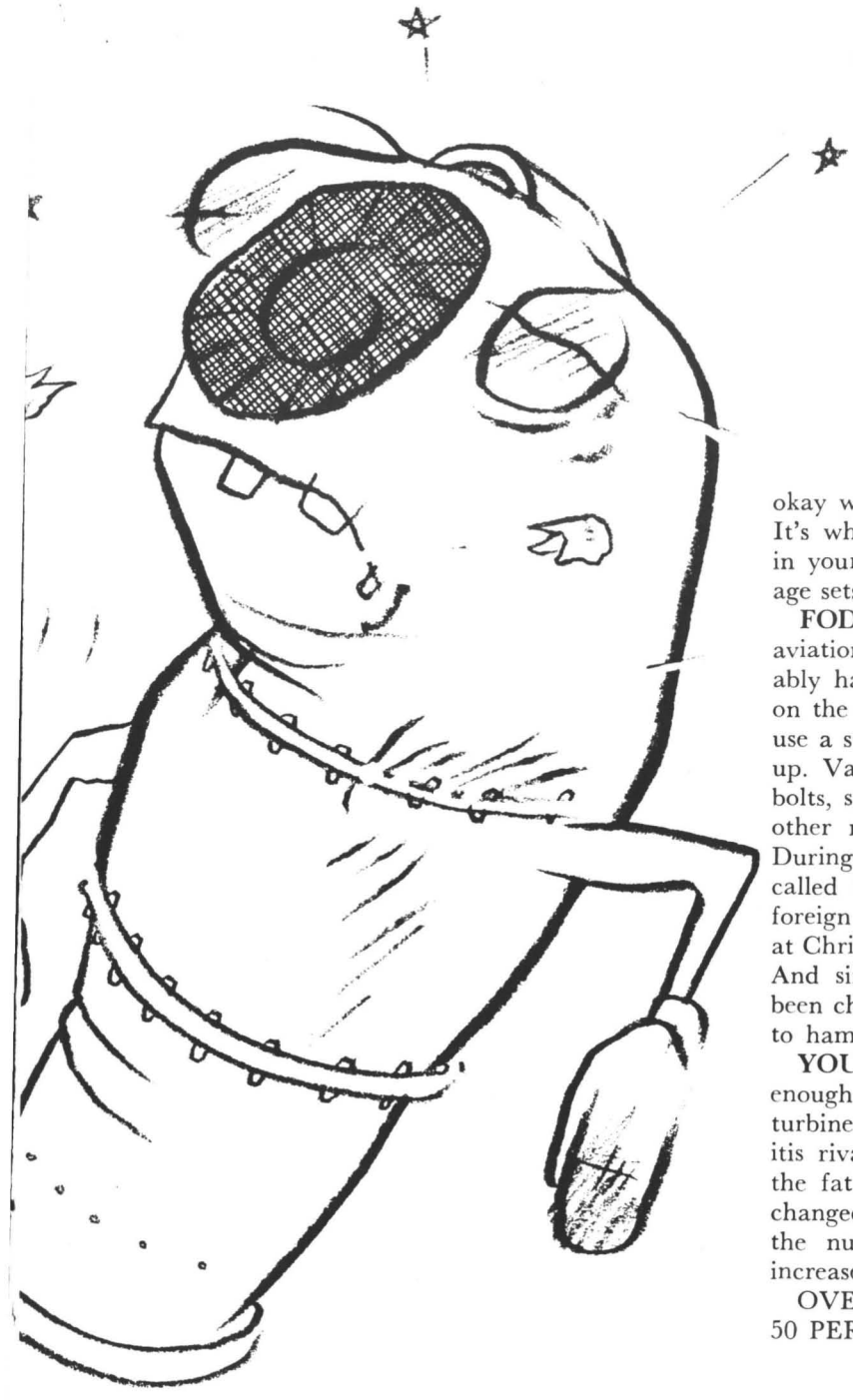
FOREIGN OBJECT

AT FIRST GLANCE, you wouldn't think Horace Greeley Entwhistle, Jr., age 3, and a turbine engine on an Army aircraft have many points in common. True, when Junior is staging a one-man civil disturbance in protest against his daily ration of spinach, he *sounds* a good deal like a turbine. That's not quite the name of the game at this point. Where the engine and Junior are real blood brothers is in their sharing of one ailment:

FOREIGN OBJECT DISEASE—*defined in medical circles as the compulsion to swallow anything you cram into your maw, usually with drastic and damaging results.*

We won't offer any hairy descriptions of the times Junior has had to have his stomach pumped out after unauthorized forays into the medicine cabinet, the liquor supply, the shoeshine box or the soap cartons and brass polish under the kitchen sink. Junior's mother doesn't like to think about it, either. She's a wiser woman today. She has learned that if Junior's plumbing system is to be kept unclogged and ready to process its quota of spinach and carrots in efficient fashion, the source of foreign objects has to be cut off. When Junior's father wants his evening toddy these days he has to work through a set of locks which would give a bank robber pause.

A foreign object can be defined as anything, useful or otherwise, in the wrong place at the wrong time. Aspirin tablets, brass polish, and soap powders are



okay when they are where they are supposed to be. It's when they are out of place — like a fishhook in your ear, or sand in your eyes — that the damage sets in.

FOD—foreign object damage — was once one of aviation's minor problems. Wilbur and Orville probably had trouble with sand in the fuel down there on the dunes at Kitty Hawk before they learned to use a strainer. Over the years the problem has built up. Various pesky things — loose change, nuts and bolts, stray tools — have been jamming controls and other moving parts since before Lindbergh's day. During World War II, pilots swore that little men called Gremlins went around at night distributing foreign objects the way Santa Claus hands out gifts at Christmas — only with different purposes in mind. And since the helicopter came along, blades have been chewed up by everything from turkey buzzards to ham sandwiches.

YOU NAME IT. I'LL EAT IT: So, it's been bad enough as things have stood. Then along came the turbine engine with a case of galloping gulp-it-down-itis rivaling that of Junior, or Lardliver McSwine, the fat man in the circus. Overnight the situation changed from bad to worse. It hasn't improved as the number of turbine powered aircraft steadily increases.

OVER A RECENT PERIOD OF 17 MONTHS, 50 PERCENT OF ARMY AVIATION TURBINE

DAMAGE SENSE

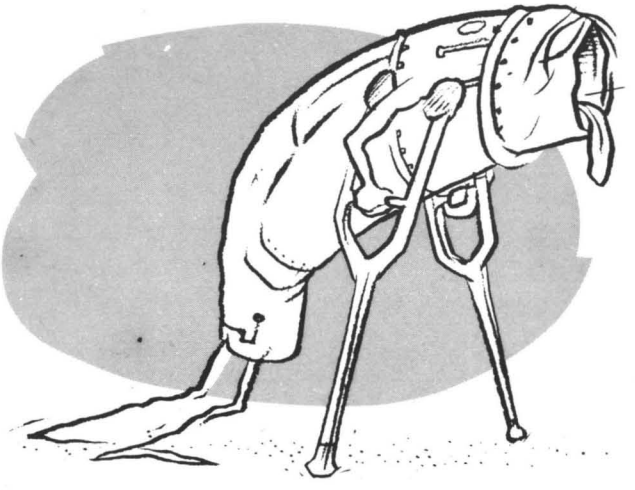
foreign object damage was once one of aviation's minor problems,

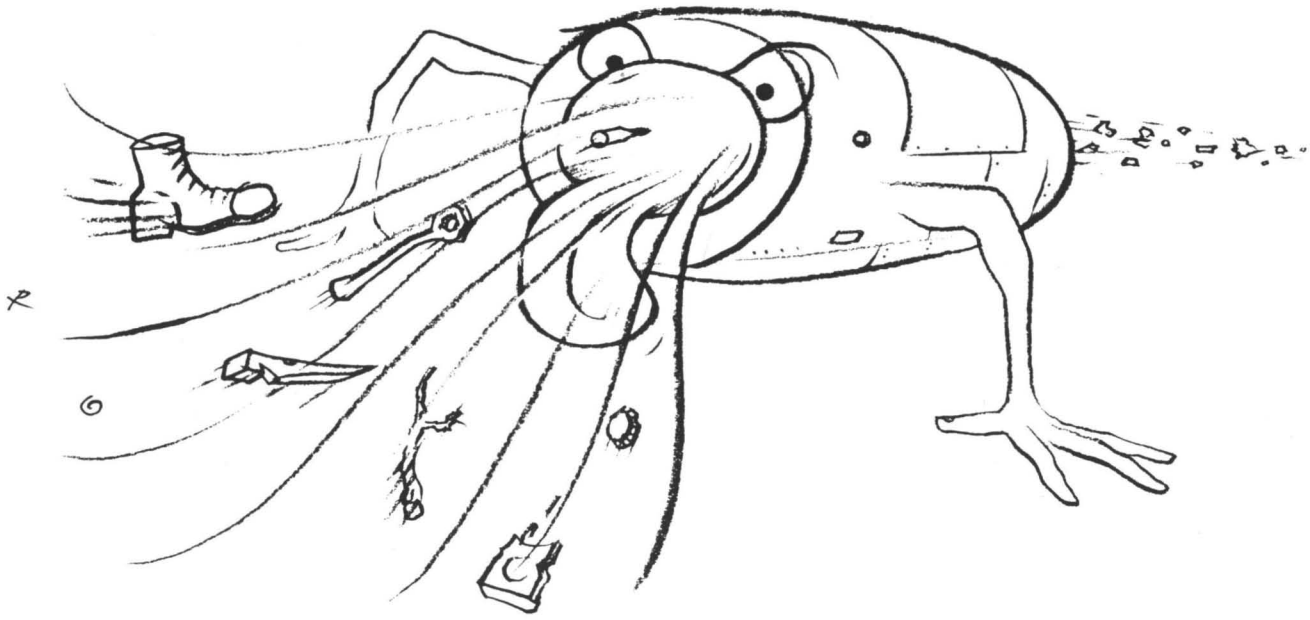
ENGINES REMOVED TO DEPOTS FOR OVERHAUL SHOWED EROSION AND FOREIGN OBJECT DAMAGE.

What do we make of this? For one thing, it's high time to take a long look at the FOD crisis and start an all-out attack on it.

If any player in the major leagues ever compiled a .500 batting average, he could demand and get full title to the Astrodome as the price of next year's contract. In Army aviation, the figures on FOD are nothing to be proud of. And the 50 percent figure isn't the whole story, not by a long shot. Nobody knows for sure how many turbines are out of action, or running at reduced efficiency, at any given moment. You could draw a deep breath and say, as of now, that just about *every* turbine engine sooner or later will be subject to some degree of FOD.

The cause of this sad state of affairs? Partly, good old Entwhistle Syndrome — the turbine's overwhelming appetite for anything it can suck up. If you were to make up a list of all the foreign objects which have interfered with turbines' innards from time to time you would have a list big enough to fill a mail order catalogue, and just as varied. After you finish, you could start another catalogue the next day. Sand, gravel, loose change hauled out of mechanics' pockets along with their handkerchiefs, assorted military insignia, straw and hay, tools, flashlight batteries, nuts and bolts, and what do *you* have loose around you right now a turbine or a rotor *won't* eat? Nobody





then along came the turbine engine with a case of gulp-it-down-itis

has yet duplicated the feat of the chap who put the overalls in Mrs. Murphey's chowder, but just hold on for a while.

The point to be noted about FOD is that the foreign object involved doesn't have to be the size of a basketball or a pair of overalls to interfere with a turbine's digestive system. That fishhook you have in your tackle box might not be big enough to handle anything above the size of a minnow. Try sticking it in your ear if you want to see what even a small object in the wrong place can do.

Take the case of hay, straw and small pieces of foliage. One recent autumn — a time of year when farmers are hard at work bringing in the sheaves — three UH-1Bs were landing and hovering in a field where Farmer Brown had been harvesting hay. One made it back to the airfield ramp before the engine failed, another had engine failure at hover and the third had an engine failure on the way home and was autorotated to a forced landing. All in all, not a very good day.

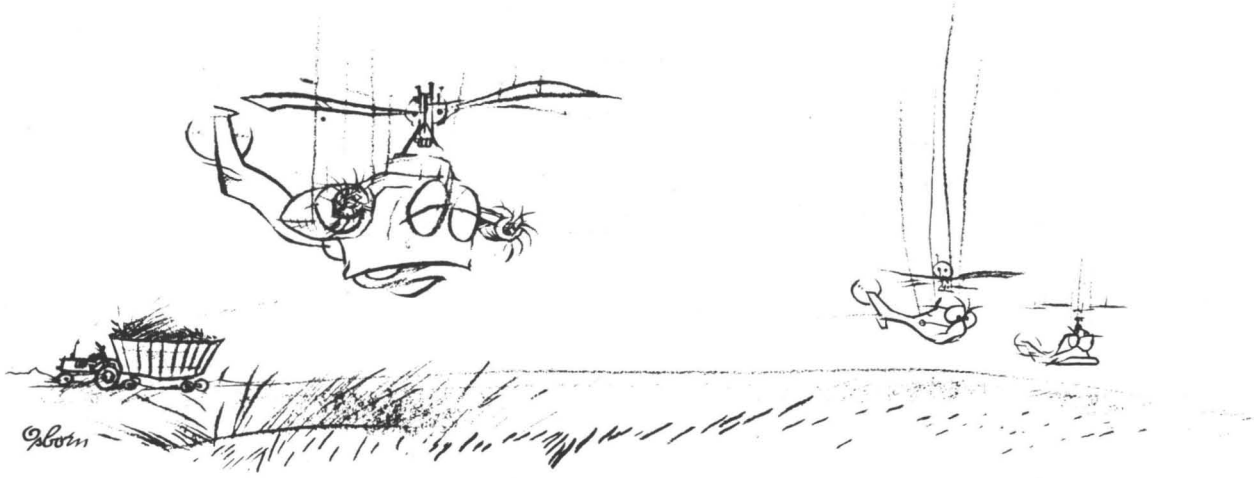
This demonstrates it doesn't take much more than a few pieces of hay to turn a healthy turbine engine into a thoroughly sick one. And when a turbine *does* get sick, the effect on aviation personnel — and aircraft — can reach the proportions of an epidemic of Asian flu during a wet spell in January.

SICK LIST: As the roll-in-the-hay incident shows, the first and most drastic result of a sudden attack of FOD is a loss of power or total engine failure, neither of which is the kind of circumstance you would want to find yourself (or even the chap you lost money to in a poker game last night) caught in when you are operating over territory where it is suspected the natives would like nothing better than to carve out your gizzard with a dull knife.

At dubious best, FOD is a source of reduced efficiency which can pile up faster than snowdrifts in a North Dakota blizzard. When foreign objects cause turbines to run high fevers, you wind up with more maintenance piled on already overworked mechanics and more aircraft sitting around out of commission. What is more important, operational missions have to be curtailed or reduced, meaning that some poor soul somewhere else goes without the support he desperately needs.

It's like that old story about the king who lost the battle because his horse lost his shoe — and the shoe dropped off because it needed a nail. This might be called FOD-in-reverse. Nobody ever has

it doesn't take much more than a few pieces of hay to turn a healthy turbine engine into a thoroughly sick one

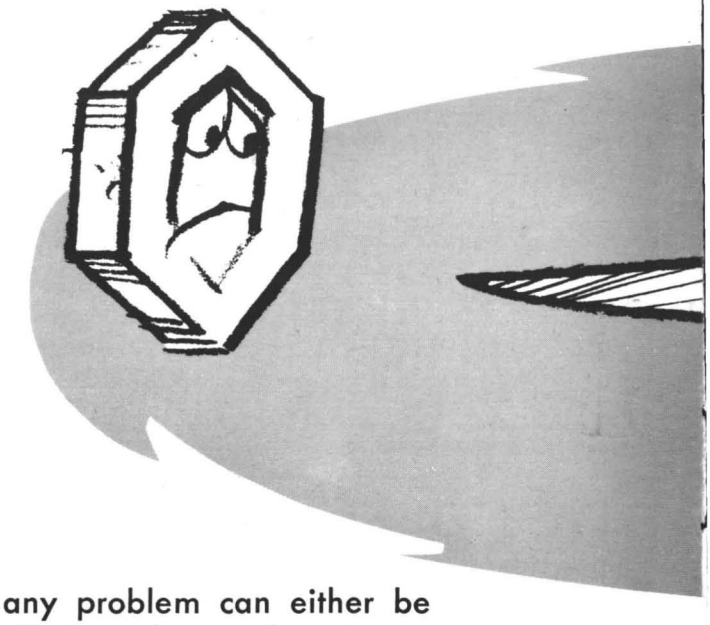


discovered what happened to the nail, but one thing's for sure: it wasn't where it was *supposed* to be when it was needed.

A foreign object which lodges where it is *not* supposed to be at a critical moment can be just as costly. A lot of people get involved.

CHEST OUT, CHIN UP: Sounds pretty grim, doesn't it? Well, let's face it, it's a problem, all right, and a major one at that. But if you're the courageous type who will agree that sticking your head in the sand is no way to fend off attacking lions, you'll go along with the theory that *any* problem can either (a) be eliminated or (b) reduced to manageable proportions if it is handled the right way. Medical pioneers long ago demonstrated this when they set out to eliminate various unpleasant ailments such as beriberi, yellow fever and polio. If they had sat around muttering about how tough things were there wouldn't be much of a population problem today.

We might as well start on a solution by being honest. Until some bright lad comes up with an Instant Automatic Handy-Dandy Foreign Object Eliminator it's a problem we will always have in some degree, the way some people have football knees or tennis elbows. But let's go back to the three UH-1Bs stricken with hay fever, for example. Here's a case in which the problem became a problem simply because the pilots involved were not aware, or had forgotten, that the problem even existed. If they



any problem can either be eliminated or reduced to manageable proportions if it is handled the right way

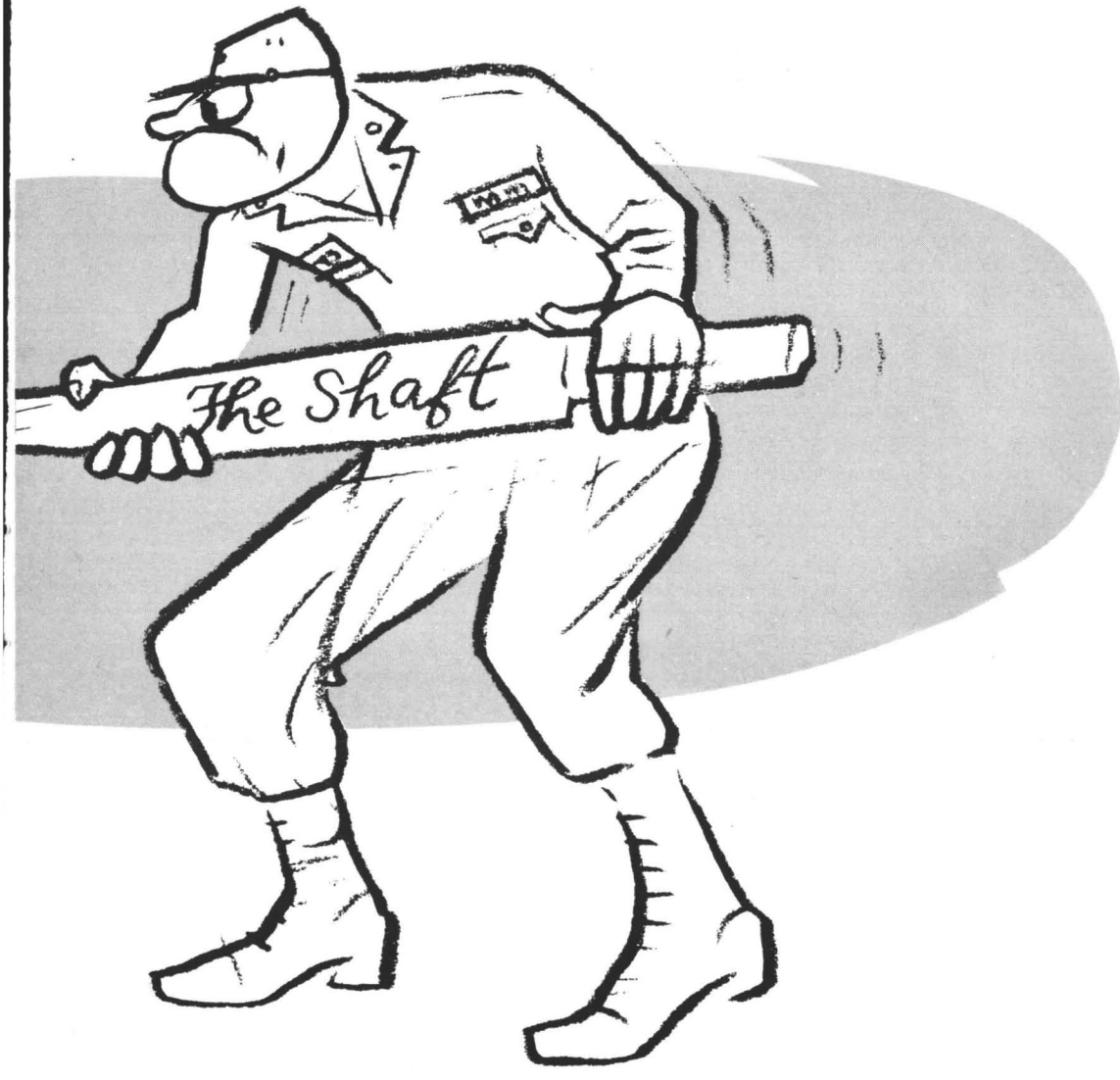
had given a little thought to the subject they would have been home free.

Unless the heat of the noonday sun has driven him batty, Farmer Brown waits until the hay is ripe before he cuts it, right? So, depending on where you are, there are certain times of year when there will be bits of loose hay lying around in nice flat fields that fairly beg for a helicopter to sit down and make itself at home.

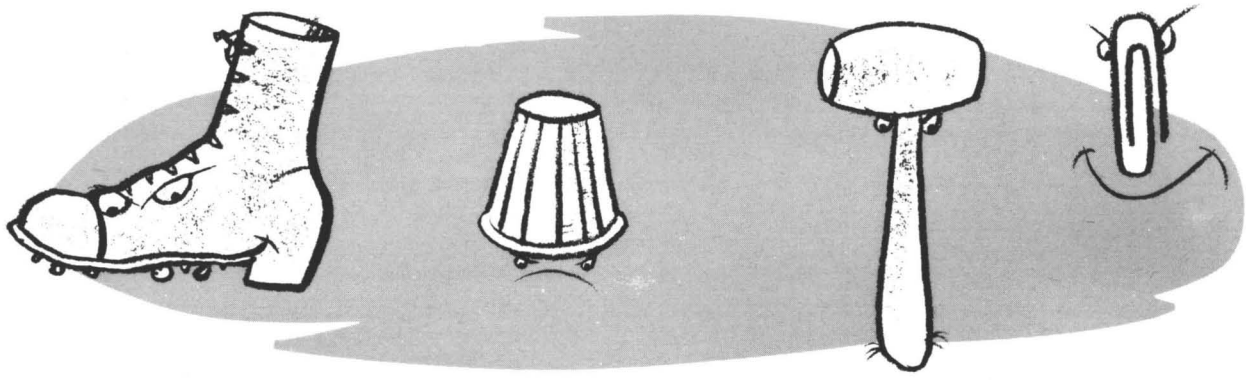
Okay, so far, so good. When you *do* sit down, or hover, rotorwash blows the hay up to be drawn through the air intake screens and lodge against the air inlet guide vanes. This is one of life's minor irritations, like ants in the sugar bowl, but it can be remedied by frequent inspections, preferably after every flight, of the screens and vanes — in the latter case by removing the screens and using a light and mirror. So maybe the pilots on this particular mission couldn't have been expected to go to such lengths on the basis of one afternoon in the hayfields. But — if they had monitored their EGT and torque closely for an unusual rise in temperature or drop in torque with a constant N_1 setting — *and had realized what the FOD problem really amounts to* — they could have done something about the situation before the hay their turbines had gobbled up had chocked them to death. In other words, they let a *minor* problem turn into a *major* one.

It's a sure fact the dangers you *know* about are the ones you can *do* something about. Once everybody in Army aviation is aware of how lethal FOD can be, what kind of a problem it really is, *and what to do about it,* its size as a problem will shrink like the neckband of a two-dollar shirt.

ALL HANDS ALERT: Check that *everybody,* chums. FOD is one problem which every man in an aviation unit can have a hand in (a) causing or (b) solving. Even if the table of organization called for a special FOD officer, section, or platoon, foreign objects could still creep in and snuggle up inside turbines unless the entire unit is on the alert. Let's take a look at some of the openings which foreign objects can take advantage of when collective backs are turned.



FOD SENSE



• Grease on a mechanic's shoes picks up bits of gravel which in turn is deposited on a walkway where the turbine can get at it.

• Litter — paper cups, oily rags and the like — is allowed to accumulate along a runway or wind blows it into a revetment.

• A mallet is left in an intake by a forgetful mechanic.

• Loose objects accumulate in cockpits (a paper clip can do the job nicely if it hides in the right place).

• Foreign objects are introduced into parking areas by snow removal operations.

• Panel markers anchored in mud or loose sand.

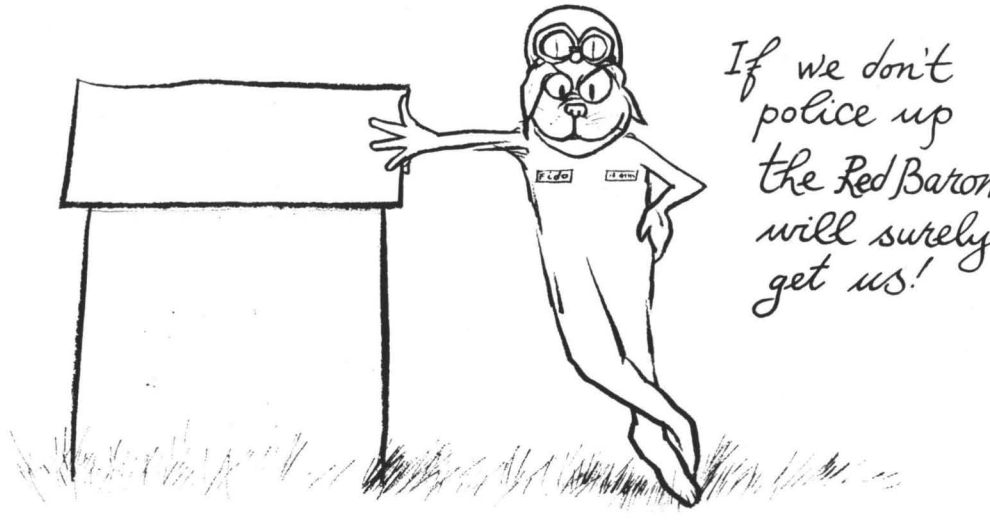
• Buckets — don't laugh, it's happened — wooden blocks and similar unsecured items in baggage compartments.

And so on and so on in spades. If you put one man to work on the problem he'd end up climbing the walls in the laughing academy, convinced he was either Napoleon or Little Bo Peep.

Basically, it is a matter of good housekeeping, a happy arrangement under which every member of the household from Pop to Fido takes pride in keeping the pad straight. If Mom spends all day cleaning up while Pop sits in front of the TV set rolling empty cans under the sofa and sprinkling ashes on the rug, and Fido is shedding hairs on the best chairs, the joint is going to look like a devastated area no matter how hard she works.

The same goes for Army aviation. When everybody has the kind of pride his job demands — pride in the unit and its record and pride in himself as a professional — rooting out foreign objects before they can do the damage becomes an automatic reflex, like swatting flies.

TOOLBOX SENSE: The all-out assault on FOD is a team effort, like any good military operation. The trouble is, that in any operation, like furniture moving, some unfortunate lad always is handed the



rooting out foreign objects before they can do the damage becomes an automatic reflex like swatting flies . . .

heavy end of the load. Some poor soul has the job of sweeping up after the parade has gone past.

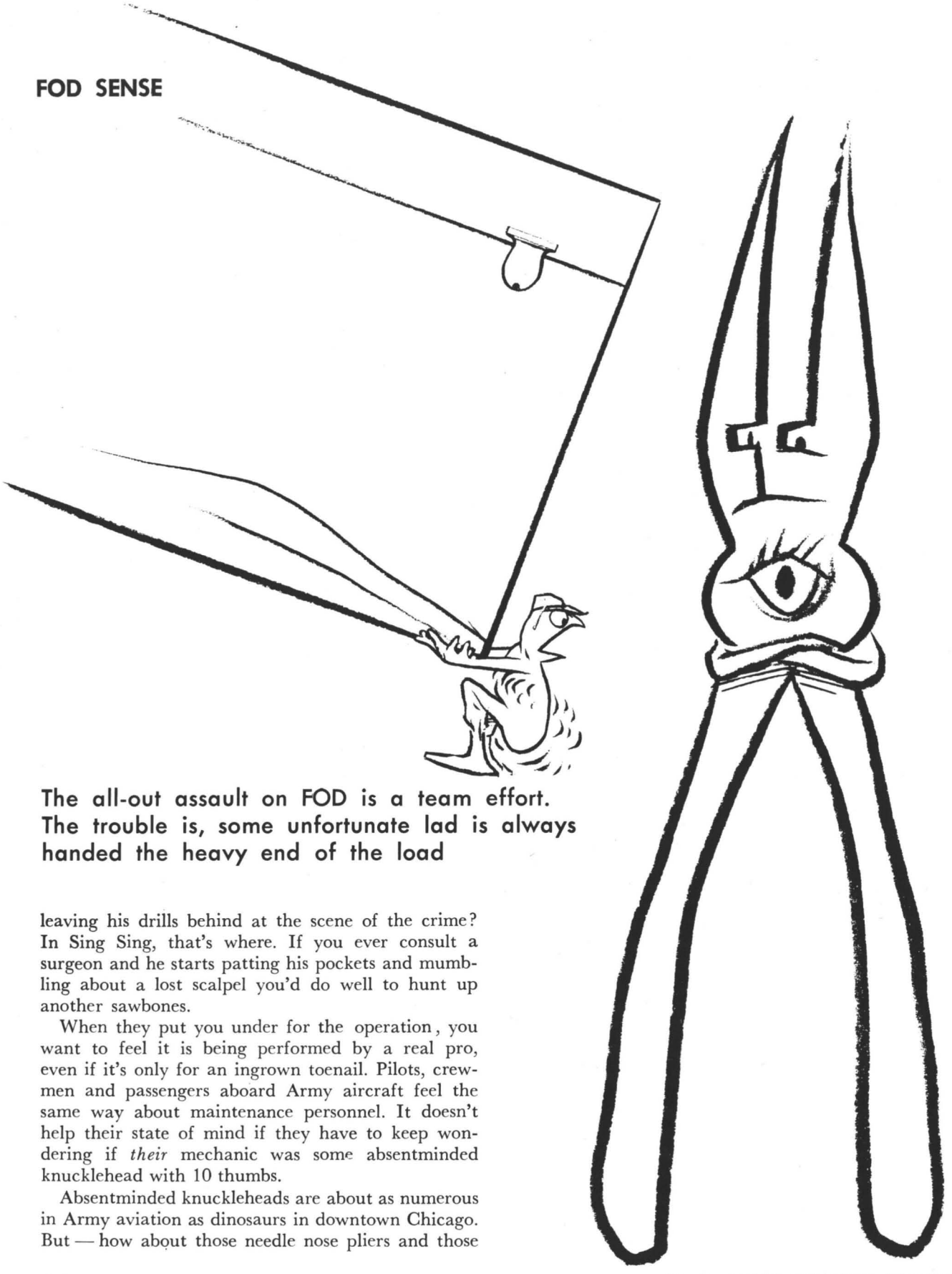
As far as FOD is concerned, the maintenance people get the task of carrying the ball about the same proportion of times as the running back on a pro football team. The mechanics, chiefs, inspectors and the rest of the experts charged with the job of keeping aircraft hale and hearty work in areas where foreign objects are spawned and where they are likely to do the most damage if they infiltrate defenses not always on the alert. So it falls on them to get rid of potential FOD down where it usually begins.

What's sadder to relate, maintenance personnel not on the alert can bring on FOD, the way Typhoid Mary used to spread germs around the land like a crop-duster. Anybody who doesn't pay proper attention to his job in Army aviation sooner or later will cause trouble for somebody else. And bringing on FOD is the easiest and surest way to do it.

Take tools, for example. If Robinson Crusoe had had all the tools which have brought down aircraft in the past, he could have built himself a six-story hotel, complete with indoor swimming pool, on his desert island instead of that crummy hut he lived in. Needle nose pliers left where they can fall into engines or jam controls. Oily rags and paper served up to hungry turbines like TV snacks. Mallets, hammers, and a hundred or so other kinds of dinguses lying around loose in cockpits and other areas they'd no business being in.

Sloppy? You can say that again, buster. It wouldn't hurt if you had it carved on a mountain somewhere for all to see. What is worse, it's unprofessional, and the Army has about as much use for a bumbling amateur as the Green Bay Packers.

One mark of the sure professional in any trade is the respect he has for his tools. Where would Joe the Safecracker be today if he was in the habit of



The all-out assault on FOD is a team effort. The trouble is, some unfortunate lad is always handed the heavy end of the load

leaving his drills behind at the scene of the crime? In Sing Sing, that's where. If you ever consult a surgeon and he starts patting his pockets and mumbling about a lost scalpel you'd do well to hunt up another sawbones.

When they put you under for the operation, you want to feel it is being performed by a real pro, even if it's only for an ingrown toenail. Pilots, crewmen and passengers aboard Army aircraft feel the same way about maintenance personnel. It doesn't help their state of mind if they have to keep wondering if *their* mechanic was some absentminded knucklehead with 10 thumbs.

Absentminded knuckleheads are about as numerous in Army aviation as dinosaurs in downtown Chicago. But — how about those needle nose pliers and those

oily rags? They are solid evidence that maintenance goof-offs do occur, that some people aren't always acting like the real pros they've been trained to be. We'll grant there can be reasons — fatigue, haste, pressure, overwork and all the rest. But you can't tell that to a turbine trying to spit up a pair of pliers.

One sign of a real pro is the solid organization he brings to his work. A golf pro organizes the clubs in his bag the same way every time he goes out on the course. A football coach organizes his bench to avoid sending in the waterboy instead of the quarterback. They say you can tell a good deal about a housewife just by inspecting her broom closet.

A professional aviation mechanic's toolbox is a model of organization. In the first place, it helps him get the job done faster and more efficiently, with less wear and tear on the nervous system. As far as FOD is concerned, the toolbox is a model *before* the job begins and *after* it is over. Everything is where it should be — in the box or in actual use. No needle nose pliers will ever get a turbine or a control in trouble if they are safe and accounted for, in their proper slot, and under lock and key when the aircraft rolls out to the flight line.

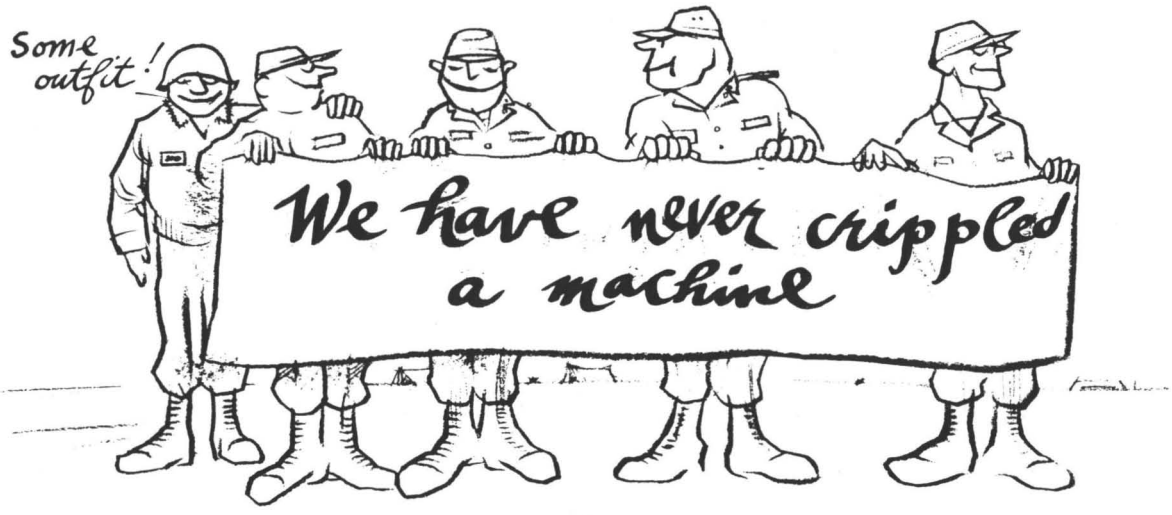
Toolbox inventory is one of the heaviest weapons maintenance personnel have in the front-line war on FOD. For one thing, it helps them sleep better at night. Generally, when an aircraft crashes because a tool is left where it shouldn't be, nobody knows who was responsible.

Except for one man. He knows, but he doesn't like to think about it.

ONE BIG FAMILY: The toolbox inventory is mostly a matter of individual responsibility and sound training, like the use of any personal equipment. You can't trail around behind a grown man checking on his gear the way a wife inspects her hen-pecked husband to see if he has on his galoshes before he leaves for the office.

But a properly trained unit can develop the kind of pride the FOD war calls for — and here the maintenance personnel in the front lines of the battle are joined by everybody from the CO on down. Take the case of an aircraft cockpit. As somebody has neatly put it, a cockpit is a pilot's place of business and the maintenance men are his office managers. It's a team, a family relationship, and when it works properly it's the kind of family marriage counselors like to dream about.

A pilot has a right to raise sand if he comes to work to find enough rubbish strewn around to start

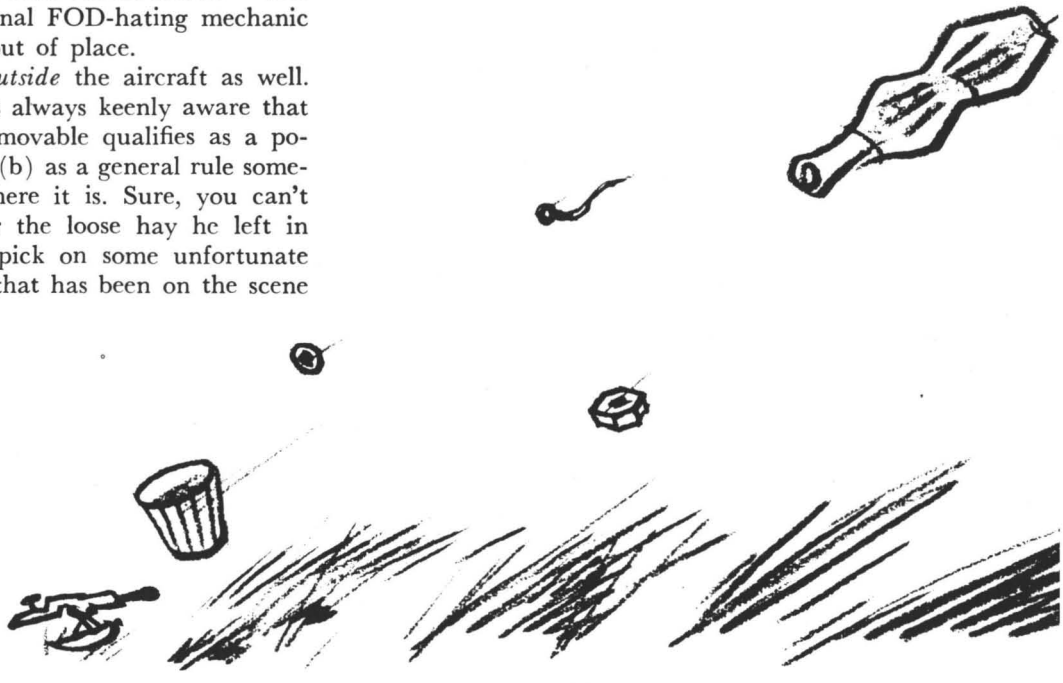


a rummage sale. The maintenance man has an equal right to feel a little tired, and to mutter bad words under his breath, if *he* arrives at a cockpit which looks like the floor of a dime store lunch counter after the noon rush. It's a two-way street.

In FOD-conscious units this doesn't happen. A pilot who realizes what a foreign object can do to his controls, his engine or his rotors, keeps everything — ham sandwiches, canteens, map cases, extra jackets — as shackled as a chain-gang convict to keep them out of trouble. And the mechanic — well we know how a professional FOD-hating mechanic feels about things being out of place.

It's a two-way street *outside* the aircraft as well. Your FOD-trained unit is always keenly aware that (a) just about anything movable qualifies as a potential foreign object and (b) as a general rule somebody put it or left it where it is. Sure, you can't blame Farmer Brown for the loose hay he left in his fields and you can't pick on some unfortunate soul for sand and gravel that has been on the scene since the ice age. But those paper cups and bottle tops and the assorted litter beside the runway didn't grow there all by themselves. Some Sloppy Joe dropped them there. And while he might be a crack mechanic or a red hot pilot when he's wide awake, he doesn't know much about FOD. Or he has forgotten. Or he doesn't care. In any case, he's not the kind of professional Army aviation has to have.

Well, so okay, maybe the paper cup blew there.



Maybe the other litter fell off a passing truck. Why is it *still* there? Whose responsibility is it to pick it up, anyway?

Everybody's, chums, everybody's. You see it first, you pick it up.

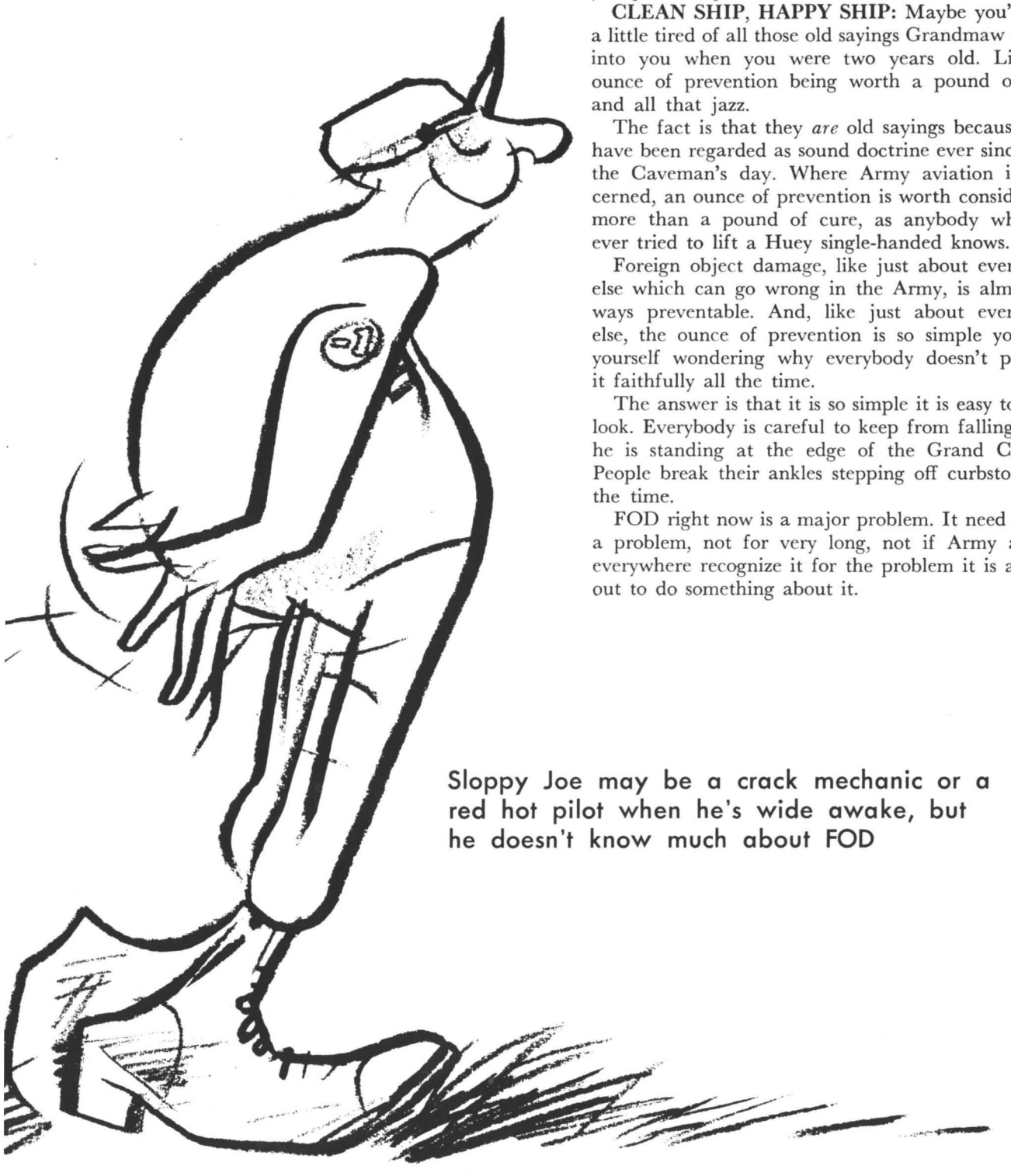
CLEAN SHIP, HAPPY SHIP: Maybe you've got a little tired of all those old sayings Grandmaw drilled into you when you were two years old. Like an ounce of prevention being worth a pound of cure and all that jazz.

The fact is that they *are* old sayings because they have been regarded as sound doctrine ever since Oog the Caveman's day. Where Army aviation is concerned, an ounce of prevention is worth considerably more than a pound of cure, as anybody who has ever tried to lift a Huey single-handed knows.

Foreign object damage, like just about everything else which can go wrong in the Army, is almost always preventable. And, like just about everything else, the ounce of prevention is so simple you find yourself wondering why everybody doesn't practice it faithfully all the time.

The answer is that it is so simple it is easy to overlook. Everybody is careful to keep from falling when he is standing at the edge of the Grand Canyon. People break their ankles stepping off curbstones all the time.

FOD right now is a major problem. It need not be a problem, not for very long, not if Army airmen everywhere recognize it for the problem it is and set out to do something about it.



Sloppy Joe may be a crack mechanic or a red hot pilot when he's wide awake, but he doesn't know much about FOD

FOD SENSE

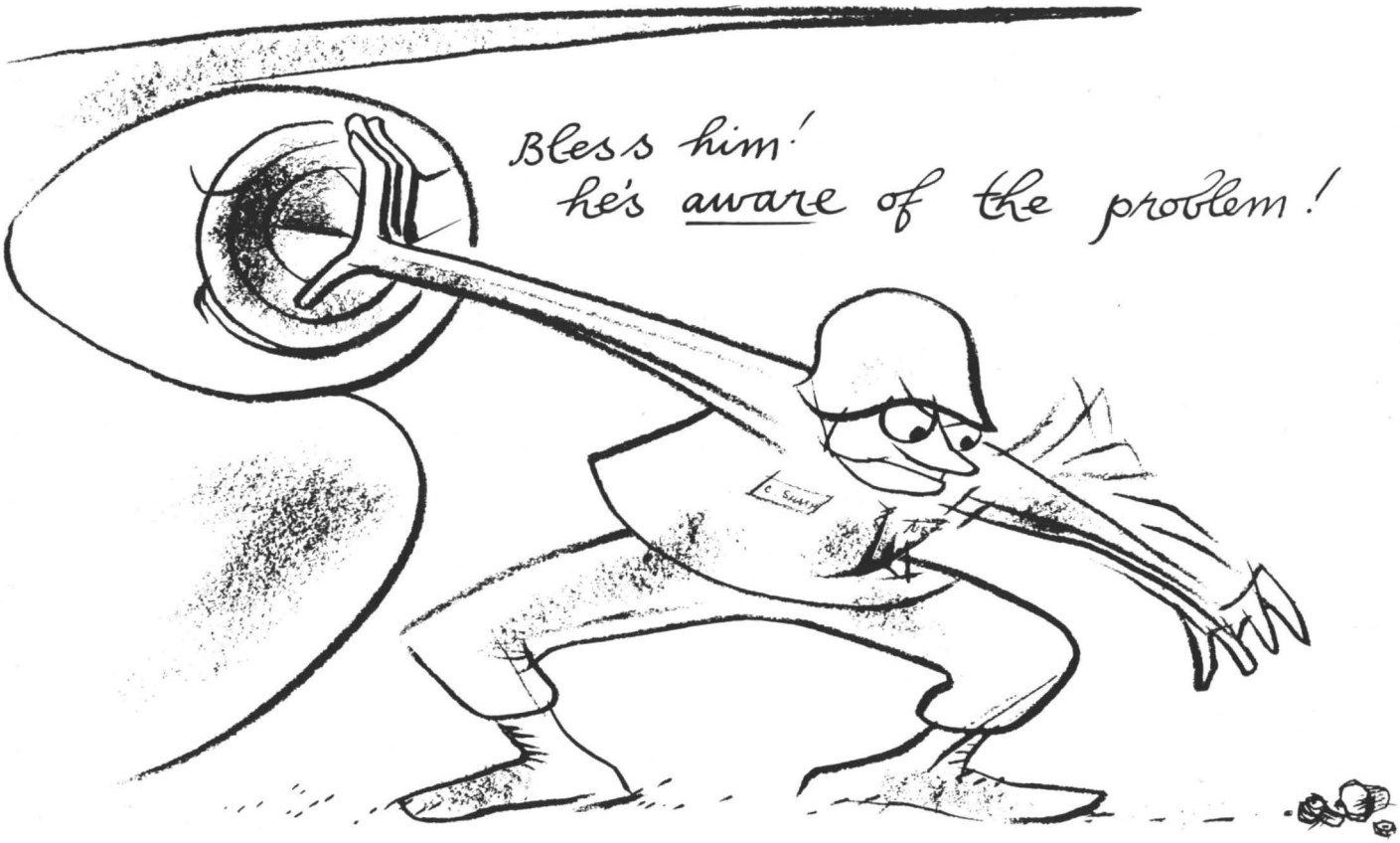
After all, it doesn't take the kind of super intelligence required to work out a formula for diverting the Mississippi or getting rid of all the sand in the Mojave Desert. It's a simple matter of keeping paper cups, paper clips, hay, ham sandwiches, tools and other assorted items of trash out of aircraft engines, rotors, controls and other places where they don't belong. And, if they have got in, of getting them out before they can turn a healthy aircraft into a cripple.

Alertness, professional pride, individual and unit responsibility— these are the tools to do the trick. If an aircraft has been maintained by a tool-conscious crew which has wound up the job by a thorough inside and out once-over for potential foreign objects and has inspected the fasteners on the inlet screen, if the aircrew has every movable item tied, nailed or welded down, if the runways, ramps and revetments are cleaner than a Dutch housewife's kitchen — then your FOD worries are largely over. They are over, that is, if this sort of housekeeping is standard unit procedure that goes on night and day every day in the year.

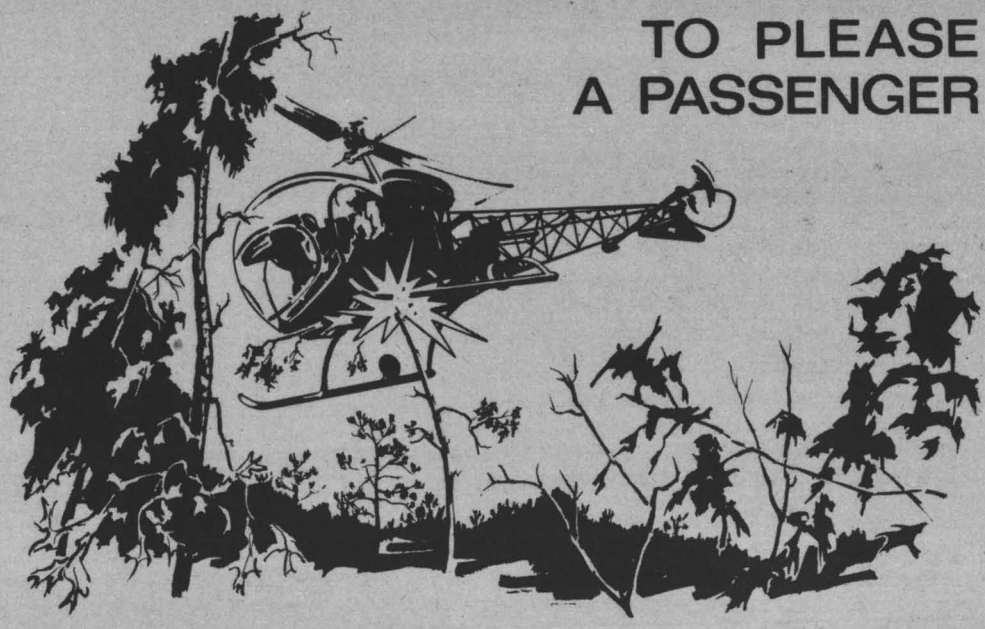
Back in the days of sailing ships, our allies in the U. S. Navy had a regular custom of ordering all hands to turn to and scrub down the ship. There was an old saying that a clean ship is a happy ship, and like the ones your Grandmaw used to tell you, it is one nobody has ever tried to debate.

And what goes for those splendid chaps in the Navy applies just as much to Army aircraft. A clean aircraft is a happy aircraft, which means it has a happy crew.

But it's a job for all hands.



TO PLEASE A PASSENGER



AN OH-13H LEFT on its first flight of the day at approximately 0730. The pilot flew a passenger to a field site and back to base, picked up a second passenger and flew him to two locations. At approximately 1530, he left a field site. The helicopter had just passed over a cleared hilltop and was over a heavily wooded downslope when the engine stopped. It descended and struck 12-foot oak trees. The left skid was torn off and the helicopter pitched down with the forward section of the cabin striking a stump in a nose low, slightly left side low attitude. The pilot and his passenger were killed.

By tracing the various legs of the flight and determining that the aircraft had not been refueled, the investigation board established that the pilot had exhausted his fuel at the time and place of the accident.

Flight surgeon: "The pilot had a great desire to please the passenger who was his new unit commander. The previous commander had not flown much and when the new one arrived, the pilot told the other aviators that they must make every effort to please him so he would like aviation. I feel this may well have led him to attempt the flight back even though he knew he was low on fuel. The alternative would have been to either delay the commander in an attempt to find a place to refuel, or to admit poor planning and have the commander return by some other means of transportation. Either of these may have given the commander doubts about the aviation section's ability to adequately support him, and this the pilot did not want . . . .

"The pilot also failed to conform to accepted procedures. This is exemplified by his frequent failures to preflight aircraft, as several aviation personnel reported . . . He was also known to have run out of fuel on one previous occasion in an OH-13. It is my opinion that his lack of attention and concern for details were important cause factors in this accident . . . .

"When found, neither occupant had their APH-5 helmets on. Witnesses at the last point of departure stated they were both wearing helmets when they took off. The passenger's helmet was found at the site of initial impact. It had no chin cushion and the chin strap, therefore, was loose, allowing the helmet to be easily dislodged. The passenger sustained a large laceration of his forehead when his head hit the upper right corner of the radio. It must be assumed that this blow knocked him unconscious. Had his helmet remained on, it would probably have rotated slightly forward and downward and taken the major part of this blow. The failure of his helmet to stay on at least contributed to his injury and perhaps to his fatality.

"The pilot's helmet was also dislodged, apparently because of improper fitting. Aviation personnel who worked with him stated he always wore the chin strap loose . . . ."

WEATHER

TWO CH-34 PILOTS were dispatched to another location to pick up a second CH-34 and return it to base. On the outbound flight, the pilot who was flying diverted around low clouds that were obscuring enroute hills. The flight was accomplished without incident until the pilot attempted to call for landing instructions at their destination. He discovered that the FM radio and VHF transmitter were inoperative and orbited south of the airfield until he received a green light from the tower.

After completing his approach, he hovered to the ramp in front of the operations building and the other pilot got out and went inside to tell operations personnel about their radio problems and their intention to depart with the other CH-34. They then hovered to the location of the other CH-34 and shut down.

The second CH-34 was preflighted and, after approximately 30 minutes on the ground, the two pilots decided that the copilot for the outbound flight would be the lead pilot for the return flight, flying the second CH-34, because of the radio difficulties. They also discussed the route to be flown and decided to fly back the same way that they had come.

After starting and warming up the helicopter, the lead pilot lifted to a hover, received clearance from the control tower and the two helicopters departed. The weather was 1,000 feet scattered, with 4 miles visibility. The two helicopters continued on their heading at 500 feet above the ground. As they approached the hills, they saw that the hills were still obscured by clouds. The cloud layer lowered and visibility was reduced by haze.

In order to maintain visual contact with the ground, the pilot of the number two helicopter descended to 200 feet. The lead helicopter remained at approximately 400 to 500 feet and was seen by the pilot of the number two helicopter to divert to the southeast to detour around a hill obscured by clouds. The lead helicopter disappeared for a few seconds when it flew through or over a small cloud. It reappeared, still maintaining the same altitude as before. A few seconds later, the pilot of the number two helicopter lost sight of the lead helicopter as it flew into or above more clouds. He slowed to 60 knots, expecting the lead helicopter to descend out of the clouds in front of him. When the lead helicopter did not reappear after a few minutes, he turned west, proceeded direct to a VOR and then to his base.

Without his FM radio and VHF transmitter, the pilot of the number two helicopter was unable to call the lead pilot to locate his position or find out why he did not descend below the clouds. When he landed, he rushed to operations and tried to contact the lead pilot, but received no response.

After flying into instrument conditions, the lead pilot flew over a town located near the top of a hill at an elevation of approximately 1,800 feet. The helicopter was seen to circle the town several times at 50 to 100 feet. The weather at this time was forecast and observed to be 200 feet obscured, with a visibility of one-tenth nautical mile. After circling the town, the helicopter was seen to fly southeast and appeared to be in a slight descent, with slow airspeed, at approximately 50 feet above the ground.

It struck the first tree, probably with the fuselage, a little more than 300 yards southeast of the town. After striking the tree, it continued for 120 feet and descended through the trees. It was believed that the retreating blades were the first to strike the trees, causing the right side of the helicopter to rise. It descended through the trees at an angle of 75 degrees and impacted the ground on its left side.

Local civilians arrived at the accident site several minutes after the crash, found the pilot alive and called an ambulance. The ambulance and a doctor arrived shortly thereafter and the pilot was in a hospital approximately 45 minutes after the accident. The crewchief, riding in the copilot's seat, did not survive the accident.

Board analysis: "After entering instrument weather conditions, the pilot continued to fly for approximately eight minutes. Reaching the town, and recognizing it as a town, he circled twice then flew away in a southeasterly direction. His altitude while circling and departing the town was approximately 50 feet and his cockpit visibility was approximately 200 yards or less, at an airspeed of less than 60 knots.

"The terrain southeast of the town slopes slightly downward and is generally clear of obstacles. It then slopes upward sharply and is densely wooded with 80- to 100-foot trees. The board feels that the pilot thought the downward slope led to a valley and that he was unable to see the sharply rising terrain due to low visibility. The board believes that the pilot either did not see the first tree that the aircraft struck or did not see it in time to avoid it.

"After striking the first tree, the pilot entered a

VIOLATION

steep flare to reduce airspeed and made a rapid application of collective to keep from striking more trees on the upward sloping terrain. It is believed that in applying the rapid collective, the pilot did so with a conditioned reflex from many hours in UH-1 series aircraft and that he did not roll on throttle as required in the CH-34 to maintain constant rpm.

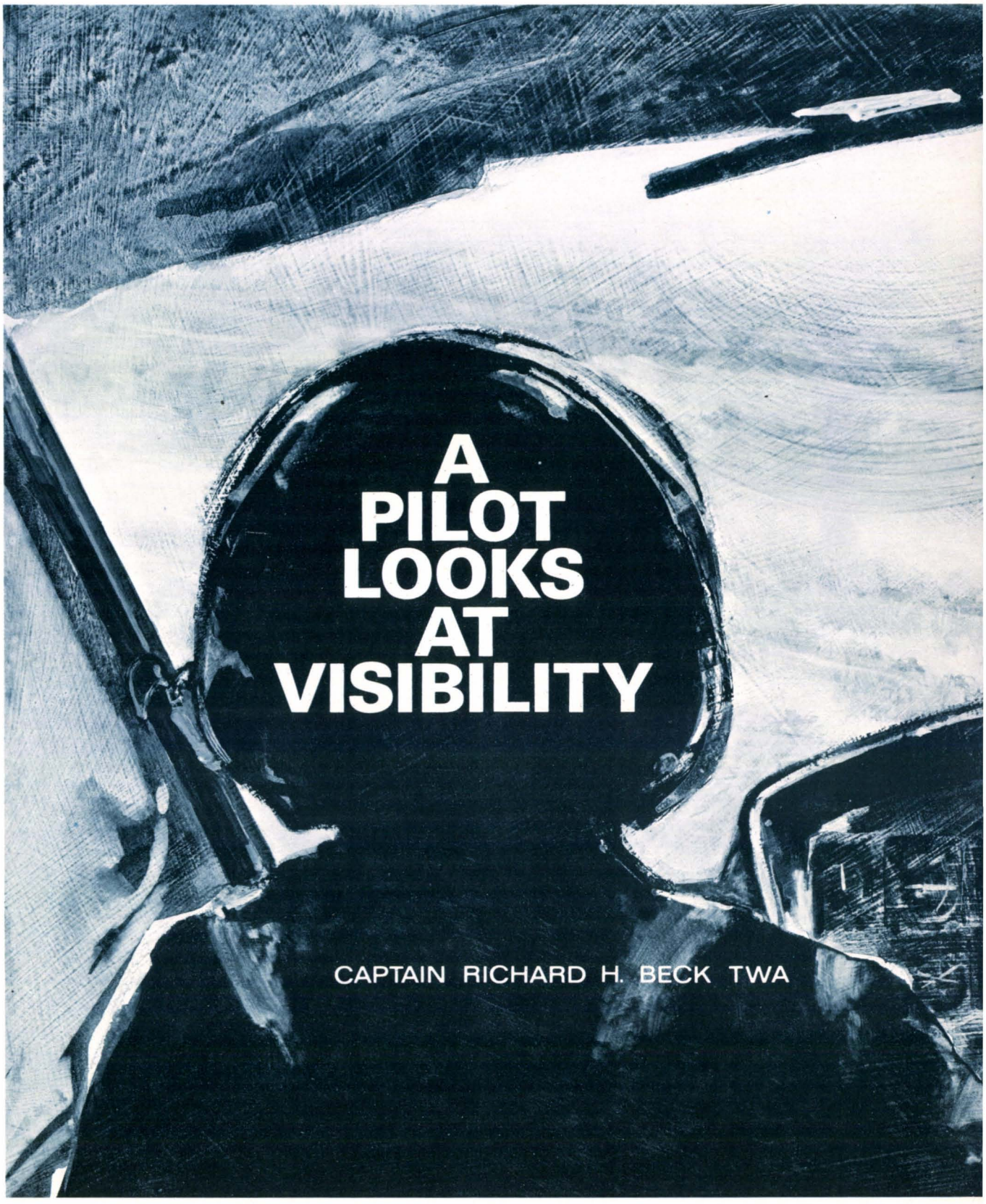
"The rotor rpm was reduced very quickly to the point that it was insufficient to sustain flight in the steep flare. After traveling approximately 120 feet, the aircraft descended into the trees at a very steep angle . . . .

"The board feels that at no time during the eight minutes in instrument conditions did the pilot fly solely by reference to instruments . . . A fuel sample taken from the tanker that last serviced the helicopter was analyzed and found to be within specifications. An oil sample taken just prior to the last flight was analyzed and found to be within specifications. The board examined the engine in the wreckage and it appeared to have been running at the time of impact. There were marks on the engine cooling fan and the engine drive shaft was broken in a manner that appeared to have been caused by torque . . . .

"It is the opinion of the board that weather was a factor in the accident solely because of its existence and the fact that the accident probably would not have occurred if the weather conditions had been better. However, weather is not an established or probable cause factor because the weather conditions had been seen by the pilot before he entered the area of low ceilings and visibility.

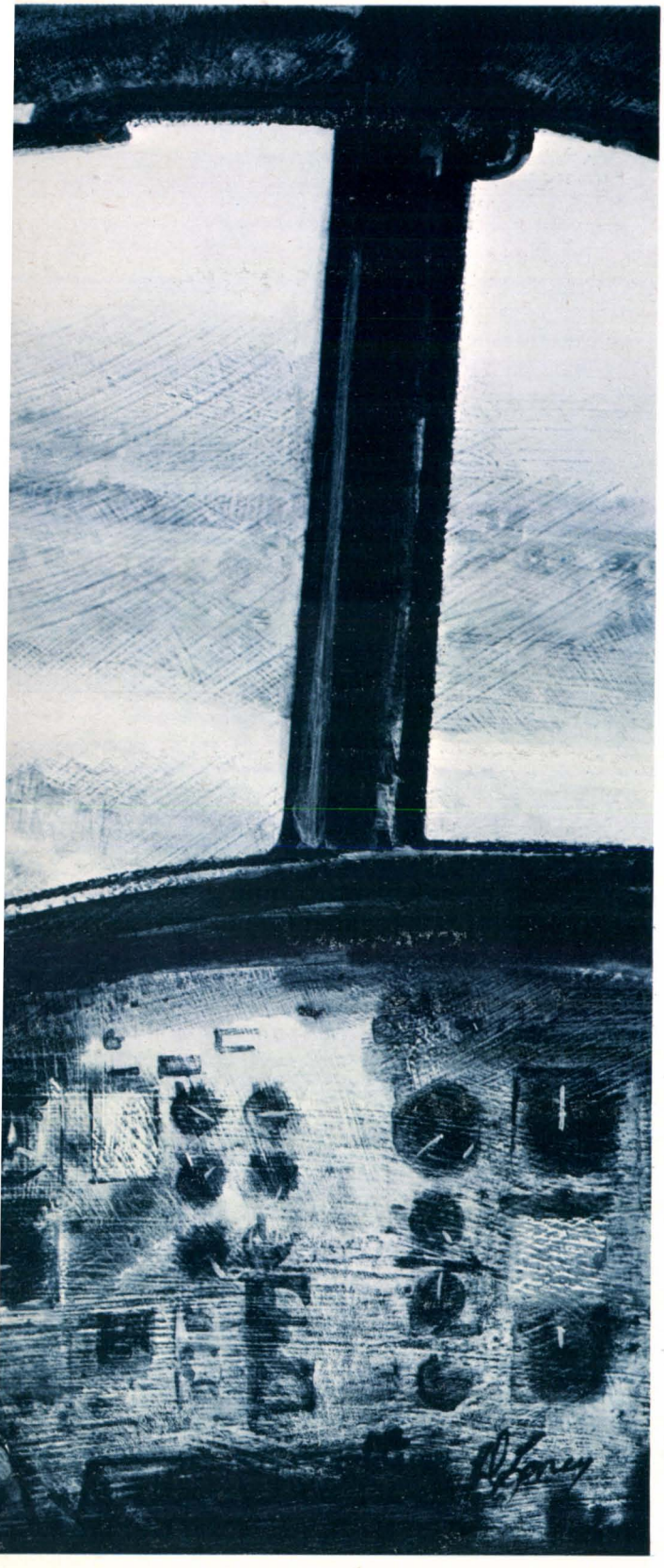
"The board determined in the investigation that the log book was not in the helicopter immediately prior to or during the flight, and that the pilot had no knowledge of the writeups on DA Form 2408-13. The attitude indicator was written up as inoperative and the airspeed was written up as reading 25 knots. The lack of knowledge of the writeups or the fact that they existed are not considered cause factors because the board believes the pilot did not attempt to fly solely by reference to instruments . . . .

"A command regulation states: 'Visual flight rules. a. Daylight hours: At no time will aviators use weather minimums lower than the following for Army helicopters outside controlled airspace: Ceiling 500 feet, visibility one-half NM, clear of clouds, and at airspeeds that will permit perception of obstructions in time to avoid collisions.' In the opinion of the board, the violation of this regulation is the main cause of this accident."



A PILOT LOOKS AT VISIBILITY

CAPTAIN RICHARD H. BECK TWA



From the AIRLINE PILOT
by permission

(Editor's note: For a number of years Captain Beck has been a member of ALPA's All Weather Flying Committee, and in August 1967, he was selected as the IFALPA delegate to the All Weather Operations Panel of the International Civil Aviation Organization.)

THE BASIC REASON for the existence of an airplane is to safely and economically transport people and goods from one point to another. During the portions of the flight that occur well above the surface of the earth, a pilot will usually experience relatively little difficulty in the guidance of the airplane by reference to his panel instruments inside the cockpit when he is "head down." On the other hand, the state-of-the-art has not yet progressed to the point where all takeoffs and landings can be made either automatically or by reference to his "head down" instrumentation. Thus, the pilot is still very deeply involved in the concept of "see-to-takeoff" and "see-to-land." When visibility is restricted, regardless of the cause, the problem of precise, high-speed navigation close to the earth becomes increasingly more acute.

Only at relatively infrequent intervals is a very short period of time spent by the pilot in this environment, and consequently there is a distinct dearth of information regarding Slant Visual Range under varying conditions of degraded visibility.

This paper is not intended as a course in aviation meteorology, but is an attempt to examine visibility in general, RVR in particular, and to present a thumbnail sketch of the characteristics of some of the various reduced visibility structures, so that a better appreciation may be gained of the problems confronting the pilot at his decision height.

VISIBILTY: In the aviation industry, various means have been instituted to provide visibility values for the pilot and to give him an increased measure of approach and landing success probability. In order of increasing accuracy, they may be listed as follows:

1. Meteorological visibility is a number that gives a general picture of what a human can be expected to see, either in any direction around the compass or in some designated direction. It is a prevailing visibility and it is a human observation involving human judgment that says a man on the ground can pick out certain objects or lights from his position. In the United States, it is usually specified on the teletype weather sequence report.

2. Tower visibility is what an airport control tower operator sees from his station in the control cab and is reported as such on the weather sequence. In principle it is the same type of reporting as meteorological visibility.

3. Pilot visibility is what a pilot sees from some nonspecific point in space, and is usually reported when he is either climbing out from an airport or making an approach.

4. Runway visibility (RVV) may be defined as the distance along an identified runway that an observer can see a moderate intensity light source of 25 candlepower at night, or the distance he can see dark objects against the horizon, sky or cloud background in the daytime.

5. In the United States runway visual range, or RVR, reported in the remarks section of the weather sequence, is an instrumentally-derived value, based on standard calibrations, that represents the horizontal distance a pilot may EXPECT to see down the runway. The RVR consists of a projector that emits a beam of light, usually along a 500-foot path (a 250-foot path for CAT II), and this light is received by a photoelectric detector that measures the amount of light received as a percentage of the amount that would be received through a clear atmosphere. To compute RVR, three factors must be known. First, the transmissivity of the atmosphere must be measured by the transmissometer. Second, the brightness of the runway lights must be known, because their intensity is related to the transmissivity measured by the transmissometer. Third, it must be known whether it is day or night, since lights are visible at a greater distance at night. It therefore logically follows that the higher the setting is at night, generally speaking, the higher will be the RVR reading, and this value will always be greater than runway visibility. In daytime, when visibilities increase, even a high intensity light will fade into the background brightness, and the substitution of runway visibility would be more representative.

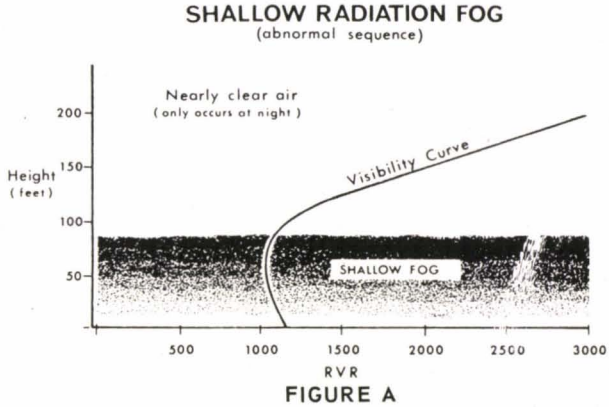


FIGURE A

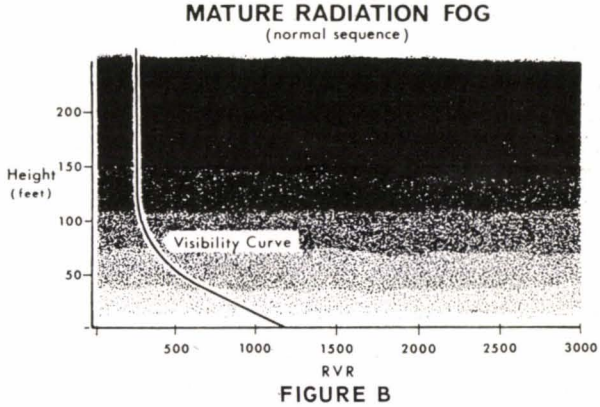


FIGURE B

But how accurate is this highly complex RVR measuring device, and most of all, will the information passed on to the pilot be reliable and will it be usable?

The instrument error is practically nil, but like our present-day computers, the accuracy of its in-

formation will be directly proportional to the data fed into it. Here are some of the pitfalls and problems involving RVR:

1. In a mature fog condition, the slant range visibility from the cockpit at the decision height will nearly always be LESS than the visibility reported at ground level.

2. When a nonhomogenous fog exists, different densities of fog, or "blobs" of fog can be drifting across the runway near to the site of the transmissometer, yet not be reflected in the RVR value.

3. When a fog is in its formative stage or is beginning to drift over an airport, such as a sea fog, completely varying conditions may exist at any number of places on the airfield.

4. Landing into the sun in a shallow ground fog that often forms around dusk or dawn will raise the background brightness as viewed from the cockpit to such a degree that the reported RVR and cockpit visibility will be completely incompatible.

5. Delays in reporting representative RVR values to the pilot on an approach have not yet been adequately solved. Nor has there been any firm agreement, as yet, as to how often values are to be passed on to him. Although it is within the state-of-the-art to do so, no manufacturer has come up with a satisfactory device to give representative readouts in the cockpit.

6. Heat shimmer, bird interference, manufacturing and installation tolerances, dirty, misted or frosted lenses are often not taken into account.

7. There is insufficient maintenance and checking on light bulbs whose filaments have deteriorated far below specified standards.

8. There is still no universal agreement on reporting RVR values in 100-foot increments in the lower visibility ranges.

9. The method by which an RVR value is obtained may vary with a particular country. In some countries, for example, it is determined by having a human observer sight down the runway and count the number of centerline or runway edge lights he can see. Many of these installations employ a system where the approach lights are more brilliant than the centerline or edge lights, and a pilot can easily be trapped into a situation where he has better visibility on the approach than he has for the flare and landing when his decision has already been made. Also, in many instances, there is often no specific or periodic check made on an observer's eyes to determine how well he actually can see, and whether he does or does not see what any other observer sees.

Thus, it can be concluded from the foregoing, that RVR can only be an indication to the pilot of what he *may* see when he reaches his decision height. Data gathered over a period of years has shown that RVR values are not representative of what the pilot sees from the cockpit on the average of about 20 percent of the time. The problem is further compounded because there is no acceptable way to measure slant visual range (SVR), and this is of prime importance because it is what the pilot will see from the cockpit at his decision height.

In order to better understand the nature of some of these degraded visibilities, it is suggested that they be examined a little more closely. Since radiation, advection and warm front fogs are the three phenomena that appear to adversely affect aircraft movements more than other restrictions to visibility, the greater emphasis will be placed on them. Other types of fog and reduced visibilities will also be touched on and their relationship to operations should become immediately apparent.

Since fog is really nothing more than a cloud formation that lies on or close to the surface of the earth, any remarks that follow will basically involve those conditions where visibility is restricted by fog of approximately 3,000 feet or less with particular emphasis on the lowest region of Category II. From a pilot's point of view, of course, he is not really mostly concerned as to whether a fog is shallow or deep, and what he will be able to see at his decision height.

RADIATION AND ADVECTION FOGS: Traditionally, we think of radiation fog as a shallow fog forming at night at flat inland airports under stable conditions. And historically we have thought of advection fog as air that has been first cooled by a colder surface into fog and then is transported by the wind from one point to another, being most prevalent along coastal areas and near large, inland bodies of water. Even though radiation and advection fogs are basically the same thing in principle, since they are caused by air being cooled by a colder surface, they will be considered each in turn.

Radiation fog usually forms under calm conditions at night due to ground cooling when a given amount of moisture is present in the atmosphere. Cloud cover will tend to slow down its formation by reflecting

The solution to the problems of restricted and reduced visibility is not going to be easy . . . there certainly must be a concerted effort to supply the pilot with a representative slant visual range that he will see from the cockpit at his decision height

MATURE RADIATION FOG

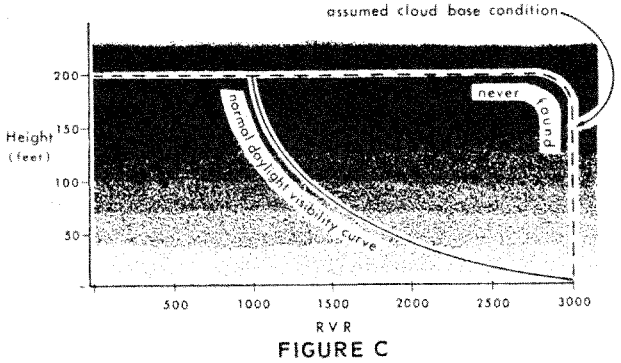


FIGURE C

heat back to the earth, and the rate of formation will vary in proportion to the amount of total sky cover, the height of the cloud cover, the amount of moisture content, the wind speed and the extent of nuclear particles present in the atmosphere.

In its first formative stages, radiation fog will evidence wisps and tendrils that are very thin and quite scattered — almost nebulous in appearance. Discounting the situation where fog drains into a valley, and using only a flat inland airport, the structure will build into the first stage of shallow ground fog, 50 to 80 feet thick. This shallow fog is defined as one in which visual contact is made above the decision height, yet is accompanied by a relatively low RVR. (See Figure A)

The pilot will have a visual segment that is constant or very slowly decreasing. He will be confident to the lower altitudes since the slant visual range will not be low enough to make a missed approach .At about 100 feet the slant visual range decreases and the rate of decrease becomes greater as he approaches the top of the fog. On penetration of the fog his SVR will be at a minimum and then will increase to the value of the RVR on the ground. In this situation, the pilot is in the beginning of the flare, and suddenly the world goes blank!

As the fog becomes more mature, the fog top rises, and the clear air above the shallow fog has now become more dense. The RVR will increase a little because of the blanket of fog holding in the heat, but the SVR may be constant with height up to well above 200 feet.

The mature fog, which is the usual fog structure, is where the fog density, or to be more specific, the slant visual range, is fairly uniform down to 100 feet. Below this there is usually a progressive increase in SVR down to touchdown. (See Figure B)

Radiation fogs almost never dissipate by themselves at night, and the final stage is the clearing of the fog. This occurs almost always in daylight and the density is usually patchy.

In the United Kingdom, scientists who examined night fogs at flat inland airports over a period of 10 years where the RVR was 1,500 feet or less, found that the fogs were shallow about 40 percent of their life's cycle and that the visual segment faded to a minimum value at about 70 to 80 feet of altitude. The other 60 percent of the time there would be a normal visual sequence with an increase in slant

visual range as the altitude decreased toward the ground. (See Figure B) They also found that if the RVR on the ground is reported at 1,200 feet at night, the SVR from 100-foot head height would be less than 1,200 feet about 70 percent of the time. United States scientists at the National Bureau of Standards in Washington, D.C., have calculated that this SVR from the cockpit would not be greater than 810 feet. In the other 30 percent of the time when the SVR was greater than that reported on the ground, the British found that it was due to the fact that the fog was shallow.

Most advection fogs occur when moist air moves over colder water or colder ground. Along coastal areas it is often called "sea fog." When cold water rises from the ocean depths, or when it flows in the form of a cold stream such as the Labrador Current, moist, warmer tropical air passing over it will cool and condense into advection fog. This fog bank may then move inland like a wall, and will deepen as the wind speed increases up to about 15 miles per hour. Wind velocities higher than this will tend to lift the fog into a layer of low stratus. This same advection principle is also involved when moist warmer air flows over colder ground. Advection fog can also form concurrently with the production of radiation fog.

Depending on the moisture content, the amount of temperature drop that is incurred, and the nuclei and/or sea salt particles present in the air mass, advection fog can produce extremely low visibilities down to the ground. Since it is a cooling process that is occurring, advection fogs may persist until there is either a change in wind direction, a change in the source region of the air or effective heating from the sun. This type of fog is very common along coastal regions and near large inland water bodies and aircraft operations under these conditions often have to be suspended.

Daytime fogs are usually in the state of clearing and may be somewhat patchy with varying visibilities. If they are in the mature state that is usually caused by an inversion, the slant visual range will usually follow a normal sequence where the visibility increases with lower altitudes. (See Figure C)

In the case of the extreme inversion, the warmer air lying on top of the colder air next to the surface will only be heated by the sun's rays, making it even warmer and thus causing a greater disparity between the two air masses. Heat energy used up in this manner will then have less probability of penetrating the dense, cold air mass that is stagnating on the earth's surface with a resultant protracted period of fog conditions. Depending on the thickness of the cold air mass, its moisture content, its temperature, its stability and the amount of foreign particles present such as smoke, dust, etc., such a condition as described above can cause fog to remain constant for long periods of time with extremely low visibilities down to the surface. Only a lessening of thickness, moisture content, or foreign particles, an increase in temperature or a frontal passage will tend to alleviate this particular situation.

Referring to Figure C again, where a rapid increase in SVR is experienced as the aircraft descends in altitude, it should be noted that this may appear to give the effect of breaking through a cloud base. Actually it is a continuous change. During many years of study, Mr. E. S. Calvert of the Royal Aircraft Establishment in Great Britain has never found a cloud base to exist when the RVR is reported as 3,000 feet or less. He stated that one should think of a gradual "fade-in" rather than a sudden breakout.

If this visual distribution always occurred, the decision to continue with the approach would normally not be too difficult. Unfortunately, it has been found that when these daytime fogs are in the RVR bracket between 3,600 and 1,200 feet, they are nonhomogenous or in a state of flux about 90 percent of the time. And if the RVR on the ground is reported at 1,200 feet, 95 percent of the time the slant visual range from the 100-foot head height will be less than this value. When it is less than 1,200 feet of SVR, approximately half of the time it will be greater than 700 feet, and the other half of the time it will be less than 700 feet.

WARM FRONT FOGS: This type of fog is caused by the addition of moisture to the air through the evaporation of rain or drizzle and can occur both when the precipitation is falling through the air as well as after it reaches the ground. This precipitation-induced fog usually forms fairly rapidly and can cover a widespread area. Visibilities can be quite patchy as well as very low, especially at night, and positive improvement usually occurs only with the passage of the frontal system. Its structure can be generally likened to that shown in Figure B.

UPSLOPE, STEAM AND ICE FOGS: Upslope fog occurs when moist air is cooled by being forced up a sloping land surface, and its continued existence

Visibility at a given decision height is usually only slightly less than that experienced in flare and touchdown

is dependent on the upslope wind as well as the moisture content. It can be quite widespread and one area of frequent occurrence in the United States is the eastern slopes of the Rocky Mountains when it is affected by moist air from the Gulf of Mexico. If the wind becomes strong, the fog will be lifted into low stratus.

Steam fog, sometimes referred to as "sea smoke," occurs when cold air passes over much warmer water, resulting in rapid condensation. Enough water vapor is added to cold air to saturate it where it is mixed and cooled, thus forming fog. Its most frequent occurrence is over open bodies of water on cold autumn mornings and in polar regions. This same principle can occur when a clear, cold air mass lies over a wet airport. When the sun is high it will evaporate water on the runway, and the moisture then rises and is immediately condensed into fog, sometimes to a depth of 8 to 10 feet.

Ice fog usually forms in moist air during extremely cold, near calm conditions. The temperature usually is below -20 degrees F and the triggering of the fog is dependent on the source of water vapor and the condensation nuclei. The tiny ice crystals that are formed are called ice needles or spicules and effective visibility is dependent largely upon whether or not one is looking toward the sun. This has become a problem of increasing concern at airports such as Anchorage, Alaska, during the winter months.

Mention should be made of the problem where a nighttime fog appears to be dissipating as daylight comes, and then suddenly the fog thickens at sunrise. Studies made by meteorologists and physicists have caused them to conclude that some of the most prevalent nuclei in air masses close to cities and industrial centers contain plentiful quantities of sulphur dioxide. Under the influence of sunlight, this gas changes to sulphur trioxide which is unstable in the presence of water vapor and its hygroscopic qualities are such that it strongly attracts water. This would account for these sunrise fog formations which sometimes occur with relative humidities as low as 90 percent. This fog now won't begin to break up until the sun generates enough heat to raise the temperature of the air mass.

Airports that lie in valleys have a distinct problem of their own. In these localities, cool air drains down into the valleys and forms a shallow fog that does not dissipate until it is heated by the sun. In their mature state, visibilities can range close to zero from the fog top down to the ground.

OTHER OBSTRUCTIONS TO VISION: These latter phenomena are usually not universal in nature and in many instances could be best thought of as local problems.

Snow and rain are classified as obstructions to vision and the extent of the obstruction is normally in direct proportion to the size of the particles and how closely they are spaced. Visibility at a given decision height is usually only slightly less than that experienced in flare and touchdown.

Blowing sand, blowing dust and blowing snow are directly dependent on wind velocity. They can be compared pretty much with shallow radiation fog wherein visual contact is maintained at higher altitudes, and then visibility usually is reduced sharply from the beginning portions of the flare throughout the touchdown and rollout.

Smoke, sea salt, microscopic nuclei and other foreign particles suspended in the atmosphere are not, in themselves, of real significance in a Category II approach, even in their heaviest state. Also, haze is merely the forerunner and end product of fog. It is almost impossible to tell where dense haze leaves off and fog begins, because there is just a gradual change in the droplet size and therefore in the visibility. Because of a certain amount of ground heating, visibility in these instances invariably increases as an aircraft gets closer to the earth.

The solution to the problems of restricted and reduced visibility is not going to be easy. Scientific establishments in the U.S.A., as well as in various other countries, have been and are now involved in these studies. Whether research will be able to apply an economical dispersal system to both warm and cold type fogs, or whether visibilities can be permanently improved by a process of fog modification, there certainly must be a concerted effort made to supply the pilot with a representative slant visual range that he will see from the cockpit at his decision height.

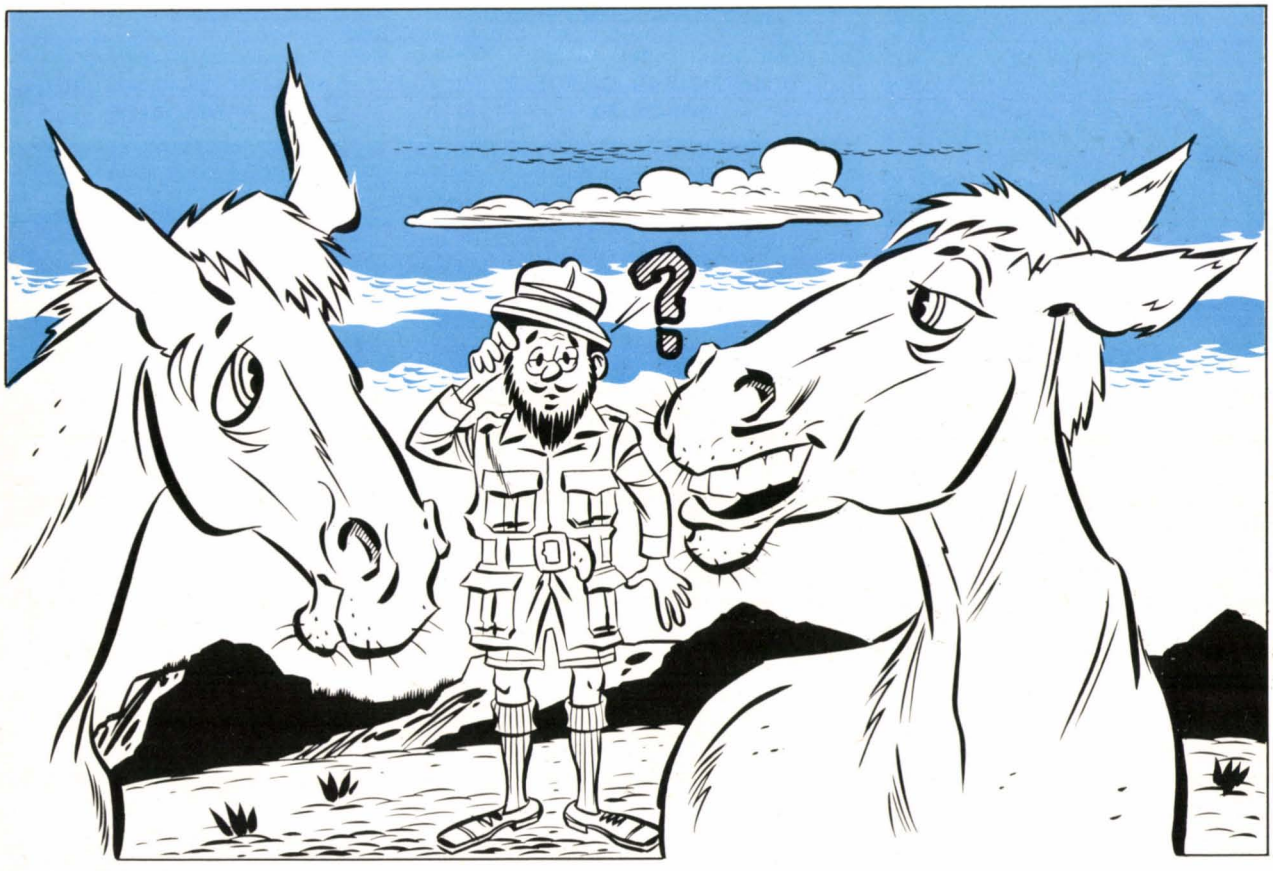
YOU'D BETTER BELIEVE IT!!!!!

Ted Kontos

WORKING IN A MOUNTAINOUS area, several scientists were gathering information about how animals communicate. Mules were used to carry their supplies up the steep narrow trails to the campsite. One of the mules, walking alone next to the edge of a trail, slipped and slid to the next lower level. Several hours of strenuous effort were required to rescue it.

The mules were herded together at the campsite that night. During the trip down the following day, all the normally calm mules showed signs of nervousness. They hugged the mountainside and refused to get near the outer trail edge. Through means still unknown, the mule that fell managed to relate its experience to the others. Not only was it able to communicate, but it did so in a convincing way that was visibly effective to the other mules.

Convincing and effective communication is the



greatest deterrent for all types of accidents. It is the only way for us to learn the many skills required in Army aviation; it is the only way to learn the procedures and techniques safe flights demand; and it is the only way for us to learn from the mistakes of others. When communications fail to convince, accidents are the result.

The directives, procedures and techniques that govern Army aviation were not developed arbitrarily. They came from experience. All have been tested and proven valid. They exist for your protection

Aviators are taught and required to use checklists. The use of checklists will prevent wheels-up landings. It's as simple as that. But an OV-1 pilot landed wheels-up with his checklist in his pocket. Despite his training, all the published material on the advantages of using checklists, and his knowledge of similar previous accidents, this pilot was not convinced that he needed to use his prelanding checklist to remind him to put his wheels down. Communications failed in this case and it took an accident to convince the pilot of the necessity for using his checklist. The Army can ill afford this type of lesson.

Operators' manuals contain full information about the loads Army helicopters will carry in varying atmospheric pressures and aviators are trained to compute weight and balance. A CH-37 pilot was not convinced of the necessity of computing his load and crashed during a demonstration takeoff over trees. His load was more than 1,850 pounds over allowable gross weight. He also tried to take off downwind to make a better showing for the demonstration. This lesson cost one life and a helicopter.

Another CH-37 pilot attempted to take off with a full load of troops and the temperature in the nineties. The helicopter staggered off, lost rpm and crashed. The troops were transferred to another CH-37, *an additional passenger was added* and a takeoff was attempted from the same location. The results were like watching instant replay on TV.

A UH-1 pilot took off with a heavy load aboard, lost rpm and aborted the takeoff successfully. Still not convinced that his load was excessive, he took off a second time, only to see his rpm drop again. This time, determined to get airborne at all costs, he continued forward. As could be expected, the rpm continued to drop and the helicopter crashed.

These are but a few of many accidents resulting from overgross loads. During a two-year period, 191 overgross accidents were recorded.

Marginal weather is another area in which communications have apparently failed to convince pilots of their vulnerability. A CH-47 crashed during a night takeoff into instrument flight conditions. Neither pilot was instrument rated.

A UH-1 pilot, attempting to fly through a mountain pass in marginal weather, entered a fog bank and crashed into a hill. Two fatalities, eight injuries and a demolished helicopter were the result.

Another UH-1 crashed and sank in 12 feet of water

during a night approach in heavy rain. One crewmember drowned. The pilot continued his approach after losing visual contact.

CREEPING DOUBT: All of these pilots were taught to use checklists, compute loads, use performance charts and stay within their capabilities. What made them deviate from procedures etched in their minds through training and repetition? The most probable answer is that they had done it before and gotten away with it. The OV-1 pilot, perhaps in a hurry to get on the ground during a previous flight, completed his prelanding check without the checklist. Success made him confident in his ability to do it again. He was no longer convinced of the necessity of using his checklist. While other pilots might require a checklist, he doubted the same might apply to him.

This type of creeping doubt that undermines pilots' convictions about the requirement for established procedures and builds false confidence in their ability to operate without procedures is prevalent in overgross accidents. If they can do it once, why not again and again? Success breeds greater doubt and false confidence, until the load is just a few pounds heavier or the temperature and pressure altitude a little higher and another overgross accident is recorded.

Flying in marginal weather builds confidence in a pilot's ability to maintain ground contact under low ceilings, in rain, or around patches of fog. Like a moth around a candle, he is no longer convinced of the danger, and tests his skill in tighter and tighter circumstances until he is trapped. He may be instrument rated and wait too long to transition to the gauges, or noninstrument rated and subject to the throes of instant vertigo. The results are the same.

I THOUGHT: Statements of pilots fortunate enough to survive lapses from established procedures and techniques often begin "I thought . . . I thought the gear was down . . . I thought the tiedown strap had been removed . . . I thought there was enough room to maneuver . . .I thought I had enough fuel . . .I thought the AC had control . . . I thought I could get it off." The list of "I thoughts" is endless.

A college professor, faced with similar "I thoughts" from his students for errors and failure to prepare for classes, had a standard retort. "As a matter of fact, you didn't think. If you had thought, you would have known better." If we take the time to think, most of us do know better.

The directives, procedures and techniques that govern Army aviation were not developed arbitrarily. They came from experience. All have been tested and proven valid. They exist for your protection.

Established procedures exist for all aviation personnel. The maintenance program, for example, is designed to prevent mishaps through established responsibilities in each echelon of maintenance and through a system of recorded checks for each step of every task. As with aviators, the penalty for ignoring established procedures can be catastrophic.

A mechanic failed to follow established procedures for torquing a UH-1 tail rotor hub bearing retainer nut and the hub failed. A fatal accident was the penalty.

Another mechanic performed unauthorized maintenance on a UH-1 lateral servo. The pivot came out of the cylinder, causing loss of control and another fatal accident.

A third mechanic installed an unauthorized bolt on the lower gun of an M-16 flex system. He installed it upside down, then overtorqued it. The bolt failed, allowing the gun to swing inboard and fire into the helicopter, into a rocket pod and into the gunner's ammunition box. The crew escaped uninjured, but the UH-1 was destroyed by the resulting explosion and fire.

20 IN 1 WEEK: During a recent week, 20 Army aircraft mishaps were caused by failure to follow established procedures. Three were major accidents, five were incidents, one was a forced landing and 11 were precautionary landings.

A CH-47 pilot did not follow checklist procedures and made a slope takeoff with the parking brake locked . . . A helicopter pilot started his engine and attempted to engage the rotor with a main rotor blade tied down . . . An OH-6 engine failed and a major accident resulted from failure to check the depleted oil supply . . . Fuel contamination (water) caused an O-1 engine to fail . . . A loose runway marker was blown into the main rotor blades of a helicopter, damaging the blades.

At this rate, we can expect 1,000 failure-to-follow-established-procedure mishaps, including 150 major accidents, to occur during a one-year period, at a cost of more than $25 million. All can be prevented by a firm resolve on the part of all Army aviation personnel to take the time to think and follow established directives, procedures and techniques. These are your communications for safe flying. You'd better believe it!

PEARL'S

personal equipment and rescue / survival lowdown

GOURMET DINING in SOUTHEAST ASIA

LCdr Tal Turaids, M.C., USN

THERE IS AN ABUNDANCE of food in the tropics. You only have to know how to find it. A British pilot, who made a forced landing on a beach in Southeast Asia, tells this story: "After wandering along the beach for several days without finding anything edible, I met a native and indicated by signs that I was hungry. He promptly climbed up the nearest tree and returned with a bird's nest. Then he dug out a wild root near the tree, which looked like a sweet potato. While I made a fire, he pulled off a coconut, opening it with great skill. Soon we were feasting on a delicious meal of bird's nest roasted in coconut oil and garnished with the root."

Many survivors have later said that the fear of getting poisoned kept them from eating the plants and fruits they found and that they preferred to go hungry. Poisonous plants are no more prevalent in one region than in another and, as a general rule, do not constitute a serious hazard. Besides, eating poisonous plant food is seldom fatal, though it can cause violent illness. This does not apply to fungi. If you don't know your mushrooms, it is best to avoid them altogether since they have almost no food value.

Food poisoning is commonly caused by toxins preformed in the food by bacteria or the bacteria themselves. Dairy products which have not been safeguarded properly, or foods prepared under unhygienic conditions are the most frequent offenders. However, there are also many plant poisons such as in snakeroot, certain mushrooms, water hemlock, wild parsnips, wild carrot, fava beans and green leaves of rhubarb.

The symptoms of food poisoning usually appear within one to six hours after ingestion and are characterized by excessive salivation soon followed by nausea, vomiting, retching, abdominal cramps, prostration and diarrhea. (Vomiting and diarrhea constitute nature's first line of defense for rejecting offending poisons.) Treatment consists of rest and adequate liquid intake. Swallowing a handful of charcoal will slow absorption of the poison. A bland diet moderately restricted in amount and avoidance of roughage (fruits and vegetables) may lead to less nausea and diarrhea. Two antidiarrhea tablets taken four times daily may be required. Abdominal pain and discomfort are usually relieved by the application of heat. If vomiting is to be induced (when a poisonous plant has been eaten and before symptoms develop), one may use one teaspoon of salt in three ounces of warm water; three teaspoons of mustard in a glass of warm water; two teaspoons of syrup of ipecac; or simply stick fingers in the throat.

Some pilots carry a deck of plastic recognition cards illustrating various plants commonly found in Southeast Asia. It is doubtful, however, if they would be of much use to anyone in a survival situation except an expert biologist. Knowledge of some general edibility rules would probably be more practical.

- Never eat large quantities of a strange food without first testing it. Prepare a cooked sample (poisons are destroyed by cooking — except in mushrooms), take a mouthful, chew it and hold it in your mouth for five minutes. If it still tastes good, swallow it. A burning, bitter taste which causes nausea is always a danger sign. Wait three to four hours. Then eat a handful and wait eight hours. If no ill effects are evident, consider the food safe. Do not waste time testing a plant or fruit which is scarce in the area — test the abundant ones.
- Avoid eating plants with milky juice or letting the milk contact your skin (except wild figs, papaya, and breadfruit).
- Avoid grasses or grain heads having black spurs in place of normal seed grains (danger of ergot poisoning).
- Avoid plants which look like onions, garlic, dill, or parsley, or plants with spines, fine hair or thorns.
- Discard all beans, bulbs, fungi or brightly colored seeds.
- In general, it is safe to try foods that you observe being eaten by birds and mammals (especially monkeys).
- Learn to recognize these four edible wild plants common in the Indochina Peninsula: (1) Fig trees, found mostly in the forest; fruit edible when soft. (2) Pandanus fruit grows at the top of a tree in clusters and looks similar to pineapples. Edible raw when yellow and breaking apart. (3) Taro — a plant 2 to 3 feet in height with large leaves resembling "elephant ears." Young leaves, stalks, and especially the thick potato-like root are edible when cooked or roasted. (4) Yams grow mostly in forests and can weigh up to 150 pounds. Edible when cooked.

Pygmies in New Guinea live chiefly on rats, caterpillars, beetles, larvae and maggots — and so can survivors. Some of the best restaurants in the States serve for hors d'oeuvres such delicacies as pickled ants and termites, fried bees and wasps, roasted grasshoppers, boiled cicadas and the like. An American pilot, Captain Die, rescued from the Burmese jungle, writes: "I soon conquered my foolish inhibitions and started feverishly hunting for the vermin. I caught tree insects large and small. After pulling off their legs and feelers, I gripped them by the wings and cheerfully bit off their bodies. I did the same with grasshoppers. I ate larvae and butterflies whole. The bodies of the latter had a slight aroma of meat and were the best of all. The larvae, alas, were hard to find, or I would have eaten more of them."

USAASO Sez

The U. S. Army Aeronautical Service Office discusses

New FAA emphasis on pilot vigilance to avoid mid-airs
New source for obtaining aeronautical charts
Requirements that controllers keep their physicals current

ON see and evade: The Federal Aviation Administration has recently amended Part 91 of the Federal Aviation Regulations (General Operating and Flight Rules) to spell out the specific responsibility of pilots to maintain a vigilant watch for other air traffic in order to avoid mid-air collisions.

This responsibility is now implied in various sections of FAR Part 91 and is generally understood by pilots. However, FAA feels that "a specific statement of the requirements is desirable to emphasize its importance."

Specifically, the new rule states: "When weather conditions permit, regardless of whether an operation is conducted under Instrument Flight Rules or Visual Flight Rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. . . ."

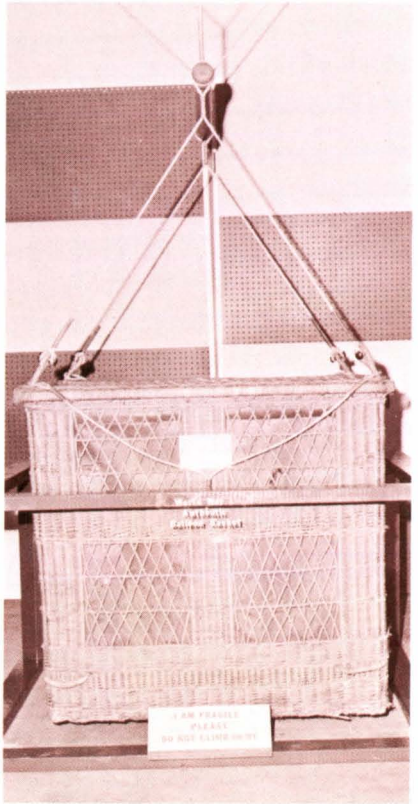
This may be the same old story, but you must admit, it is one of the best lifesavers known, so let your motto be "See — Evade — Exist."

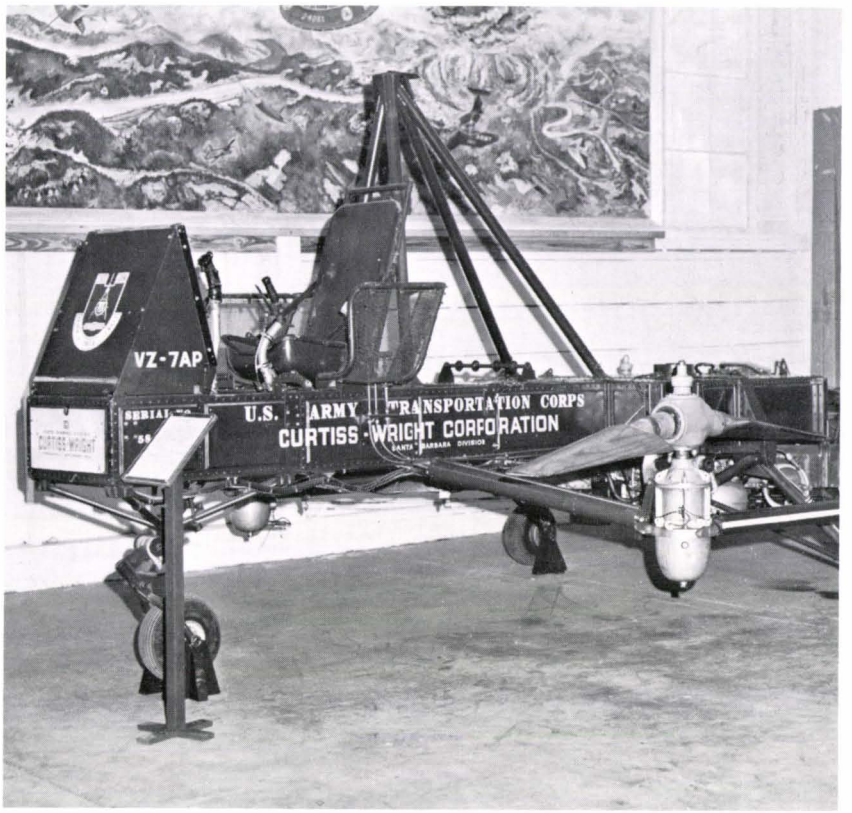
ON aeronautical chart requests in CONUS: For fast service on aeronautical charts, instead of sending your requests to USAASO, send them to:

Commanding Officer
Army Map Service, CofE
ATTN: Map Distribution Division
6500 Brooks Lane
Washington, D. C. 20315

ON controller physicals: Some Army airfield operations officers and air traffic control facility chiefs may have inadvertently situated themselves very far out on the proverbial limb. USAASO field personnel have discovered several instances where Army controllers were actively controlling air traffic without a current Class 2 physical. AR 611-201 states, in part, that a soldier classified in the air traffic controller MOS "Must meet Army Class 2 medical fitness standards for flying as prescribed in AR 40-501."

Where controlling civil traffic, the law of the land requires that the controller have in his possession a current FAA Class 2 medical certificate. This FAA certificate is relatively easy to obtain and procedures are outlined in AR 40-2, Section XVII. Controllers themselves should, for their own protection, make every effort to keep their physicals current. This little extra effort could prevent considerable embarrassment and expense to themselves and to the Army.





U. S. ARMY AVIATION MUSEUM

The museum's displays range from World War I relics, such as the balloon basket (upper left), to experimental craft (above) and the first "Firefly" used in Vietnam (below)

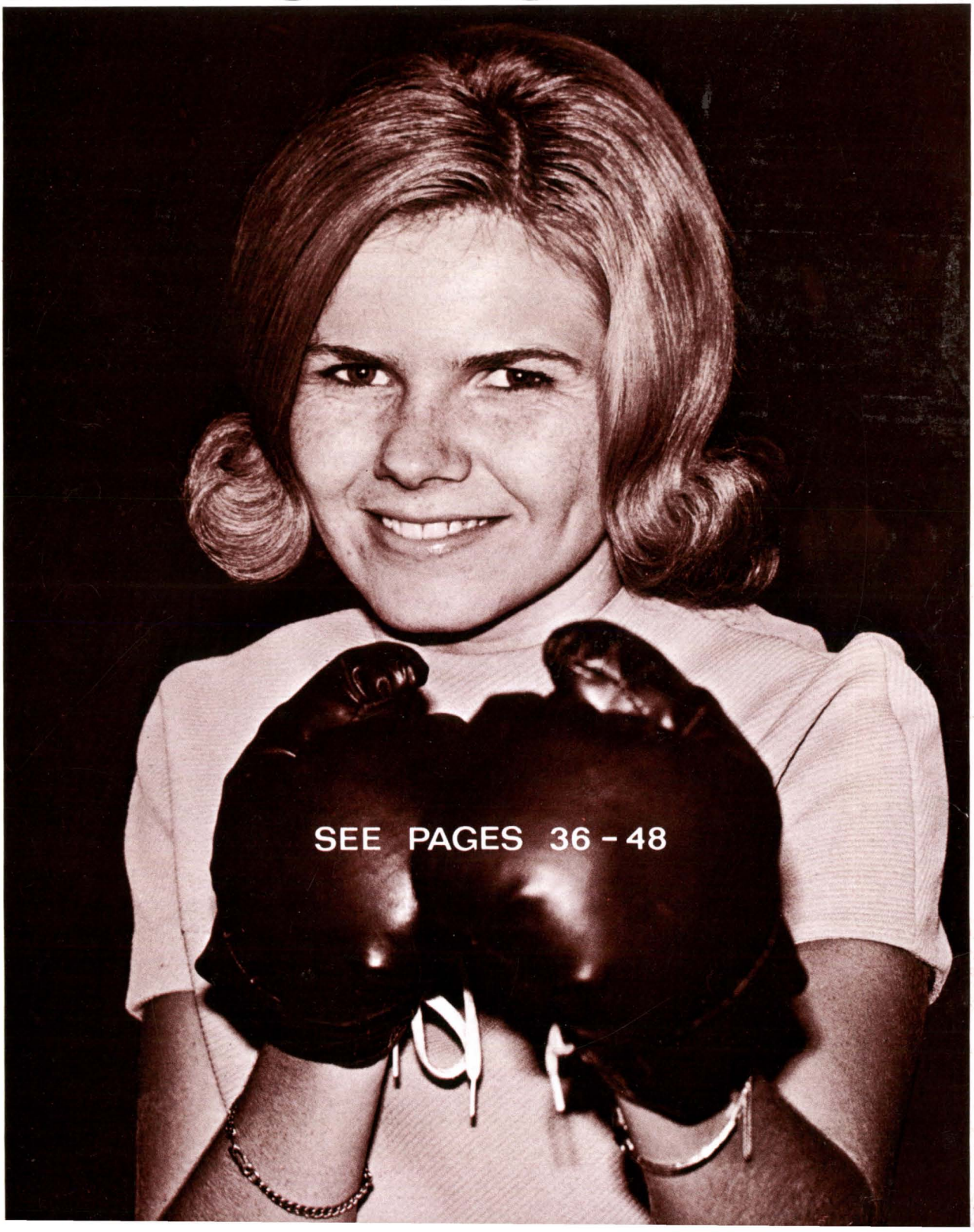
NEW FACILITY OFFICIALLY OPENS, FEATURES ARCHIVES AND DISPLAYS

THE U. S. ARMY Aviation Museum at Ft. Rucker, Ala., was officially opened during ceremonies held on 26 Nov. 68. Guest speaker for the event was BG Hal C. Pattison, chief of Military History, Department of the Army.

MG Delk M. Oden, commanding general of the Aviation Center and School, cut the ribbon officially declaring the facility open to the public. More than 200 guests, military and civilian, were on hand for the event.

The Aviation Museum is one of 45 Army installation museums and is expected to be extensively used by military students and researchers from civilian industry. Included among the displays are historic aircraft ranging from a balloon basket used in World War I to a Russian Mil-4 helicopter. There is also an archives section of historical documents and photographs for research.

KNOCKOUT FOD



SEE PAGES 36 - 48