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UNITED STATES ARMY FEBRUARY 1971

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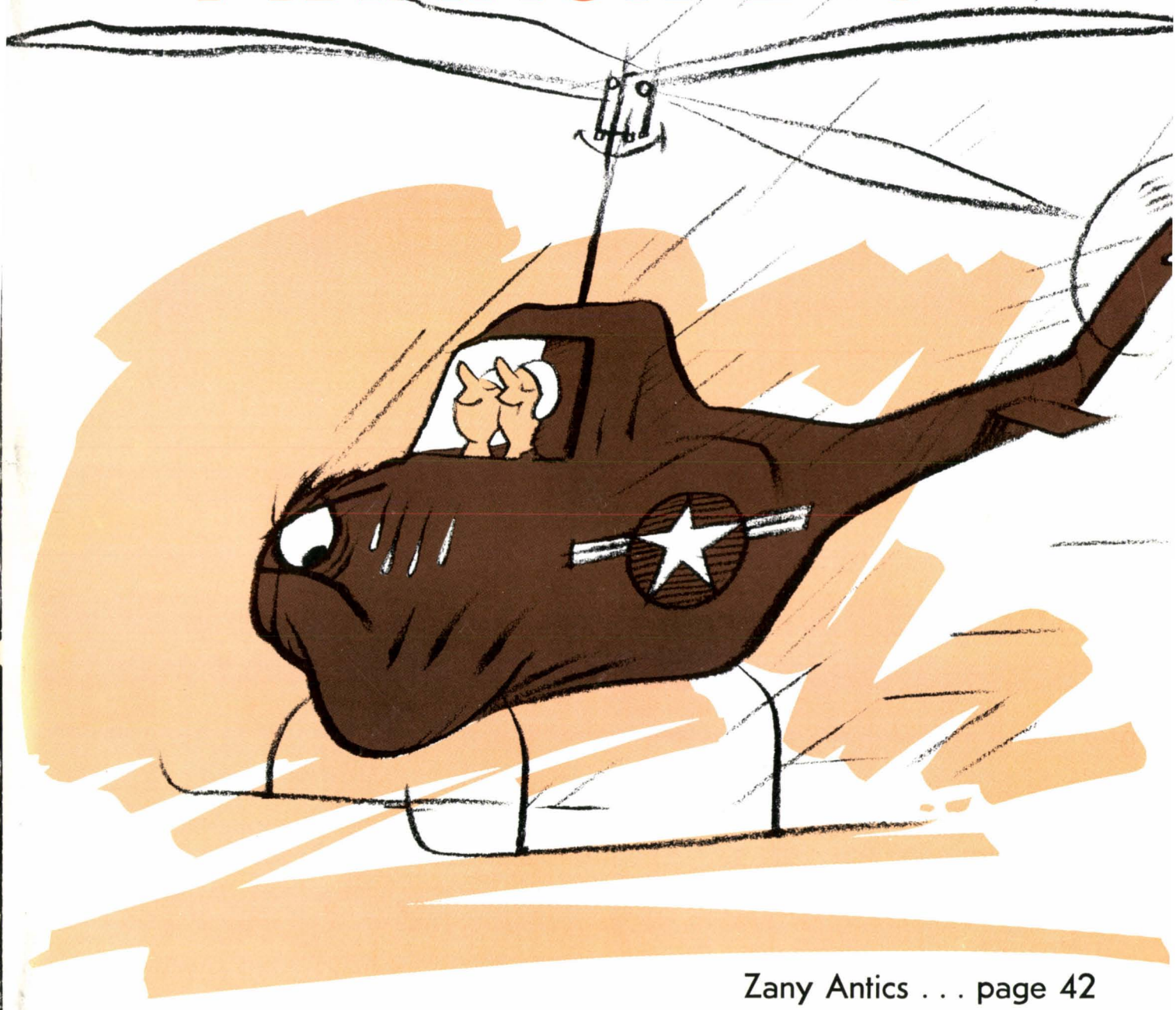

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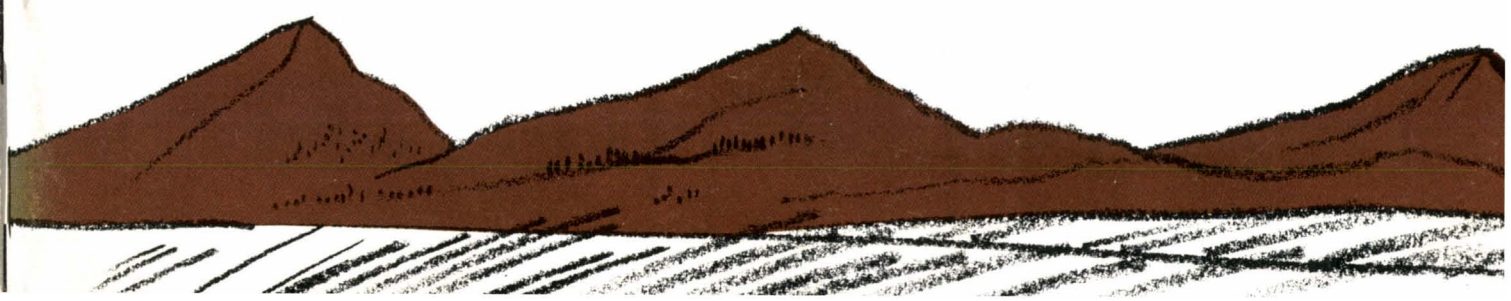

UNITED STATES ARMY AVIATION DIGEST

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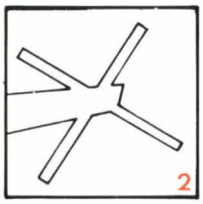

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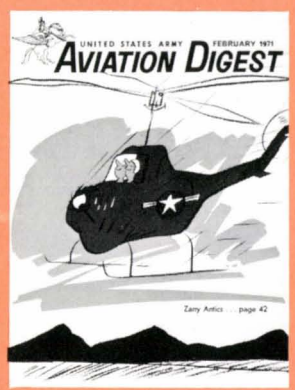

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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

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

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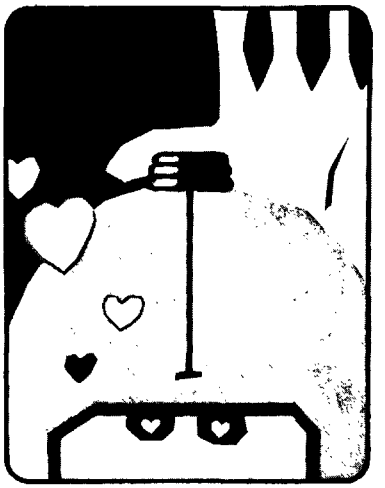
For those not eligible for official distribution or who desire personal copies of the DIGEST, paid subscriptions, $4.50 domestic and $5.50 overseas, are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

VIEWS FROM READERS



Sir:

For the past 5½ years I have been in numerous units where I have been either the aviation officer or assistant. During that time I have seen many attitudes toward safety programs and quite frankly most of them disturb me.

I'm sure your readers know commanding officers who believe in safety so strongly the entire unit thinks safety. Conversely, there are commanders at all levels who completely ignore it. The thinking of the men in their commands varies from "can do safely" to "safety? Oh yeah, those meetings." Why this tremendous division in attitude? I feel certain your readers agree the answer lies with the commander.

Safety programs are useless if commanders ignore the following:

• The safety officer is directly responsible to only one person in all matters pertaining to safety—the commander.

• At the battalion level, or higher, the safety officer's job should be his primary duty—not an additional one.

• Without the commander's guidance and assistance, the safety officer's job is completely compromised, resulting in an ineffective safety program.

• Safety is an attitude which the commander must firmly believe in and which he should instill in every individual in his command.

I hope enough commanding officers read this and decide to strengthen their safety programs. Remember, the attitude of the commander dictates the attitude of the unit. It is all up to the boss.

CPT Benjamin F. Vandervoort
236th Avn Co (ASH)
APO Seattle 98731

• All we can add to this letter is AMEN.

Sir:

We in the field are having difficulty in locating the Federal stock number for the new main rotor blade tiedowns. Your blurb in the November "Maintenance Matters" was informative and we thought you might be able to help us further.

CW4 Bill C. Walton
HHC Aircraft Maint Bde
Hunter AAF, Ga. 31409

• We're glad you brought this to our attention as this reference was inadvertently omitted. The Federal stock number for the new tiedowns is 1730-473-5167.

★ ★ ★

The AVIATION DIGEST thanks all of those individuals who have sent us either pictures or slides for possible publication. It would be neither feasible nor practical to publish all of the pictures that we receive. This is not to say that we are overstocked with photographs. Quite the contrary! We are always in need of new and particularly current photographs and are dependent on our readers for both current and often illuminating input. Those of you who have submitted articles or short "blurbs" describing the "where, what, who, when and how" for each photograph make our job much easier and provide interesting material for our readers. Please keep your contributions flowing. Our staff will have them reproduced and return the originals to you if you desire.

TAKE TIME **FOR SAFETY**

Sir:

The Royal Thai Air Force has one wing, Wing III, equipped solely with helicopters. In Wing III there are three squadrons, two of them equipped with CH-34s and the other with UH-1Hs. As Operations Advisor to the Royal Thai Air Force for helicopter operations, I must be concerned with all available information concerning the UH-1H. Inasmuch as this aircraft is not in the U. S. Air Force inventory, there is little information available through Air Force channels. I do, however, occasionally get a copy of the U. S. ARMY AVIATION DIGEST and find articles in there which can be translated into Thai and passed on to all concerned.

I would appreciate having, if possible, six copies of this magazine sent here each time it is published. Thank you for considering this request and I shall look forward to hearing from you.

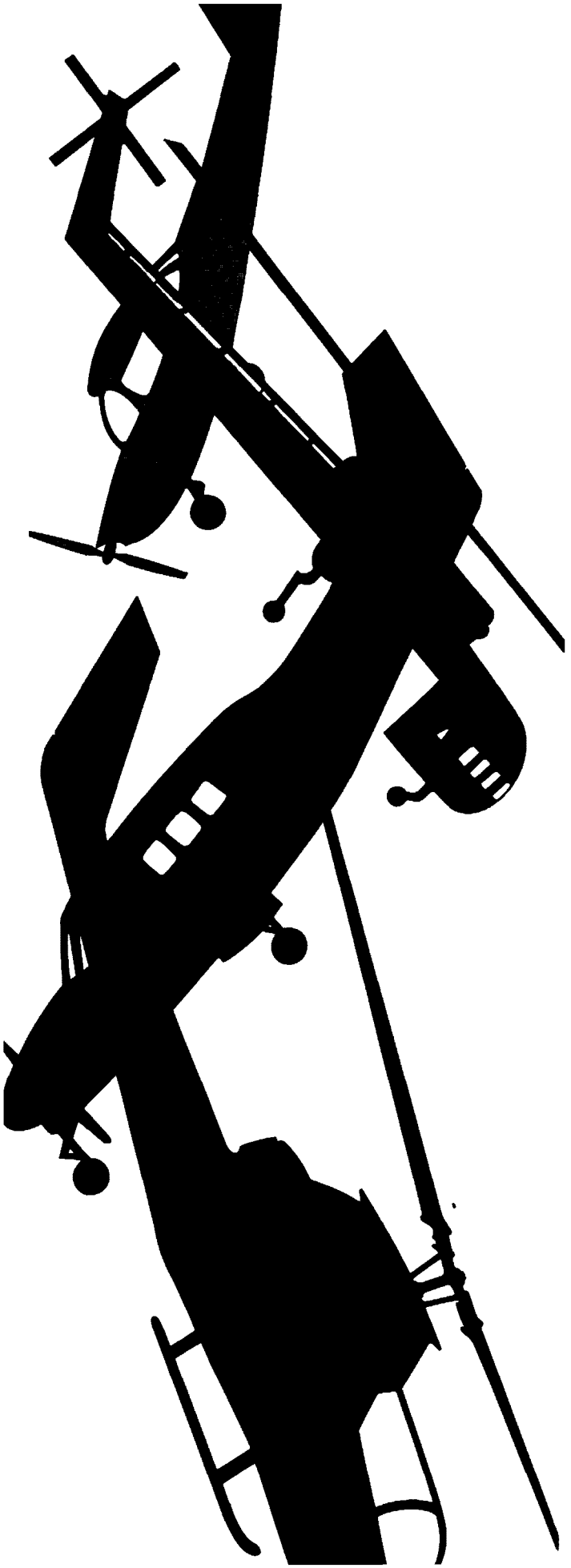
CPT Charles H. Cole, USAF
Operations Advisor/AF Adv Gp
P. O. Box 204
APO San Francisco 96288

• There are two ways which you might obtain six copies of each issue published of the DIGEST for the Royal Thai Air Force:

(1) You can submit a request for the copies through Headquarters, U. S. Air Force (AFDASDC), Washington, D. C. 20330, and then distribute them from your office.

(2) The Royal Thai Air Force can obtain the DIGEST through its embassy in Washington, D. C.

Regrettably we cannot honor your request from this office. The DIGEST is an official Department of the Army publication and distribution is handled by The Adjutant General.



Surprise! Not exactly the type thing an Army aviator hopes for: flying through the clear, blue skies for instance, when suddenly you feel yourself falling. It's not exactly a Freudian dream because you know you're wide awake. The thought dawns upon you . . . the hover check you've performed hundreds of times didn't quite seem so necessary this time. What a foolish thing to forget. Racing through your mind is one distinct word . . . "stupid!"

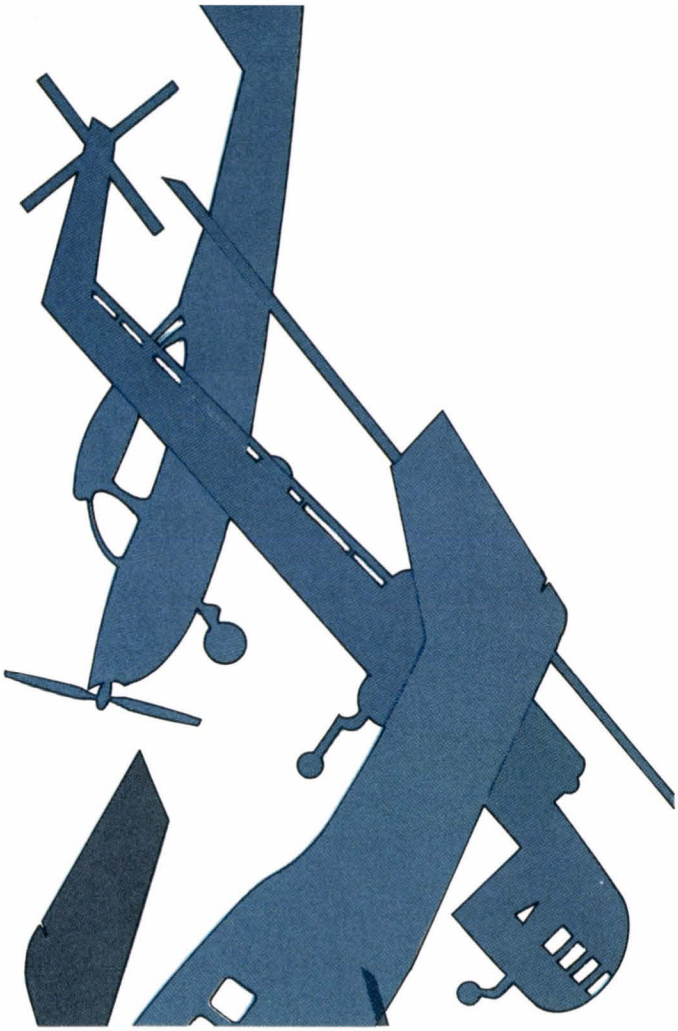
ACCIDENTS are stupid! They are generally caused by deviations from standard practices, lack of good flight techniques and poor mental discipline.

During the month of May 1970 the aviators of the 11th Aviation Group, 1st Cavalry Division (Airmobile) flew 27,094 combat hours during the Cambodian operation with a record of 18.0 accidents per 100,000 hours, in contrast to the overall division rate of 27.6 and U. S. Army, Vietnam rate of 26.6. They flew in some of the worst monsoon weather and some of the most unfriendly and unforgiving terrain in Southeast Asia.

In the group professionalism is stressed *all the way*—throughout flying, training, maintenance, day-to-day military activities, personal appearance, care of equipment and in every imaginable circumstance. Deviation from these standards usually results in an accident, and this unnecessary deviation is what makes an accident stupid. Here are a few examples of this type of accident.

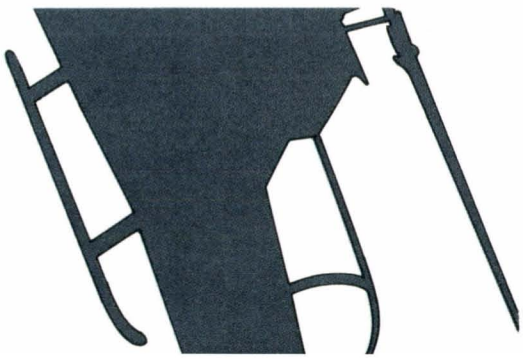
A crew flying a UH-1H all day landed about 1900 hours for refueling at group headquarters. Since the copilot had an early morning meeting there the next day, the aircraft commander (AC) decided it would be simpler to leave him overnight and fly alone back to his home station 60 to 70 kilometers to the west. The AC put the crew chief in the right seat and took off in the face of bad weather, after dark, to return to his home station.

First, the AC violated a standing order that there must be two qualified aviators in every UH-1H aircraft. Second, he was flying in the left seat knowing the right seat had the most complete navigational instruments and was thus best for adverse weather and night operations. On top of this the attitude indicator on the left side was inoperative, a fact written up in the book. This alone should have been sufficient incentive for the AC to take the right seat. Finally, he knowingly entered helicopter instrument conditions.



ACCIDENTS ARE STUPID

Colonel Kenneth D. Mertel



At a point midway to his home station the weather deteriorated and the AC entered instrument environment from time to time. Near his home station he became totally dependent on his instruments and a few seconds later unit operations heard these cryptic words over the radio: "Get off the controls, get off the controls!" Then there was silence.

Thirty minutes later the aircraft was found. It had been flown into a rice paddy at high speed and was scattered all over the landscape. The AC, gunner, crew chief and three passengers were killed.

Had this AC set out to deliberately commit suicide, he could not have accomplished it more successfully. He violated several routine unit orders and violated all principles of sound judgment and common sense. A check with the ground controlled approach at destination indicated no call for assistance.

Accidents can also be caused by mechanical malfunctions, generally engine failures. This type of accident seldom occurs if professional standards and procedures are followed. Concentrate on a careful check of the engine. Daily instrument readings taken at standard altitude and temperature will usually chronicle any deviation from normal. Engines, like people, rarely "get sick" all of a sudden—they develop symptoms and deteriorate slowly. These checks help to eliminate, or at least point out, failing engines.

For example, part of taking care of the engine includes a daily check of the barrier filter and particle separator. This is supposed to be done by the AC who also must sign them off, indicating both are clean and free from obstructions. Clean air will help guarantee a properly functioning engine, long engine life and maximum power.

Occasionally there is an accident due to a material failure other than engines, but this is rare when high aircraft maintenance standards are maintained. An extremely high mission-ready (MR) and operational-ready (OR) status is maintained in Vietnam. Comparing the hours flown, the MR aircraft available, and the safety record and it's obvious aircraft maintenance is at a high level. You can help by making a thorough preflight and seeing to it that your crew chief and gunner do the same. When on the ground for 30 minutes or more during the day, conduct another preflight and have the crew chief do the same. Look for oil leaks and other symptoms of possible trouble.

Colonel Mertel was commanding officer of the 11th Aviation Group in Vietnam when he wrote this article

Here is a simple example of overgross. This accident could easily have been avoided by checking the operating weight

Still another factor leading to mangled aircraft is trying to fly one which is overgross. Usually when you take off in Vietnam, especially in the Cav's area of operations, it is as if you are operating from the top of a 4,000 foot mountain for the density altitude (DA) is just that. In the early morning DA will run about 3,000 feet and by later afternoon about 4,000. To assist you in this vital matter, there is a series of procedures to follow to make sure your aircraft is not overgross for current density altitude conditions.

First, know the basic operating weight of the aircraft and calculate each load. The basic operating weight is the total weight of the aircraft as it sits on the ground with the pilot, copilot, gunner, crew chief, body armor, tools, ammunition, rations and oil. Operating weight, when compared with maximum authorized gross load, will provide an indication of how many passengers or how much cargo can be safely carried. You must know the aircraft's operating weight, check it daily and record it in the book.

Second, be able to compute DA. This is done by setting 29.92 in the Kollsman window of the altimeter and reading the resulting altitude. Check outside air temperature and compare it with the standard temperatures (15 degrees C. minus 2 degrees for each 1,000 feet above sea level). Take this difference, multiply by 120 and add to altitude from the altimeter. The result is an accurate approximation of DA for that particular time and place.

Next in importance is the hover check. All UH-1Hs are checked frequently to verify torque and percent of power that can safely be pulled with that engine, thus indicating the remaining power reserve. Settings are listed on a placard on the dash showing various temperatures, torque and power readings that tell whether it is safe to take off with the actual load either on a normal takeoff or a takeoff over obstacles.

If the aircraft cannot be hovered at a 2 foot stabilized hover with less than the reading shown on the placard, there is no point in trying to fly. You may get off the ground with a running takeoff, but you will not be able to land when the required power exceeds that available under DA conditions present. Accidents are caused by aviators who say, "Well, I think I can make it," or "I can always take one more." These are the aviators who invite and have accidents.

In a nutshell, know the operating weight of the aircraft. Second, compute density altitude so you know where you stand. Third and finally, be able to hover with the load you intend to carry.

The results of failing to follow these procedures are obvious: they are accidents caused by loss of rpm. I know what I'll find when I interview a crew who has had an accident of this type: they ran out of power on takeoff; did not know density altitude; did not know correct aircraft operating weight; and certainly did not carry out a correct hover check.

Weather, per se, is a factor in some accidents, but only rarely. Most of the time you can fly around adverse weather, especially during monsoons. Monsoon weather is characterized at its worst by low (100 or 200 foot) ceilings, but amazing visibility below the ceilings. Visibility is better in monsoons than at any other time of the year though only at low level. Since visibility is good the frequent thunderstorms can be bypassed.

Those with tactical instrument tickets must remember that they do not represent a very high skill level of training. Therefore, I require 10 to 12 hours additional incountry instrument training to sharpen your ability to execute ADF, GCA and FM homing approaches. The FM homer is a most important device to help find fire support bases and other unit locations. In every unit someone has an FM radio. When you become disoriented, *tune in* and *fly to.*

One need only be respectful of weather, not afraid of it. You can accomplish your job in, under or around weather without undue fear and without an accident.

Accidents are not generally caused by newcomers; they are caused by aviators who have been in Vietnam for several months. I have coined a phrase: *the 10 month syndrome.* This syndrome applies to an aviator who has been in Vietnam about 9 or 10 months, has flown from 600 to 1,000 hours, has flown well and who probably has not had an accident. But now with all that experience

behind him he is like "Snoopy," the world's finest aviator—he no longer has to worry about computing DA, checking barrier filter or particle separator, calculating operating weight or really paying any attention to the go no-go gauge. His vast experience gives him that extra "sixth sense" which warns if he is wrong, if the bird is overloaded or if he can't hover straight up over a 200 foot tree. As a result, this type aviator is the major cause of accidents.

Time and time again when an AC has an accident I can accurately estimate his hours and determine exactly what happened, especially when it is the type of accident caused by loss of rpm or overgross for DA conditions.

I urge you not to become overconfident, because then you forget the professional standards that will keep you out of trouble. A really professional aviator is one who still uses standards, professional ideas, experience, common sense and judgment to enable him to get the job done safely.

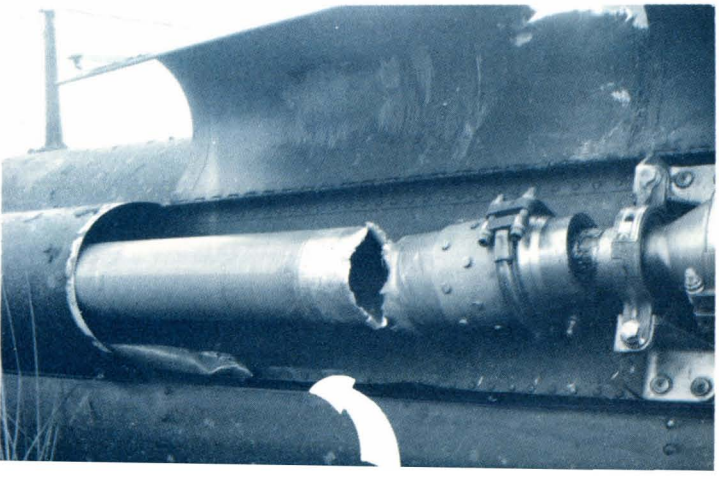
Another primary area of accidents is main rotor blade strikes and tail rotor strikes, a frequent hazard in a one- or two-ship landing or pickup zone. These are avoidable with teamwork. The gunner and crew chief must check clearance as you descend or ascend, and you and your copilot must constantly be alert and know the dimensions of your bird. Practice judgment of distances, be alert, take your time and you can avoid rotor strikes.

If someone had an accident or incident in the group, there was a standard procedure he would have to go through. First, he was temporarily grounded, examined by the flight surgeon and then given checkrides. Next, he was interviewed by the company commander and battalion commander. All three then appeared before the group commander to explain why professional standards were not followed and why a half-million-dollar aircraft was damaged or destroyed. Next, within about 48 hours the group commander made a decision as to whether a collateral investigation was necessary, or whether he should take necessary action under his prerogatives as a commander. Generally for an AC this meant his aircraft commander rating was suspended or revoked. Suspensions were for 30 day periods while revocation was for a specified number of days after which the AC was eligible to requalify. The reason for all of this was to create an atmosphere of awareness of accidents and their potential dangers.

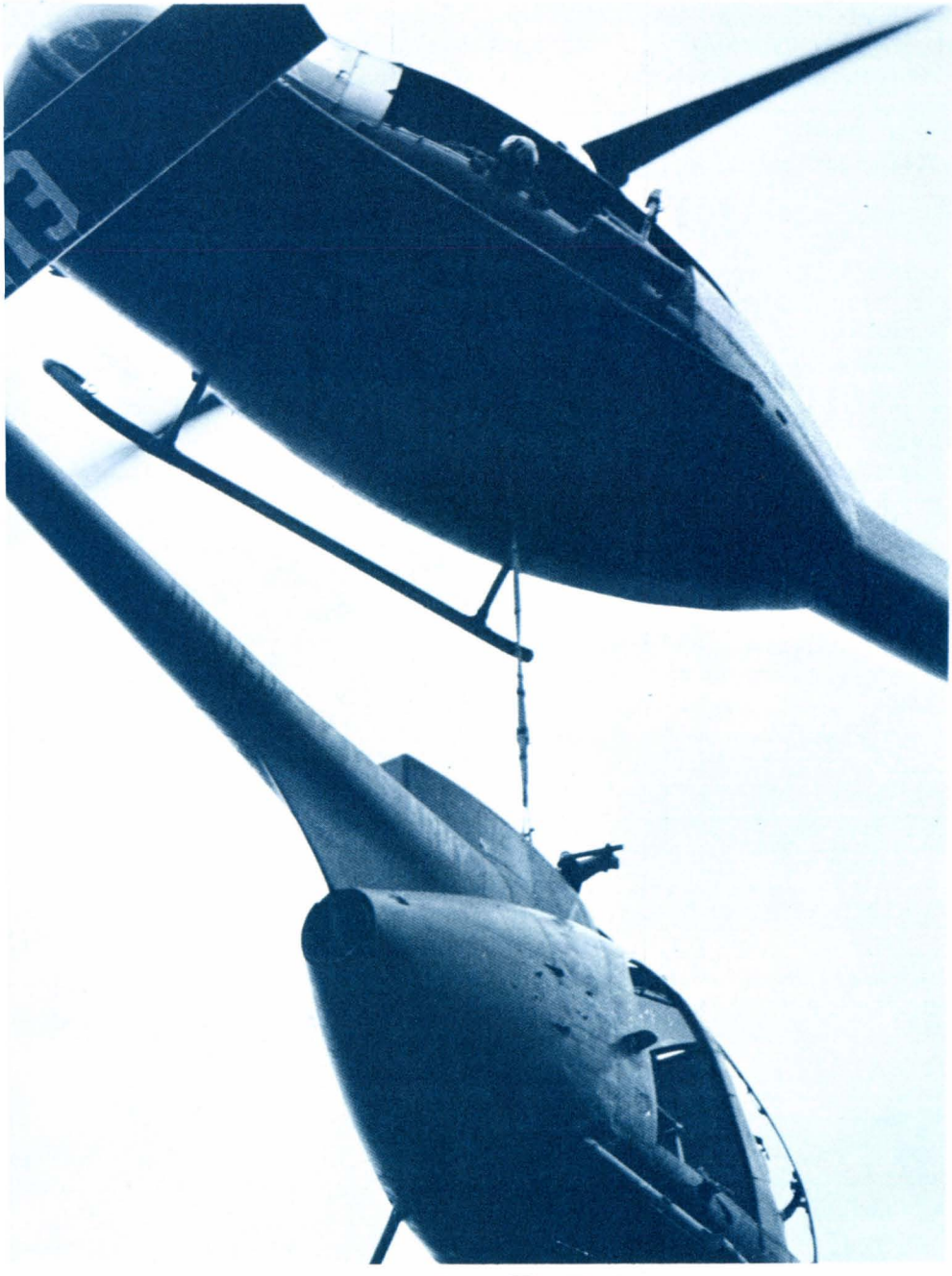
Being an AC is a highly prized status and means one is truly a professional. Whenever he fails he should no longer be an AC. I have found this policy extremely effective and believe that it, and the other things discussed here, may well be the key to reducing the accident rate within a unit.

Although the fatigue factor is a major contributor to accidents, extra care when flying under fatigue conditions will help to prevent these accidents. During the Cambodian operation when we experienced the most flying hours under the worst weather and terrain conditions, we had our best safety record.

Safety is a problem for all of us: gunner, crew chief, copilot, aircraft commander, maintenance officer, surgeon, safety officer and the commander. It's a team effort so develop a safety awareness about your acts. Be professional in your thinking, planning and checking—every hour, every day. If we all work together we can do our job safely with fewer accidents, with less loss of life and assets, and with less injury and pain to others. That is our goal and our duty.



How about this? Somehow this foreign object (indicated by arrow) found itself beneath the tail rotor drive shaft cover. A normal daily inspection should eliminate this problem



LOH RECOVERY

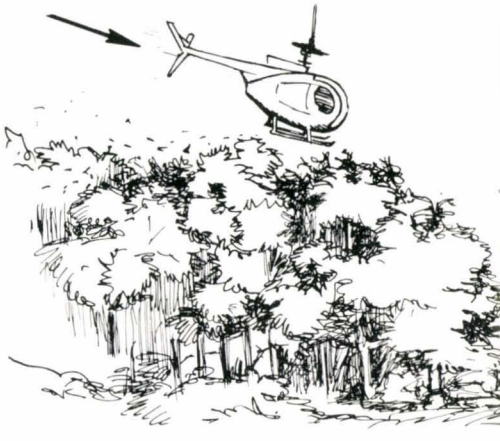
In a recovery operation all the manpower, energy, time, added work and possibly even aircraft can be lost if careful plans are not made in advance

Lieutenant Conrad W. Hamp

FOLLOWING a full day's work in the Republic of Vietnam a light observation helicopter (LOH) went down due to transmission trouble. It was landed without further damage in an insecure area. Since night was rapidly approaching, a decision was quickly made as to what security measures were necessary.

Being in an air cavalry unit, our Blue element would be inserted. By the time the Blues were ready with all the equipment needed for the operation, it was dark with no moon for illumination. A night insertion can be a hairy operation with nothing to make an approach to except a strobe light. The Blues had been out all day in the area of operations (AO) and now it was necessary for them to stay out in an insecure area. Luckily nothing happened during the night and it looked as if they were going to get our LOH out and back in one piece.

The next morning members of our LOH recovery team went out to do their job of recovering the downed ship. They did a fast job of removing the blades and hooking up the sling to the LOH. Gunships and LOHs had to be diverted from regular missions to cover this operation. The recovery team hooked up the LOH without any trouble, and shortly thereafter our LOH was on its way home under one of our "H" models.



Everybody who wasn't working or flying was out waiting and watching for the LOH to be set down in our troop maintenance area. Finally the recovery team appeared about 15 miles to the north at an altitude of about 1,500 feet with its load underneath. It was looking good and a few of the guys were making ready with their cameras.

As in any place in Vietnam, every company area and base camp has a perimeter, usually with a berm 4 to 6 feet high all the way around it for added protection. Our maintenance area was no exception; it had a 4 foot berm on short final.

The recovery aircraft entered downwind and the pilot started the letdown to about 500 feet. Everything looked good. On base leg he let down still further to about 100 feet above ground level. It still looked good but just a little too low for a base leg with a sling load. The turn to final got worse, letting down to about 60 feet on long final. The LOH was almost in the trees due to the nice long sling. Everyone started holding his breath, hoping that things wouldn't get worse. As the final approach progressed, the recovery aircraft kept getting lower and lower until on short final the LOH was dragging in the little shrubs and trees on the other side of the berm.

It was really starting to look bad now. It seemed to be turning into a low-level approach with a sling load, if that is possible. The recovery aircraft still had to clear the berm before termination in the maintenance area. Guys were starting to take cover just in case—and it was good that they did. The LOH hit the berm, skid toes first. Since the air speed was a little on the high side, the LOH swung back on the arc of the sling. The tail rotor of the LOH almost struck the tail rotor of the "H" model, missing it by inches. Close! It made my heart stop just knowing what would have happened if it had struck the tail rotor.

When the LOH struck the berm, it pulled the nose of the "H" model down. The pilot, seeing and feeling this, pulled in power and pulled the nose up. This made the LOH swing forward with great speed like a giant pendulum. The LOH swung out at full radius of the sling. At the peak of its arc it became visible to the pilot in the "H" model through his front window at 12 o'clock.

With the load swinging forward at such a great speed, a decision had to be made and quick. There was nothing for the pilot to do but punch off the load. The LOH went flying through the air and crashed on its right side. The "H" model was landed safely and no one was injured, but the LOH was a total loss. The only thing worth salvaging was the radios and a cyclic stick.

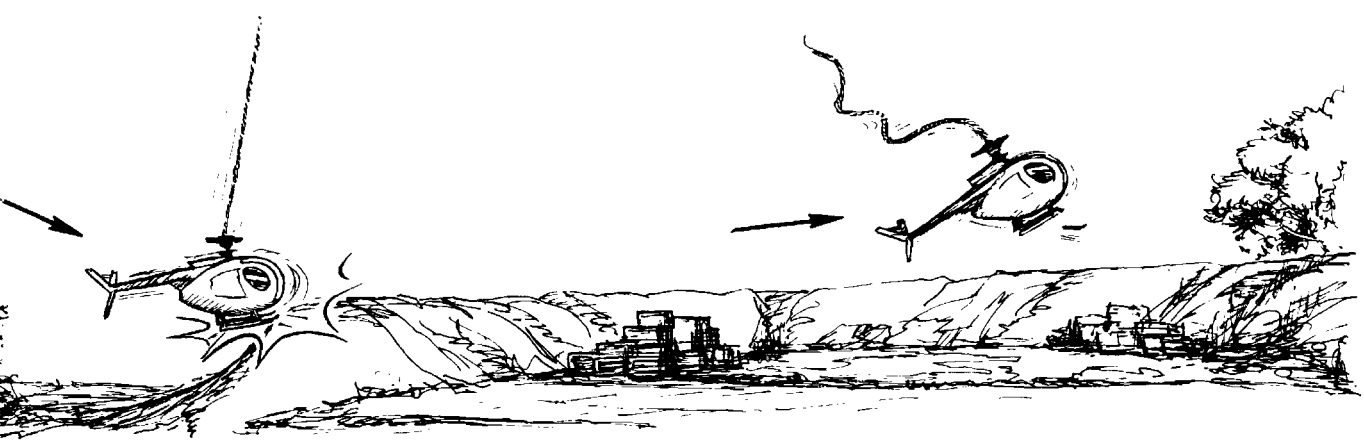
All the time and energy, not to mention the loss of the aircraft, was wasted. But there is always something to be learned from other peoples' mistakes as well as your own.

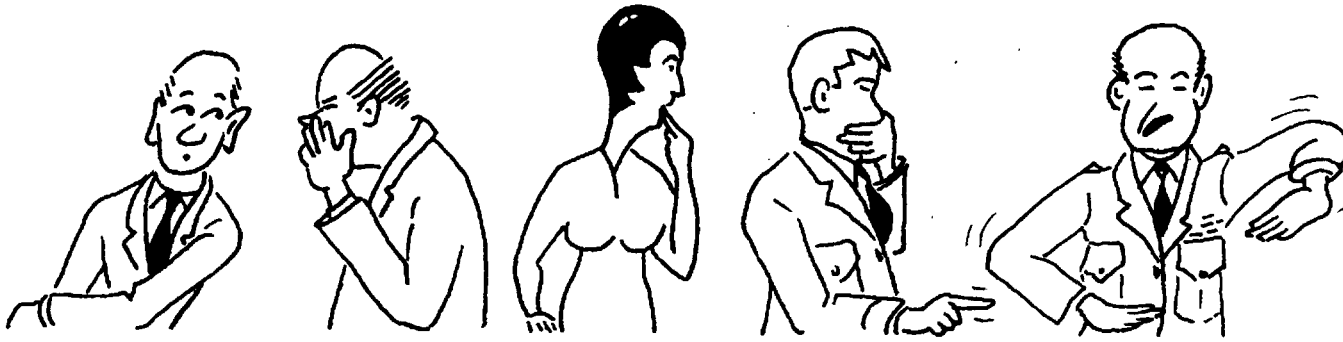
All the manpower, time, effort and added risk would not have been in vain if some prior planning and judgment had been used. This all could have been easily avoided.

The approach should be planned so that the approach angle is great enough to clear all obstacles during descent to termination. Termination should be slow so as to avoid any abrupt flaring and large power applications. Termination should be high enough so that the load is at least 3 feet from the ground to avoid dragging.

One other and probably major contributing factor to this accident was not using any ground guidance personnel. This should have been prearranged or arranged by radio prior to landing. Both were at the pilot's disposal and could have been easily utilized.

This could happen anywhere, not just Vietnam, and it could involve anyone. I'm sure this was not the first time this has happened and it probably won't be the last. But maybe, just maybe, reading this story will prevent an accident for you. I hope so.





SUPPOSEDLY an officers club is intended as a place of entertainment and relaxation—a refuge from the pressures and tensions of the day. But it is inevitable that if there are any Army aviators around, the flying "war story" will be one of the more persistent topics of conversation overheard.

The warrant officer aviator sitting on the corner stool might be saying, "There I was at 20,000 feet. I had an engine failure, a pocketful of nickels and there wasn't a soft drink machine around for miles."

Naturally, what is being overheard is the not-so-common, everyday war story.

From across the bar, muffled by the activity but obviously descriptive, comes, " . . . there I was, low level, low on fuel and my crew chief yells . . ."

Depending upon the listener, the circulating war stories might provoke several differing emotions: humor, total disregard or intense interest. The point is that war stories can prove profitable, especially when an aviator hasn't experienced a particular situation covered in the yarn.

Being a relatively new aviator (I've been flying for about 3 years with one tour in the Republic of Vietnam) I am still more of a listener than a teller and I feel I have gained a substantial amount of knowledge about aviation because I've listened with a discerning ear.

The secret is to observe the situation, taking into consideration your frame of mind, and decide whether you want to disregard, be entertained by or learn from the experiences of an "old salt." If you are an apt listener you can achieve both entertainment and education, depending on the style and background of the teller—that is assuming that you don't completely disregard him.

To the new aviator it is often difficult to determine the difference between fact and fiction. Therefore, it is helpful for a new aviator to learn to sort and categorize the various types of war stories.

War stories might be categorized into four types and it is important to recognize them in a minimum amount of time.

The first and most often told is the "flying bullets and plexiglass" war story. This type can be educational but as a rule it isn't. The listener might pick it up where the crew chief screams, "'. . . receiving fire, come right.' So I kick right pedal, punch off a pair and my copilot opens up with the mini's." The dialogue that follows can go many different directions, anywhere from getting shot down by quad fifties to making a miraculous recovery by pure pilot technique. This type is entertaining but not particularly educational.

The "name dropping" story is more often than not very boring and uninformative. Dropping a name, usually of a colonel or higher, is intended to add importance to the story as well as to the story teller; from my experience it is best to avoid this type:

"Back in—let me see—February of '59 I was flying 'Pistol Pete' Peterson around Germany—he was just a full bird at the time—and we got in the soup. Although I was a good pilot even then I was still a little nervous so I elected to call for a ground controlled approach. Now I've made instrument approaches into Hamburg, Nurnburg, Berlin, you name it—but nothing that could touch this one. They talked me down right in the middle of the Harz Mountains. The wind currents were treacherous, and let me tell you 'Pistol Pete,' or rather Colonel Peterson—he was only a full bird then—was mighty nervous." And on and on it goes. Obviously nothing very beneficial can be derived from such a tale.

Now from a dark corner of the lounge vibrates the "wild women and song" war story—much listened to but lacking in value. It can be left to one's imagination as to what such a yarn encompasses.

The last and most beneficial war story can only be categorized as educational. It is any bit of knowledge, no matter how minute, that is generally un-

THERE I WAS

CW2 Harold L. Wiest

known and that one day might save a crew or aircraft. Perhaps it vaguely acquaints an aviator with a particular trouble situation. A pilot might one day find himself in a similar situation and, while digging through his mental resources for a solution, perhaps he would remember the circumstances of the war story and come home safely.

The educational war story can come upon you without warning. It is possible to be enjoying a fellow pilot's account of a familiar battle when lo and behold something that you had learned in flight school, but had long since forgotten, jumps up and hits you in the face.

For example: "There I was in a Charlie model on a low-level reconnaissance mission in the depths of the A Shau Valley. We had just left the Aluie airstrip in search of enemy activity when my crew chief says, 'Come right, I've got a trail.' Then I hear *rap pap pap pap.* All of a sudden my tachometer is running wild, so I pull in an armload of pitch and roll off some throttle—but not before I gain altitude. Plexiglass was flying everywhere. Man, I was a sitting duck. I finally got back down to the treetops and made it back to home base."

Now if you are not too gassed and if you really have the drive it takes to reach out and grab some knowledge, you have rediscovered the high side governor failure and the proper corrective action. If you were a true disciple of aviation you would halt this free wealth of information and ask about the whys and wherefores and, if the speaker were legitimate, he might continue on with his story . . . "Well, you see as I was coming right I took a few hits. I took one round in the fuel control regulator assembly (N_2) which creased the flyweight spring housing allowing maximum constant fuel flow and away she went. By the time I pulled pitch and rolled back the throttle I was about 300 feet above the trees."

Either this pilot is for real or he's a convincing story teller. At any rate something has been learned. If one day you are flying up in the clear blue and your rpm's take off, you will have the preventive steps bouncing around in the darker depths of your mind.

There isn't a club around that doesn't have a glassy-eyed storyteller just waiting for his audience to walk through the door. At times competition is keen and to be a listener can be very rewarding.

I'm not saying war stories are the only means of achieving "winged wisdom," In fact, I can't even say it's a good way. I'm only saying that if you get trapped at the tap you might as well gain what you can when you can.

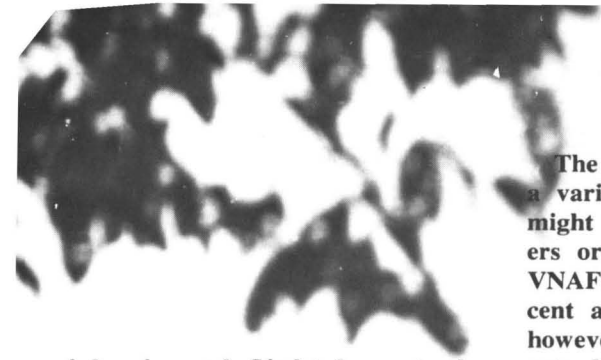
Captain James B. McKenzie Jr.

THEY'RE HERE

LAST JUNE the first class of Republic of Vietnam Air Force (VNAF) students was graduated from the U. S. Army's advanced helicopter training program at Ft. Stewart, Ga., one of the Army's flight training centers.

A great deal of involved planning was necessary before the class could be trained. The program was new with many doubts, questions and virtually unknown facts.

Where will they live? How many aircraft will be needed? What will the students eat? Would methods of instruction (MOI) techniques for both aca-

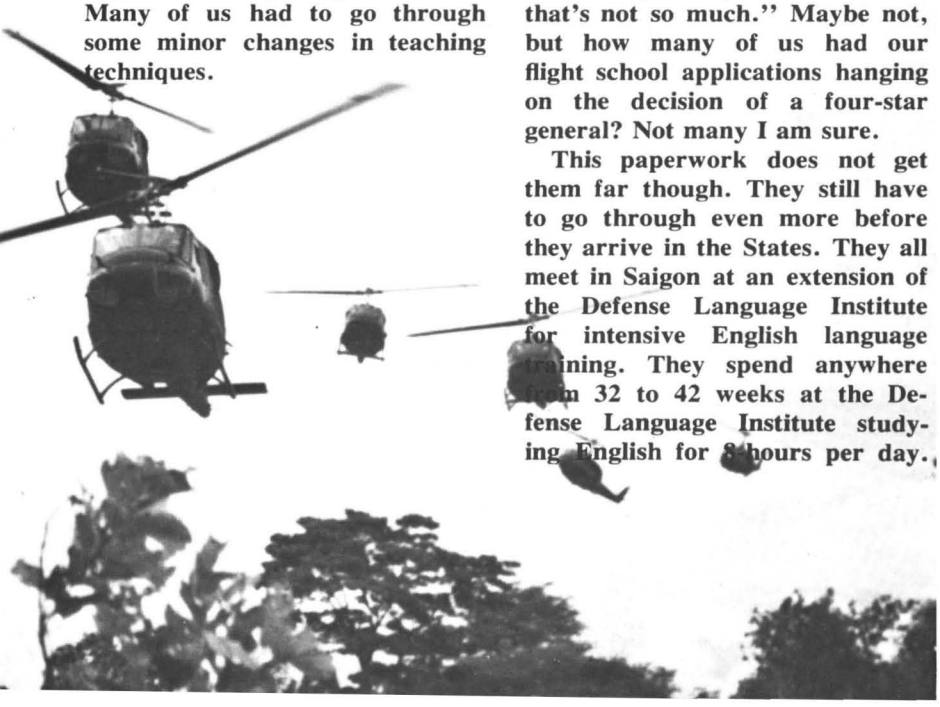


demic and flight have to be redone? These were just a few of those questions.

Following months of preparation, most of the problems dealing with command, control, logistics, etc., seemed to have been solved or at least had answers in sight. However, the task of training the instructors was our greatest barrier.

Most of our people were already qualified platform and cockpit instructors. They knew how to teach. What really needed to be done was motivate the instructors—have them rise to the occasion, so to speak. Why not then clear up some of those preconceived opinions and biases, etc., by giving them background material on the students, review of some important MOI techniques and how they could obtain help.

This is the crux of my article. Some of you reading this may have been involved, but many of you may just be getting started. For many of you this will be the biggest challenge of your career. Many of us had to go through some minor changes in teaching techniques.



The VNAF flight students have a variety of backgrounds. They might have been students, farmers or had prior service in the VNAF. (Fact sheets show 80 percent are from the Saigon area; however, this is not really accurate because it seems that the students adopt the city where they attended school.) At any rate, they have to volunteer for the program. If they are civilians, they attend the VNAF school at Nha Trang prior to flight training. They could just as well be in attendance at the Army Officer Training School in Tu Duc. If they had prior service, they must apply for an interservice transfer to the Air Force. They also must fall between the ranks of private and first lieutenant. However, all must meet the basic minimum requirements which are:

- **18 to 25 years old.**
- **High school equivalent (most have had some college and English language training).**
- **Satisfactory score on VNAF flight aptitude test.**
- **Approval of unit commanding officer, if in the military.**
- **Final approval for preliminary attendance comes after an interview with members of the general staff of the armed forces in Saigon.**

You say to yourself, "Well, that's not so much." Maybe not, but how many of us had our flight school applications hanging on the decision of a four-star general? Not many I am sure.

This paperwork does not get them far though. They still have to go through even more before they arrive in the States. They all meet in Saigon at an extension of the Defense Language Institute for intensive English language training. They spend anywhere from 32 to 42 weeks at the Defense Language Institute studying English for 8 hours per day.

When their instructors feel that they are qualified, they are given an English comprehension exam on which they must achieve an English comprehension level of 70 (100 being the base figure for the average U. S. high school graduate). Then comes the long plane ride, providing they meet security requirements under AR 380-10, to Lackland Air Force Base, Tex. "Wait," you say, "isn't primary training at Ft. Wolters, Tex.?" You are correct, but these fellows will not get there for at least 6 more weeks. While at Lackland they spend another 6 weeks learning an aviation-oriented vocabulary. Here they must achieve an English comprehension level of 75.

So by the time these commissioned officers, warrant officers (aspirants) and/or air cadets reach Ft. Wolters they are very qualified individuals. Should you be stationed at Hunter Army Airfield, Ga., they will have received 18 weeks of flight training in the TH-55 before arriving for UH-1 transition.

Changing your mind a little about these people? If not here is the real "bone crusher." All of these gentlemen will be true professionals. How can I say this? Well, what else would you call a man who has an 8-year commitment to serve upon graduation? Some of our 3-year friends would cringe at the thought.

Some of you are asking yourself, "How can I be your so-called motivated instructor?" Very easily—by teaching effectively! That's nice, but that doesn't answer my question. Will it be hard? Will it be easy? Most of all, will I enjoy it? I am afraid you will be the one to make those determinations. However, we all know if we really enjoy what we are doing, selling, painting or flying we do

Debriefing of the flight is as important in training the Vietnamese student as it is in training a U.S. student

a better job. So, if you like to teach, no matter whether you are in the aircraft or in a classroom, and you are willing to accept what I am going to say, you will succeed in your role as an instructor.

Establish good relations. This point can be made best by relating the following story. When the advanced party of VNAF liaison personnel arrived at Hunter, one of its many tours happened to include the synthetic instrument training section. One of the VNAF officers stopped for a moment at a Link instructor's table. The instructor, trying to make conversation, said in his best broken English, "Ah, you know GCA?" The officer looked at him for a moment and replied in perfect English, "Why, of course, I believe it is probably one of our greatest aids to navigation." Keep an open mind and treat your students as intelligent people. Remember, they are professional soldiers.

Learn their customs and culture. This does not have to mean many hours of studying; whatever you feel is adequate. You may want to visit the library and do research on it. Again, you say they didn't bother to learn about the States when I was there. Why should I? I think you will find that to be the opposite in most cases. I found, as did many others, that the Vietnamese people were quite anxious to learn about our country. Of course, we may have oversold it a bit in doing so, but we were sure glad to expound on how great home was. Remember? Why not return the favor? It doesn't necessarily entail the trip to the library. You can pick up a copy of DA Pamphlet 360-411 (Pocket Guide to Vietnam) and learn something about their historical, political and religious background. That DA pamphlet is just one of many that will satisfy your thirst for knowledge. If not that, ask your VNAF student; I am sure he would love the opportunity to talk about home.

Avoid humor. Now he's going to tell me not to tell jokes. I want you to know I have literally wowed my past students with real side splitters. Why, the guys call me another Bob Newhart. True, I am sure. Some of us have a knack for this type of presentation. My only advice to you is: if you are not really current with some solid Vietnamese jokes, I would save them for a later time. Besides, it might cause serious misunderstandings and possibly hurt a student's feelings.

Be courteous and friendly. You will find your new allied students have a geat respect for you. This is primarily because of their upbringing. They are taught this order of importance: king, teacher, father. As you can see the teacher or instructor rates only second to the king. Why? Because the teacher taught him to be a man. Do you qualify for that level of responsibility? So, why not have it work both ways by showing your student the proper respect? You will find these people more reserved than Americans. You will have to show the person you not only want to be his all-knowing instructor but also his friend. I believe all of us can use a friend when we are in a foreign country and just a bit homesick. If you wish to do more, inquire about your installation's sponsorship program.

The last thing under this subtopic may appear ridiculous but worth mentioning. Learn how to pronounce your student's name if at all possible. Here at Hunter AAF tapes and phonetically spelled name lists of class rosters are used to accomplish this task. Nobody likes to be called "Hey you." If you can pronounce "PAPLACZYK" correctly after a few tries, you can make it with Tran Hung Dao.

Watch for signs of misunderstanding. If you are a platform instructor, you should have few problems with eye contact. However, IPs may experience some difficulty with this technique. To keep your eyes on the students at all times while in the cockpit could prove dangerous. Some eye contact can be improved though by having the students use sunglasses instead of the helmet visor. At Ft. Wolters they found that this also allowed the instructor pilot to view total facial expressions as well as the eyes.

In the same area, there are certain other suggestions that may be employed to prevent misunderstanding. Again for you IPs, when a student's altitude is considerably off, try pointing to the instrument instead of saying altitude. Try the same thing with air speed, too. This will remove

Learning to properly preflight is the basis for the professional aviator

any doubt for either you or the student as to what you mean. Another technique that should be used by all types of instructors is the use of questions. Always ask a question that requires a definite answer. Yes or no is not good enough. Our friends at Ft. Wolters learned this, too. They discovered that the students did not wish to displease their instructors and, therefore, always replied with "Yes, sir." So, if you ask your student, "Do you understand?," what do you suppose his answer will be? You guessed it, "Yes, sir."

Give additional help. This is not a new idea for any of you who have previously instructed. You must always be available to your student whenever he needs you. This could be during class breaks, after class and, perish the thought, maybe even after duty hours. This may intrude into your free time, but that is the price you pay for being just shy of the king. On the serious side, the instructor's mission is to help his students in any way he can.

Use good MOI techniques. Now relax, I do not plan to run you through a quickie MOI course in the next few paragraphs. Here are a few items to keep in mind when dealing with foreign students:

• *Speak slowly.* But don't go to the exteme. Whatever you do, do not insult their intelligence. At the same time use your head. Keep your rate of delivery constant and slow enough to allow for what I call the "translation lag." Even though the students have an adequate comprehension level, complete fluency of our language is doubtful in a period of a year. English is a difficult language, as most Americans already know. Time has to be given so that the student may translate your words into Vietnamese, determine what was said, obtain an answer in Vietnamese, if required, and retranslate that into English. Whatever the case, some time must be allotted for this lag. Use of written or questions on slides will shorten this lag. It will also eliminate regional dialect problems. Some of us will have to watch our northern and southern accents, too. Besides, your students will find the written word easier to comprehend than the spoken version.

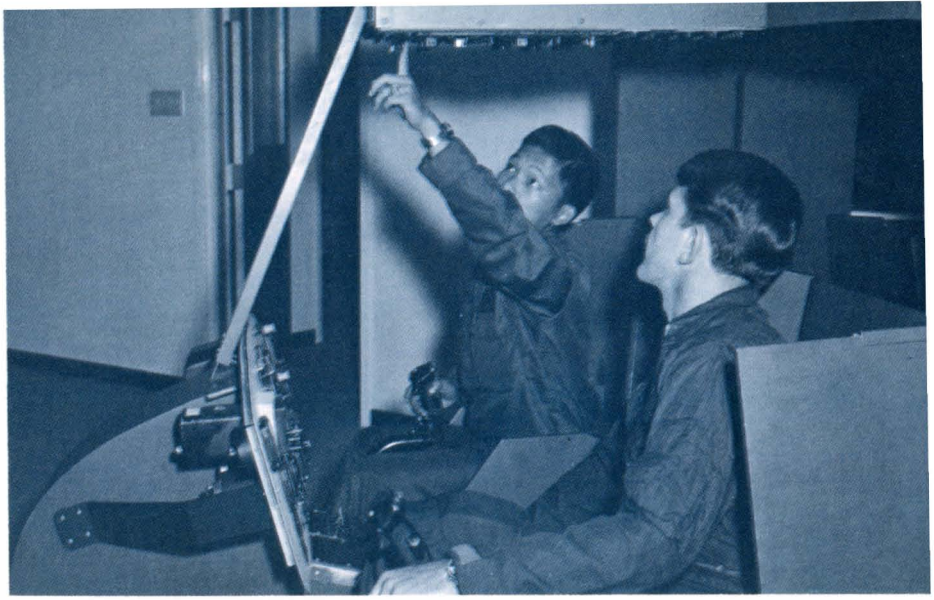
• *Repetition.* Tell them what you are going to talk about. Tell them about it. Then tell them what you told them. The more something is said or repeated, the greater the opportunity for complete understanding.

• *Demonstrations and drawings.* The old cliche, "A picture is worth a thousand words," really fits now. If all other methods fail, including demonstrations, sit down with your student and literally draw it out. It may be the key to success you needed.

• *Be patient.* Some of you by this time may believe this is too much to remember or handle alone. To be quite honest it is. Problems will arise and not all the answers will be available. However, it won't all be resting on you. There are places within the aviation training center that can help.

VNAF liaison office. Both Ft. Wolters and Hunter AAF have this service. What can these people do for you besides administrative, logistics and whatever? To start with, these officers and NCOs have experience in the field of aviation. Most of the officers are rated aviators with 2,000 to 3,000 flying hours. The NCOs are maintenance personnel. Here at Hunter AAF two of the officers have completed MOI and are qualified IPs; the remainder have completed UH-1 transitions. From personal contact it is evident that these liaison personnel are more than anxious to help. Use them because more than likely they have had the same problems your student has or will have. When advised, they

Hours of studying culminate the VNAF students' work day



Practice in flight simulator improves student cockpit procedures and eliminates wasted time on the flight line

will also ensure weaker students receive needed extra instruction.

Learning Center. This is a relatively new concept in military training, but it is already proving itself to be a valuable one. What it consists of is reinforcement for a student having difficulty in either flight or academic subjects. How does it work? Should a student be having trouble in an area of study, for instance starting procedures, his IP submits a slip requiring him to attend the Learning Center. This slip would in turn be logged in by the LNO (or battalion operations center) who then notifies the student's company that remedial or extra study is needed in the area of starting procedures. The company ensures attendance.

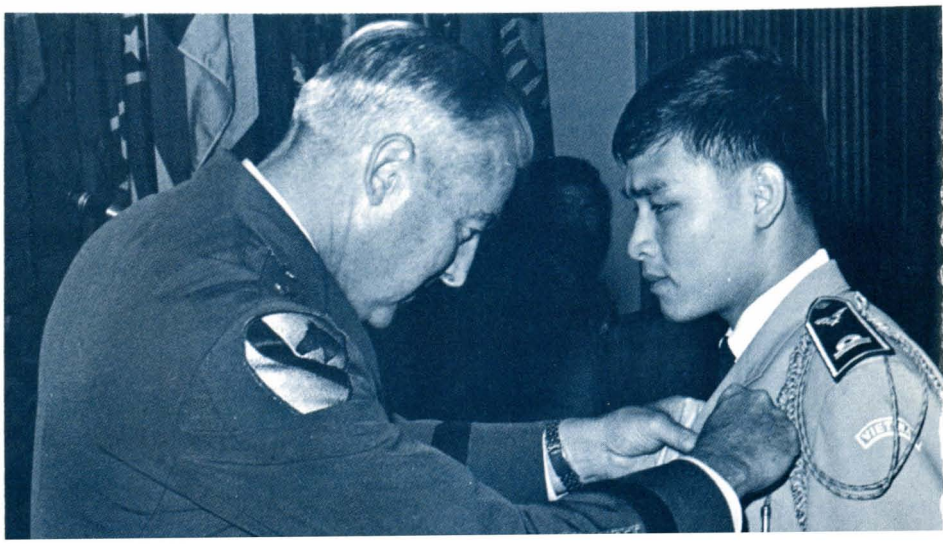
The Learning Center is staffed with trained academic and flight instructors from the various departments. The reinforcement is done through the use of a 35 mm sound and slide apparatus, 8 mm sound and motion, and educational television. Large trainers, mock-ups and other training aids are also employed. For the starting procedure problem, Hunter AAF has built two large mock-ups of UH-1 cockpits. As was stated earlier, this concept has produced excellent results.

The Learning Center has been received favorably by both the instructors and the students. In fact, better than 50 percent of those students attending have done so on their own. An interesting point to note is that the Learning Center is located in the living quarters of the students and is available to them at any time. The variety of subjects available for study at the Learning Center is innumerable. However, do not use the facility as a substitution or crutch for the old student to instructor relationship. Instructors will tell you there is no substitute for this concept.

Problem areas with the VNAF students have been described by supervisors as the same problems encountered with all students, such as standard autorotations, low level autorotations and difficulty with ADF and VOR orientation. While working with the UH-1, after initial training in the TH-55, some students had difficulty seeing over or around the console. As one major described it, "They are a pleasure to work with and they try hard." Quite a compliment, I'd say.

I hope I have given you a better understanding of the VNAF students. I also hope this has refreshed your memory on a few areas, and maybe informed you about some items you did not already know. It offers no guarantee of personal success. However, it provides a little insight on what is ahead. Most of all, no matter how much someone pounds his information into your head, if you do not have an open mind or at least be willing to try it once, you will be a discredit to yourself as well as the U. S. Army Aviation School.

Still no motivation? Let this thought linger then. Call it Vietnamization or whatever you wish, but for every satisfactory VNAF student you train and graduate, that is one less U. S. aviator that may have to return to Vietnam. After all, what is your mission as an instructor? It's teaching aviation in the best possible way.

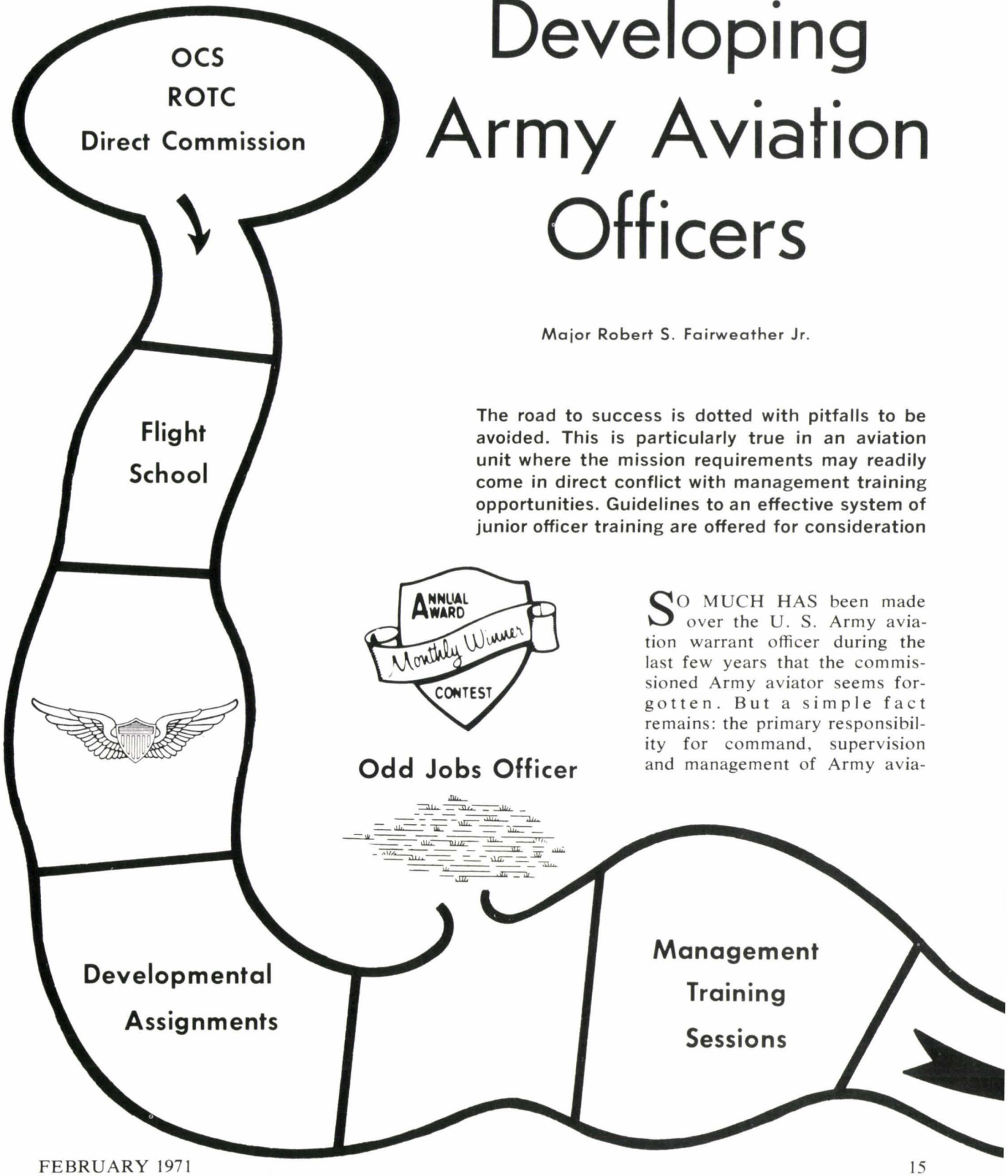


Climax of training is the awarding of the wings

Developing Army Aviation Officers

Major Robert S. Fairweather Jr.

The road to success is dotted with pitfalls to be avoided. This is particularly true in an aviation unit where the mission requirements may readily come in direct conflict with management training opportunities. Guidelines to an effective system of junior officer training are offered for consideration



SO MUCH HAS been made over the U. S. Army aviation warrant officer during the last few years that the commissioned Army aviator seems forgotten. But a simple fact remains: the primary responsibility for command, supervision and management of Army avia-

tion lies in the hands of commissioned Army aviators. To meet this responsibility these officers must be more than aviators, they must have the ability to manage aviation resources for efficient and effective mission accomplishment.

At one time it was generally accepted that the ability to lead was natural, and found only in born leaders. Therefore the emphasis was on devising means to find these gifted few and little effort was spent in training "normal" people for leadership positions. However, extensive research in psychology has proven this concept to be false, and that effective managers could be developed through training. The military services recognized the importance of these findings early, and soon developed extensive training programs.

Each Army branch now has officer basic and career courses and further training is given in Command and General Staff School and the Army War College. Few programs in industry come close to those routinely given in the Army and, in that respect, Army officers can feel fortunate.

What about the Army aviation officer? His training as an aviator qualifies him to fly an aircraft and gives a basic knowledge of aviation employment. There are, however, no formal training programs in aviation management that compare with branch career courses. Without such programs, the responsibility falls on aviation commanders and supervisors at all levels. In fact, part of the officer efficiency report concerns the efforts taken to develop subordinates.

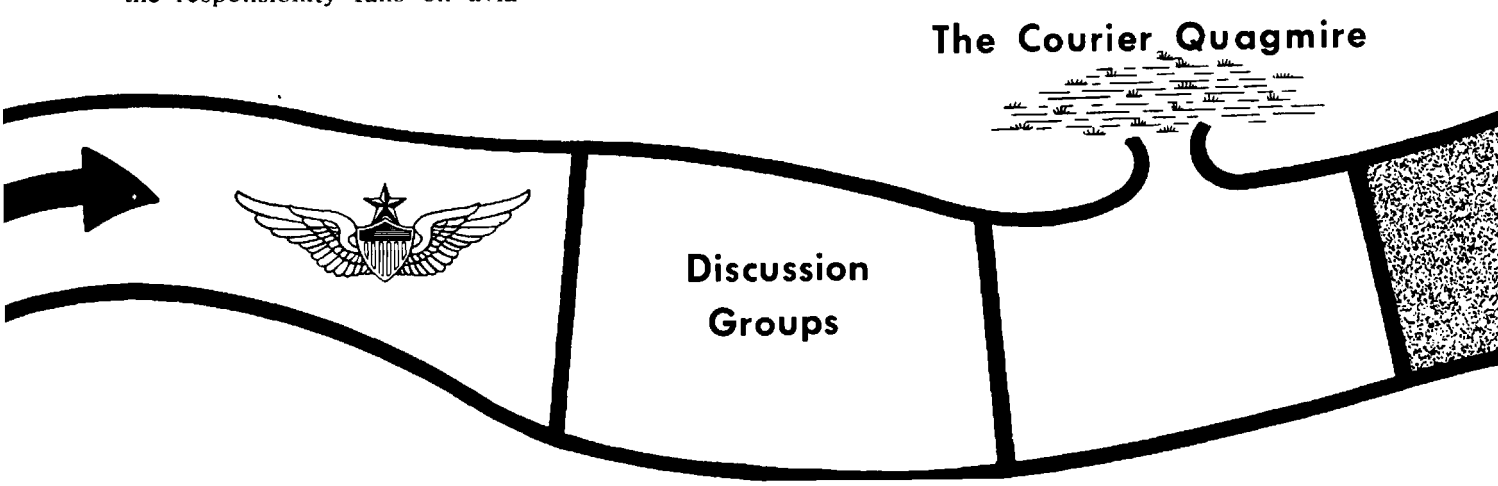
But what, exactly, can the supervisor do? He doesn't have much either in the way of resources or time. Under certain conditions, development must take a backseat to other requirements. But most commanders and supervisors can undertake some such programs and would be wise to do so. Any increase of capabilities brings rewards in terms of increased performance and motivation. Some of the possible programs include management training sessions, reading programs, discussion groups, developmental assignments and junior aviation officer training councils. These will be discussed in more detail later.

General areas of aviation management education could be categorized as follows: command and supervision; operations and employment; logistics; maintenance; and administration. The officer has had the basic principles in his branch training. What must be shown at unit level is how to apply them to the aviation field. For example, the preparation of unit aircraft and maintenance records for a command maintenance management inspection, or the requirements for maintaining individual aviator flight records. There are many things that must be known about aviation and it is imperative that planned aviation management training be given.

The following suggested programs do not represent all of the possibilities. However, applied either independently or combined, they can help accomplish training goals.

Management training sessions: One of the most effective approaches that I have seen at unit level evolved when a commander scheduled weekly management training sessions. Usually an expert in some field, such as an experienced maintenance officer, was invited to give a management oriented lecture on a specific subject and then open the floor to questions. All officers were uged to attend the sessions which were held during normal duty hours. By keeping the sessions short and factual, interest was maintained. These sessions are best held in a setting or location appropriate to the subject and should be attended by the commander whenever possible.

Reading programs: These are not new and most military libraries have recommended reading lists. However, there are certain things that can be done to improve them. First, make aviation oriented publications readily available to the unit. Also, participants could be selected on a roster basis to select an article of value each week and circulate it on a "read and initial" basis to all other officers. The com-



mander could heighten interest by asking random questions about their thoughts on the writings. The commander should give some guidance on subject selection and circulate articles that he considers of particular benefit.

Discussion groups: Bull sessions and "hangar flying" are common to Army aviation. Why not take advantage of the natural desire for aviators to express their ideas and relate past experiences? By holding regular discussions on aviation topics the commander could provide guidance on management subjects. This technique can prove to be educational for the commander as well.

Developmental assignments: Usually the commander has some control over duty assignments within his unit. Wherever possible primary and additional duties should be rotated to give the junior officer experience in all phases of aviation unit activity. Too many commanders assign additional duties indiscriminately and are reluctant to make changes when particular officers handle them especially well. Some risks must be taken, but usually they are only slight while the rewards are great.

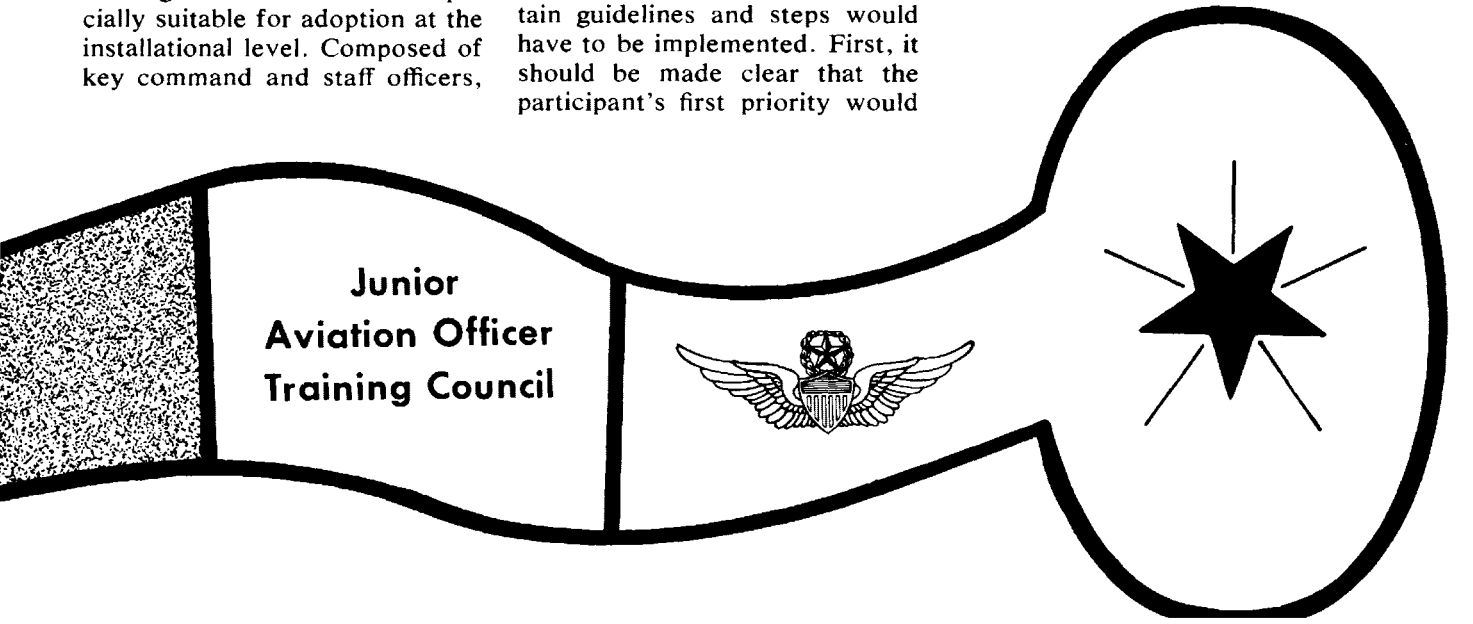
Junior aviation officer training council: This is another form of training which would be especially suitable for adoption at the installational level. Composed of key command and staff officers, the council would select a number of field grade volunteers to serve as "coaches" and assign one or two junior officers to each coach. The council also would identify a number of task areas upon which to concentrate. The coach and his junior officer would then define a specific task.

A typical task area could be "flight standardization" concentrating on combining the preventative safety program with the standardization program. The coach and trainee would work as a team, with the coach providing motivation, guidance, advice, counsel and direction. The junior officer would do all the necessary investigation, recommendations and writing.

Upon completion of the study the coach would make a written evaluation of the junior officer's performance and forward the evaluation to the council. The council would review the study and the coach's comments, and would then issue a critique and suggest actions to be taken. In addition, a letter could be sent to the junior officer's rater informing him of the officer's participation and any contributions that his study made toward improving management. The rater would not be shown the coach's evaluation or the council's critique.

To support the program certain guidelines and steps would have to be implemented. First, it should be made clear that the participant's first priority would be to his regular job. Second, the rater should agree with the junior officer's participation. Third, selection criteria for all personnel should be established. Fourth, the program should be widely advertised with gains to individuals and the Army pointed out. Finally, a program for supportive education and training concurrent with task accomplishment should be developed. This last step could consist of suggested reading lists, group discussions, briefings on local management organizations and procedures, and the invitations for junior officers to attend staff and command conferences or briefings as observers.

This program could be adopted at most installations. With modifications, it could be also adopted within tables of organization and equipment units. If the council members gave the recommendations contained in the studies sincere consideration, and took time to prepare comprehensive critiques, and if the coaches really assisted and guided the junior officers, success would be almost certain. However, programs don't just happen. The initiative must be taken by commanders and supervisors truly interested in meeting their obligations to develop subordinates.



DEAR CONCERNED Readers: We have received many queries concerning a question posed by WO1 G. A. P. in the November 1970 issue. A typograjhical error resulted in quoting an incorrect technical manual (the correct reference should have been TM 55-1520-210-10) and the 300 to 400 rpm quote was a misinterpretation of a paragraph read by Danny. Insofar as your quotes concerning overspeeds are concerned, we are in agreement. The quote of 6700 rpm +50 concerns the pilot's check during his engine runup on the ground. In the configuration of flat pitch with no lifting load on the rotor system, it is not possible for a pilot to obtain 85 percent or 91 percent unless he pulls in pitch.

Danny

Dear Charlie: Why was the idle mixture check taken out of the new U-6 checklist?

LT M. A. T.

Charlie's answer: Trying to read a 10 rpm change on a tachometer that is fluctuating approximately 100 rpm is very impractical and made the check invalid. If you have flown Bird Dogs lately, you may have noticed that this check was also removed from the O-1 engine runup (for the same reason).

Dear Danny: Can you settle an argument for us? A pilot in our company says that the oxygen regulators in the Mohawk should be left in the 100 percent position when not in use, and I say it doesn't make any difference as long as it's turned off. Who's right?

CW2 J. O. D.

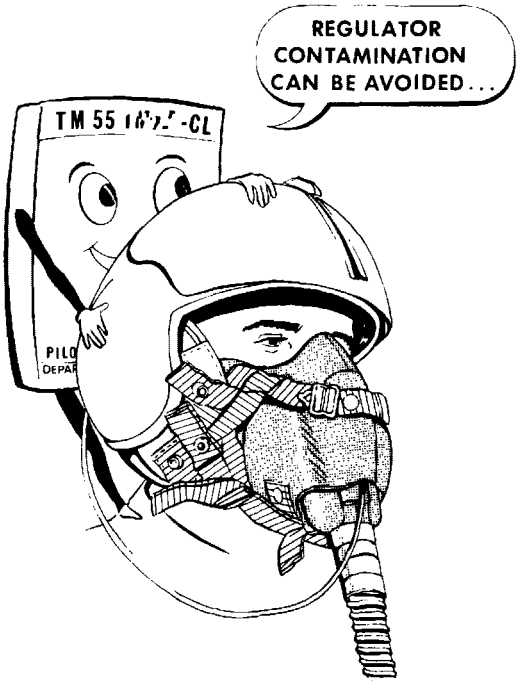
Danny's answer: I hope you didn't bet any green stuff with him because it appears that he's been reading an advanced copy of a TM change. The next change to all OV-1 operator's manuals will include the following note after item 3 in the BEFORE LEAVING AIRCRAFT check: *When not in use, the diluter demand switch should be left in the 100 percent OXYGEN position to prevent regulator contamination.* The reason for this is that if the demand switch is left in NORMAL, the aneroid of the regulator is vented to the atmosphere allowing dirt, dust and contamination to collect internally. In the 100 percent OXYGEN position, this aneroid is closed to the atmosphere.

Dear Danny: Could you please settle an argument here at the Aviation Maintenance Training Department? Tell us what materials are used in the construction of the UH-1DH model oil tanks.

Maintenance Officer

Danny's answer: The UH-1D/H model oil tanks are constructed of "18 to 8 corrosive resistant steel"—18 parts chrome to 8 parts nickel.

Charlie and

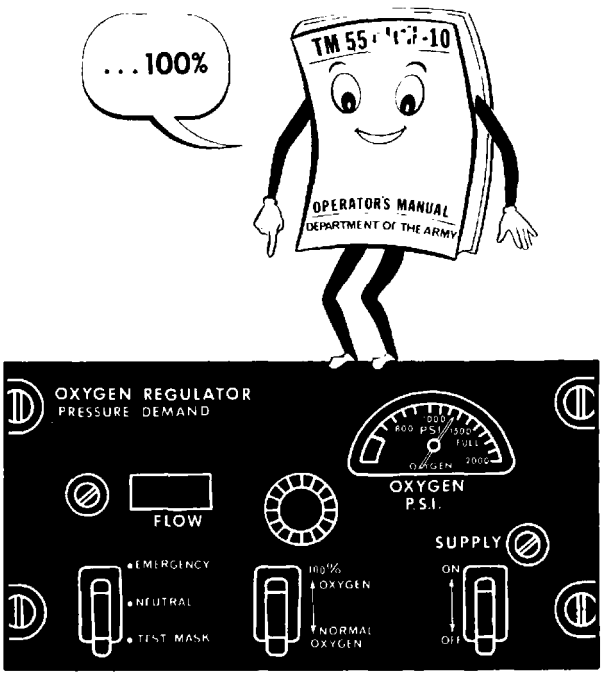


Dear Charlie: Why does the CL procedure for landing an OV-1 with one main gear up or unlocked not include feathering the props? I believe that crash damage could be minimized by landing with feathered props.

CPT J. E. C.

Charlie's answer: The amount of damage resulting from a landing with one main gear up will depend on many factors; i.e., drop tanks attached, left or right gear up, whether it's a SLAR bird, etc.

Danny's



Write-In

Emergency gear-up landings (one main gear up) have been made using the SLAR antenna on "B" models and drop tanks on "A" models. After studying field reports of actual emergency landings, this procedure has been reevaluated and the next change to the OV-1 CLs will indicate prop feathered on the gear-up side after touchdown. The other prop will still be used in reverse as required to assist in maintaining direction.

Dear Charlie: The UH-1DH model dash 10 does not list an alternate oil for MIL-L-7808 or MIL-L-23699. What is the SAE, CA or SUS grade to be used as an alternate oil? Should the oil contain ashless dispersant additives or detergent additives?

CW2 E. E. F.

Danny's answer: Let me answer this question for Charlie. MIL-L-7808 is the substitute oil for MIL-L-23699 and vice versa; there are no other alternates. TM 55-1520-210-20, change 4, page 1-16, figure 108, contains this information. These two oils may be mixed if a shortage exists in one type provided the following is done:

- **Note in the DA Form 2408-13 the mixing of the oils.**
- **Permit the aircraft to fly a MAXIMUM of 6 hours.**
- **Flush the entire oil system thoroughly and refill.**

Dear Danny: I am assigned to a UH-1B outfit and quite frequently fly cross country. The question concerning the correct cruising speed has arisen and, as the dash 10 does not mention it, what do you say? Is it 80 knots or can it be 90 knots in a slick aircraft?

CW3 D. D.

Danny's answer: There is no set or recommended cruise speed for the UH-1B aircraft. Everything is predicated on your gross weight, altitude, fuel aboard, outside air temperature, fuel consumption, distance to be flown and how bad the critter vibrates at certain speeds and loads. Your cruise speed should be determined from the performance data charts, based on the above mentioned factors. Read the article on performance data charts for the UH-1H in this column. It will show you the new charts which will be out shortly and in time will be prepared and published for your UH-1B aircraft also.

Dear Danny: On pages 7-5 and 7-6 of TM 55-1510-201-10/4 (U-8D, RU-8D and U-8G) there is a chart giving the operating flight strength of the aircraft. I don't understand how you can have a "caution range" after exceeding red line speed. Please explain as the book has lost me.

Mr. C. S.

Danny's answer: Don't feel like the Lone Ranger. A lot of us got lost on that one. Actually, the chart is wrong and has been since the first manual was produced. It appears that the draftsmen or aerodynamics specialists in Wichita got their hash marks in the wrong area. The area past the red line should be shown as a "prohibited operating range" and the solid black area as "designed structure limits." Steps have been taken to correct this discrepancy. By the way, if any of you aviators fly U-21s you may have noticed that this same chart was also wrong and has just recently been corrected by change 5 to the U-21 operator's manual.

OVERHAUL?

The author, Deputy Director for Maintenance at the U. S. Army Aeronautical Depot Maintenance Center, Corpus Christi, Texas, clarifies misnomers about depot aircraft maintenance and maintenance terms

Lieutenant Colonel William G. Phillips

H-M-A-L-T-Z-Z!

ASK THE NEXT half-dozen aviators that you meet what the word *overhaul* means and you're likely to get a dozen different answers.

It seems incredible that a simple word with only eight letters could confuse so many people. Nevertheless, the word is confusing and poses no small problem in daily communications.

Since the word is cussed and discussed at all levels within the U. S. Army, it is prudent for those who make overhaul a profession to clarify some of the peculiarities about the term. This will enable the customers to know what to expect when encountering the label on the product.

In an aeronautical depot overhaul—as in most other areas of human endeavor—you get what you pay for. However, due to the distinctions between types of funds that Congress appropriates, the Army is in the position of buying overhaul services from itself. It uses funds earmarked for that purpose and allocated to the U. S. Army Materiel Command. These funds are further allotted to the U. S. Army Aviation Systems Command which is responsible for the overhaul of Army aircraft and is the sole customer, so to speak, of the U. S. Army Aeronautical Depot Maintenance Center.

This means that the actual field operating elements of the Army who use the equipment do not fund for depot overhaul but merely make known their projected requirements. These requirements are programed and budgeted by the responsible commodity command as the actual purchaser of the overhaul service from its own depot facility. The depot is an "industrial funded" subactivity of the commodity command.

Simple? Sure, but the problems it generates are not.

Unfortunately, there are several terms kindred to overhaul such as *repair, depot maintenance* and *rebuild*, which complicate our discussion.

Turning to Army Regulation 310-25, Dictionary of United States Army Terms, March 1969, these terms are defined as follows:

Overhaul: To restore an item to completely serviceable condition as prescribed by maintenance serviceability standards.

Repair: To restore an item to servicable condition through correction of a specific failure or unserviceable condition.

Rebuild: To restore an item to a standard as nearly as possible to original or new condition in appearance, performance and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements using original manufacturing tolerances and specifications and subsequent reassembly of the item.

Depot maintenance: That maintenance performed on materiel

requiring major *overhaul* or a complete *rebuild* of parts, assemblies, subassemblies and end items, including the *manufacture* of parts, modifications, testing and reclamation as required. Depot maintenance serves to support lower categories of maintenance by providing technical assistance and performing that maintenance beyond their responsibility. Depot maintenance provides stocks of serviceable equipment by using more extensive facilities for repair than are available in lower level maintenance activities.

Also: That maintenance involving the *overhaul* of economically repairable materiel to augment the procurement program in satisfying overall Army requirements and, when required, to provide for repair of materiel beyond the capability of general support maintenance organizations.

(This function was formerly known as 5th echelon maintenance.)

It is also noted that the official Army definition for a depot maintenance shop indicates that it is an installation where materiel is repaired which requires a *rebuild* of subassemblies, assemblies or end items.

Where is the problem, you ask. The official definitions seem clear enough. The rub of it is that the key words in the definitions raise questions.

What is meant in the definition of *overhaul* by "a completely serviceable condition"? The word "completely" here seems to infer varying degrees of serviceability within the overall category of "'Group A" or "Ready for Issue."

If we are not careful in this area we can talk ourselves into believing that the wife can be a little bit pregnant or an airplane a little bit unsafe.

In a similar vein, we are also plagued with defining *rebuild.* The official definition blithely states "to restore as nearly as possible to original or new condition." Where do we draw the line between what is possible and what is practical?

Is an aircraft restored to as nearly the original or new condition if a patch is used rather than replacing a complete metal panel? In such a decision, if there are no other overriding factors, the panel would be patched because of the economics involved. However, in so doing we have ignored the letter of our definiton which said plainly "as nearly as possible to the original." And it *is* possible to replace most metal panels.

Very simply, if you want a mechanical contrivance to have exactly the same *service* expectancy following scheduled overhaul that it had prior to overhaul, you must restore it to a like-new condition. This may be termed "remanufacturing," but a rose by any other name will cost as much and take as long to produce.

Depending upon the item, the cost curve takes a sharp upward swing to obtain the last 10 percent or so of the reliability of a new item. For instance, it has been estimated that accepting a mere 2 to 5 percent shorter lifespan for overhauled UH-1 helicopter engines has enabled the Army to cut average turn-around times to less than half, while the working backlog inventory of unserviceable repairable engines is reduced 5 times. At $68,000 each, this is a respectable savings, brother taxpayer.

On the other hand, a predictably higher change-out rate will increase field maintenance costs, deadline rates and man-hour requirements.

A tempest in a tea cup? Yes, but also the first crack in the credibility dike leading to a complete collapse of our definitions of *rebuild, overhaul* and *serviceability.*

Where is the line drawn and who draws it? In industry, the common practice is for the owner or customer using the equipment to be overhauled to

make decisions concerning cost versus performance and appearance or service life-trade-offs.

Since Army personnel using aeronautical equipment are not directly concerned with financing the overhaul program, they turn in an item for overhaul and expect and deserve a serviceable item in return.

But what is acceptable to good ole Joe may very well get a thumbs-down verdict from the next customer. Lincoln's comment about "pleasing all of the people part of the time" won't get you by. In aviation it is wise to please all of the people all of the time.

So in seeking a more comfortable position on the horns of this dilemma, we have come up with a device known as the approved data package or overhaul specifications to which we adhere as closely as possible. (Oops! Excuse me—we *do* adhere to the specifications unless we request and receive authority to deviate.)

Among the reasons for requesting such authority are a lack of funds, materials, tools, manpower and time, as well as an occasional opportunity to do a job better, faster, safer or with less effort.

All such deviations must receive the blessings of the maintenance engineers responsible for quality at the national maintenance point. They also are made known to the commodity manager if there is an impact logistically. However, slight changes or deviations in specifications are not always disseminated as widely as desired. Field users are seldom consulted prior to the fact, and often they receive equipment which has been repaired using unfamiliar and (apparently to them) unauthorized procedures, materials or tolerances.

The major impact of all this on the user is that the performance, appearance or service life of the overhauled item may have been degraded by these considerations to which he was not privy. Occasionally these decisions result from obvious trade-offs in which the powers-on-high have weighed total worldwide requirements versus assets during programing seances.

In either event the field recipient of the overhauled product is handed a degraded item. To make matters worse, his buddy in another outfit may have drawn a new item from the supply system or an item overhauled prior to an approved change in the overhaul specifications which may have relaxed some gold-plating standards.

Now we have a disgruntled customer. (Don't ask me what the opposite type is; I have yet to see a "gruntled" customer.)

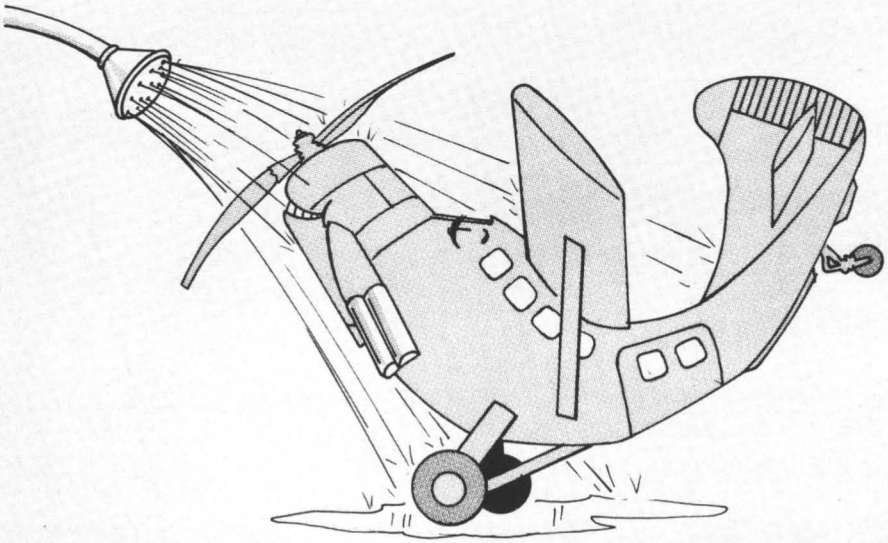
From this discussion it seems apparent that the largest fault with the system is that time, distance, communication and the necessary division of responsibility have precluded the field user from sharing in the decision that led to an item being in less than a new condition or configuration.

It is hardly reasonable to expect the customer to be happy with less than new items, but we certainly should ensure his understanding if not his sympathy. This could best be done by placing the responsibility for many of the decisions involving economics versus serviceability upon the user.

To accomplish this the major commands could budget and program their individual overhaul programs in accordance with departmental guidance, setting forth performance objectives and targets just as they do for lower level maintenance programs. Overhaul activities would coordinate specifications directly with the commander financing the requirement.

There is no doubt that some commands and overhaul activities would be more successful than would others in such an effort, but the competition would be beneficial for all concerned. It should also result in closer fleet management by the major commands.

Maintenance



Corrosion Prevention On The U-1A: Due to the extremely high corrosive effect of exhaust fumes, engine oil, battery acid and drained fuel, the lower surface "skin" of the fuselage of the U-1A aircraft must be removed, treated for corrosion and replaced frequently. Repair and replacement of this portion of the aircraft results in an average of 1 to 2 weeks of downtime for the aircraft and many man-hours of labor. Aircraft availability goes down and maintenance cost goes up in proportion. The applicable dash 20 describes the best cleaning method to be used, but it leaves the frequency to the discretion of the maintenance personnel. Through experience and consultation with other crew chiefs and maintenance personnel, it has been determined that cleaning the aforementioned parts after each day's flight is the most effective interval. Daily cleaning completely eliminates the corrosion problem; however, if a build-up is allowed in this area, corrosion occurs and the time and labor required to remove the accumulation of the build-up is multiplied manifold as compared to the relatively short time required for daily cleaning.

Preclude Doubt Of Aircraft Status: To preclude pilots or mechanics being in doubt about aircraft status, one individual initiated the practice of putting cans painted red with a white circle with the aircraft status marked in red in the center of the white circle over the cyclic stick on the pilot's side of the UH-1. This leaves no doubt of the aircraft's status before starting.

Another idea intent on preventing damage to the aircraft and possible damage to other property and personnel is the tagging of flight controls. Experience has proven that a tag of any available size placed on the controls in the cockpit remind the pilot or other personnel that a flight control is being adjusted or is disconnected and the aircraft should not be runup or moved under its own power until the existing discrepancy has been thoroughly checked and corrected.

Maintenance Tips For The U-6 Beaver: Ever since U-6 wingtip fuel tanks were installed there have been numerous cases of unsecured fuel tank caps being lost in flight. Since the fuel tanks are higher than the pilot can reach without the assistance of a ladder, the pilot usually gives the caps a casual glance and proceeds with his preflight. To prevent the possibility of the caps coming off in flight, many units have painted a slippage mark on the cap and the filler neck on the backside so the pilot can see at a glance that the cap is properly installed.

Prevent Overtorqueing Of Filter Assembly: In filter assemblies that incorporate O-ring seals, additional torque should never

Matters...

be used to stop oil leaks. Solution: Remove and inspect the O-ring.

Cleaning Of Lycoming T-53, T-55 Engines: Since fresh water supplies contain varying amounts of mineral deposits, repeated washing of the turbine engine will leave deposits of these minerals on the compressor blades that may eventually result in high exhaust gas temperatures. Such deposits can be removed by cleaning the compressor with walnut shell grit. Care should be taken to use this method on these engines only. Definite internal damage results to engines utilizing a Teflon compressor liner.

Ground Support Equipment—General Inspection Standards:

• Inspection to determine if ground support equipment is correctly assembled. Normally this is a visual inspection ensuring that the item is in proper position and all parts are in their correct relative positions.

• Inspection to make sure ground support equipment is secure—usually a visual, hand-feel, wrench or screwdriver inspection for looseness.

• Excessively worn is understood to mean worn beyond serviceable limits or likely to fail if not replaced before the next scheduled inspection. It also includes illegibility of markings, data and caution plates and printed matter.

• Tighten means to attempt to tighten with a torque wrench, even if the item appears to be secure.

• Wooden components will be checked for serviceability.

• All components must be secure to prevent loss, damage or injury to equipment and/or personnel.

• Decisions to repair or replace components must be made on the basis of safety, accuracy, etc., but supply economy must also be a consideration.

Ground Support Equipment—Inspection Requirements:

General requirements—

• Inspect equipment for cleanliness.

• Perform serviceability inspection on all new equipment.

• Inspect equipment for proper lubrication I/A/W applicable tm.

• Check for oil leaks. All seals that leak will be replaced.

The following list of other inspection requirements is to be used as a guide for serviceable ground support equipment:

• Functional checks.

• Engine and accessories inspection.

• Ignition system inspection.

• Frame inspection.

NUTS

General: Self-locking nuts are used on aircraft to provide tight connections which will not shake loose under severe vibrations. These nuts must meet critical specifications as to strength, corrosion resistance and temperature range set forth in military specification MIL-N-25027 before they can be used.

Types: The two general type self-locking nuts currently in use are designated as the all-metal type and the nonmetallic insert (fiber or nylon) type. Each obtains its locking quality through a different means as indicated by its respective title.

All-Metal, Self-Locking Nuts: Locking action of the nut depends upon the ability of the metal to recover its size and shape when the locking action and the load carrying portion are engaged by bolt or screw threads. High temperature, AN 363 or approved equivalent, and cadmium plated all-metal, self-locking nuts will not be subjected to temperatures in excess of 1200 degrees F. or 648 degrees C.

Nonmetallic Insert, Self-Locking Nuts: The nonmetallic fiber or nylon insert is pressed within the inside diameter of the nut proper. When a screw or bolt is installed, the insert stretches and forces contact between itself and the bolt or screw threads, producing the locking action. Do not subject nonmetallic self-locking insert nuts to temperatures in excess of 250 degrees F. or 121 degrees C.

LET'S KEEP OUR HEADS

The Army was able to initially obtain 42,000 SPH-4 helmets on an expedited basis to provide its flight personnel with the greatest degree of protection available. Because this quantity falls short of the quantity needed, a priority system has been established for their distribution: first is Southeast Asia; second is student flight training; and the third makes allowance for all those deploying to SEA or who are recommended by a flight surgeon for medical reasons. The Army Materiel Command and the Defense Supply Agency are taking steps to obtain additional helmets

Major Nicholas E. Barreca, M.D.

Aeromedic

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

To the air crewman: The protective helmet for flying means different things to different crew members. Many are concerned with ballistic protection—the ole bullet "stopping" capability. Others are more concerned with keeping their heads intact during an emergency situation. Actually helmets are designed with many ends in mind. Each function of the helmet must be optimized in a given design without significantly compromising the remaining functions. In creative protective equipment development, this is known as the *dual design principle.* Let's look at some of the features that must be considered in the design of a protective helmet for flying:

• *Impact attenuation*—This is the ingredient that provides our helmets with a tough shatterproof impenetrable skin to distribute crash forces and prevent immovable or flying objects

from denting or ventilating our valuable craniums. In addition, the head suspension and absorbent styrofoam liners reduce the ultimate headache producing forces from reaching our heads full strength.

• *Retention*—In order to accomplish its ends, the helmet must stay on the head . . . certainly as long as one's head does. A well designed integrated nape and chin strap usually serve this function well if constructed of strong, weatherable material attached to strong anchorage points.

• *Noise attenuation*—In our present, sophisticated, pollution wary society almost everyone now recognizes the harmful effects of noise. Noise induced hearing loss, speech communication interference and annoyance and fatigue must certainly be prevented in the aviation environment. A helmet with well designed integral earcups can provide excellent attenuation of noise while not adversely affecting good retention characteristics or creating an excessive weight penalty.

• *Minimal weight*—The heavier the helmet, the more uncomfortable it becomes. More importantly, added weight becomes magnified by the momentum of G force deceleration, thus decreasing retention characteristics and placing added physical stress on our precious necks. It is the consensus of medical opinion that this weight should never exceed 3.5 pounds.

• *Ballistic protection*—This is a nice-to-have item, with lots of emotional impact. However, less than 1 percent of fatal casualties in air crewmen result from ballistic inflicted head wounds. In order to stop high velocity rounds, one's head would need to be encased in a shroud of steel. Until we develop a *lightweight* "plastic-polymer" having the strength of armor plate, we'll have to be satisfied with stopping small fragments and glancing blows. Remember the compromise to achieve minimal weight as well.

• *Comfort*—If a helmet isn't reasonably comfortable, it won't be worn properly. Minimizing weight is one factor. Another is a smooth, comfortable fit without lumps and bumps pressing on the ole skull bone. An additional factor is good ventilation to cool down the "hot heads."

• *Speech intelligibility*—It matters not much to what extent the outside noise is attenuated (reduced) if the avionics (mouthpiece microphone and headset) collect noise or transmit garbled speech. In some rotary wing aircraft, noise intensity levels that may exceed 105 decibels are transmitted to the ear along with inherent systems static when the mike button is keyed. The electronic state-of-the-art is such that this can be minimized.

• *Eye/face protection*—The helmet visor protects us in a number of ways. The clear visor, if down at all times, protects the eyes from fragments or flying objects from hostile sources, bird strikes, crash sequences and even flying mud (see page 32). It also prevents flash burns to the eyes and upper face. A sun visor protects against intense brightness and glare. The ideal would be a dual visor (clear and sun), however, this adds prohibitive weight to the helmet and shifts its center of mass. Thus we recommend the clear visor alone or in combination with the N-15 sunglasses (particularly on takeoff and landing).

• *Optimal color*—A dull, dark, muddy color usually decreases Charlie's sharpshooting ability. The old white paint job was beginning to increase his score. However, a nonflammable paint must be used. When helmets are designed with good airflow ventilation, such as the SPH-4, color becomes a less important variable in heat loading to the head.

• *Material integrity*—All parts of the helmet must be weather, sun, flame and corrosion resistant, otherwise many of the above characteristics would degrade. In addition, it must integrate with other equipment, such as oxygen masks.

Today we have a helmet that optimizes all of these characteristics in one. It provides the Army with the finest flying helmet among the three military services. It's the special protective helmet, SPH-4. Designed within specific weight limitations, it is one of the most comfortable and quietest helmets ever developed. Its impact attenuation has been laboratory tested and confirmed. Due to its excellent integrated chin/nape strap and crown suspension system, it is the ultimate in retention as well as comfort. In addition to superior noise attenuation, it also provides improved avionics with reduced feedback and systems noise. Finally, it provides a reasonable amount of ballistic protection with little cost in unnecessary or prohibitive weight.

While this helmet gives the finest crash protection available, it also affords the flight surgeon with a special preventive tool. With other helmets the flight surgeon frequently had to depend on helmet and earplug combinations to obtain adequate noise protection for individuals. With the SPH-4 adequate noise protection can be achieved for most people with the helmet alone in current Army aircraft.

Air crewmen who already have sustained certain perma-

nent hearing loss should have the protection of this helmet as soon as possible. This might prevent extension of hearing loss to involve speech communication frequencies. Once this happens and is moderately advanced the air crewman often must be removed from flying duty. Individuals who are particularly susceptible to noise induced hearing loss would be wise to use both helmet and earplugs even with the SPH-4 for additional noise protection.

WARNING

Even with the excellently designed SPH-4, protection can only be realized when the helmet is properly fitted and worn. Once the appropriate size is selected, regular (hat size up to 7¼) or extra large (hat size 7¼ or greater), the individual air crewman can adjust the helmet by following the accompanying instruction booklet. Here are a few simple steps to ensure an adequate, lasting fit and optimal protection:

• Adjust the crown straps to position the earcups at ear level.

• Adjust the headband suspension to fit the circumference of the head and provide sideways as well as fore and aft stability.

• Rotate each earcup so that the protruding bulge fits into the depression beneath the ear at the earlobe.

• Adjust the earcup crossweb compression straps to provide an airtight fit of the earcups over the ear. A spacer kit of self-adhering compressed foam can be used to increase earcup pressure in those persons requiring additional compression.

• *The last adjustment should take place each time you put on the helmet.* In order to remove the helmet comfortably it is usually necessary to loosen the nape strap. Thus once the chin strap is snapped, cinch up *both* the chin strap and nape strap adjustments tightly. This is perhaps the most important adjustment for guaranteeing both retention and noise attenuation.

• If possible use only the second snap fastener from the bottom for the chin strap. This is to provide the best vertical stress on this assembly for maximal retention. The upper three snap fasteners were originally designed for oxygen mask attachment, but this modification in wear will improve the bioengineering of the system and increase retention characteristics of the suspension.

• Keep the helmet protected in its bag.

• Inspect helmet parts periodically to ensure their integrity, particularly to ensure that the suspension webbing is not worn or frayed or developed a failure at points sewn to other components.

• The styrofoam lining must not be crushed. If crushed inadvertently or during a crash sequence, turn the helmet in for a new one. This is "one shot" protection.

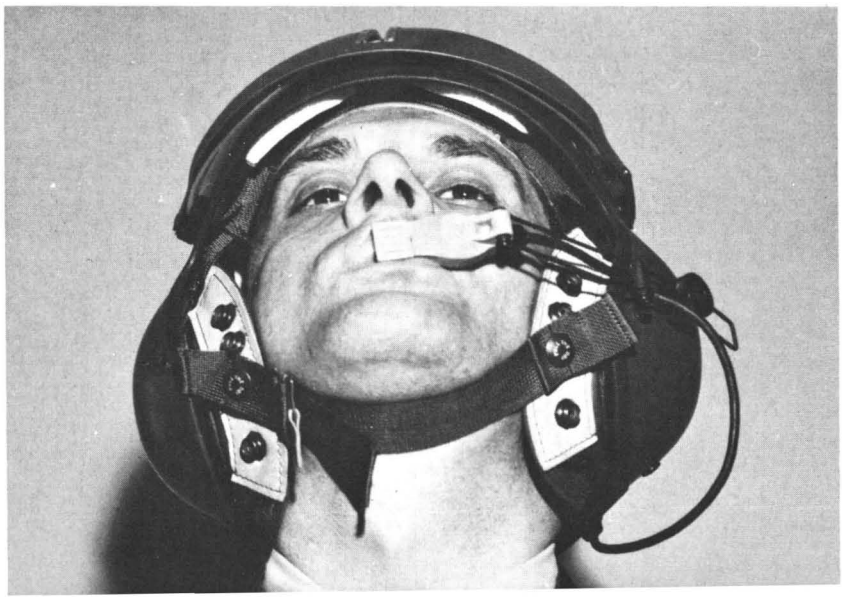
• Never carry the helmet by the chin strap, mike boom or commo cord.

Now you know the purpose of a protective flying helmet and how to use it effectively. By following a few simple rules, you too may *keep your head.*

To the flight surgeon: Since the SPH-4 has been released for use, a few minor fixes and allowances have been made. A knowledge of these will enhance the use of the SPH-4 and enable the flight surgeon to better advise the air crewmen entrusted to his care.

• The original SPH-4 earcups were manufactured of vinyl covered polyurethane foam. Some controversy was heard from the field regarding undue pressure on aviator goggle spectacle frames and/or a break in the earcup air seal with reduced noise attenuation. To study this problem, a liquid filled earcup has been delivered to the field for testing (the earcups can be easily removed and interchanged). To date each of these cups have their advantages and disadvantages but the decrease in noise attenuation is not thought to be significant. Some flight surgeons have subjectively tested the cups with the standard aviator goggle frames and noted

Figure 1



no significant discomfort or difference in noise attenuation. New plastic aviator goggle frames are being evaluated and will probably prove to integrate better with the SPH-4. The final verdict will rest on conclusive laboratory analysis. We'll keep you posted.

• The instruction booklet accompanying the SPJ-4 helmet is misleading. In the booklet pictures used to describe chin strap adjustment, the chin strap is snapped to the second from the top snap fastener. This implies that the upper three snap fasteners might be for the purpose of fitting the chin strap. This is not entirely true and could reduce the retention characteristics of the helmet. The upper two or three snaps were meant for oxygen mask fitting (see below).

Ideally, the second lowermost or third from the top snap is for the chin strap (see figure 1). This provides the most vertical relationship of the chin strap to the horizontal headband suspension, thus increasing the likelihood for retention.

• For those of you supporting U-21 Ute or OV-1 Mohawk units, we have some useful information. Inquiries from the field have prompted us to investigate the appropriate oxygen

Figure 2

mask suspension for the SPH-4 helmet. Up to now the MS 22001 (modified A 13A) pressure demand oxygen mask has been used with a modification suspension harness kit (FSN 1660-872-7794, 5 and 6) for adaptation of bayonet-type retention fittings. The SPH-4 will not lend itself to adaptation with this modification kit. Further, it has the provision for oxygen mask attachment by virtue of the snap fasteners on the helmet suspension harness. The MS 22001 oxygen mask will continue to be used, but a different harness modification kit (FSN 1660-179-1190, 1 and 4) must be requisitioned. A specific size sleeve is available (see figure 2) for each size oxygen mask, small, medium and large. This harness utilizes a similar retention hardshell sleeve, but with a pull-the-dot snap fastener on either side for attachment to the helmet suspension harness. Each pull-the-dot fastener connects to the hardshell through a "Y" shaped harness with upper and lower adjustments. In order to provide the best fit each side of the mask suspension may be attached to any one of the top three pairs of male snaps on the helmet suspension harness (see figure 3). In fastening the chin strap on the second from the bottom snap fastener, as recommended above, some freedom in selecting the optimum location of the oxygen mask may be compromised. *Every effort should be made to achieve an oxygen mask fit using only the top two pairs of snaps, thereby reserving the third (second from bottom) for the chin strap.* Should the "Y" strap harness adjustments not permit an adequate fit under these conditions, then the third pair of snaps may be used for the mask, lowering the chin strap to the fourth or bottom pair of snap fasteners. By following these recommendations an excellent mask fit, precluding mask leakage, will be achieved. In addition, this mask suspension is

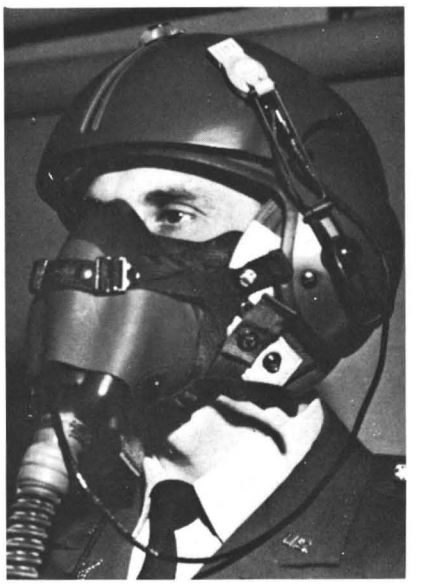


Figure 3

particularly resistant to being dislodged by G forces.

NOTE

Flight surgeons, knowing that **several** possible choices of attaching the chin strap or oxygen mask exist, must be alert for misapplications by air crew. This is especially important during aircraft accident investigation. In reporting the postaccident mode and condition of the helmet, its parts and accessories, every effort should be made to *specify the snap fastener attachment positions of the chin strap and oxygen mask (if used).* This will better enable correlation of theoretical and experimental concepts with actual helmet retention experience. Finally, all helmets involved in aircraft accidents should be forwarded to the U. S. Army Aeromedical Research Laboratory (USAARL), Fort Rucker, Alabama 36360, for analysis.

Aero Scout...

...what's it all about?

Captain Matthew M. Serletic

THE BIRTH of the aero scout was inevitable. In the early 1960's United States commanders in the Republic of Vietnam were faced with an enemy whose hit and run tactics made him extremely difficult to locate. The mountainous terrain and thick jungle provided vast sanctuaries where the Viet Cong could hide and mobilize. The allied foot soldier could spend days participating in giant search and clear operations only to catch but a brief glimpse of the VC disappearing into the jungle. U. S. commanders had superior firepower but lacked the necessary mobility and information-gathering capabilities to effectively engage the enemy. However, the 1st Cavalry Division (Airmobile) introduced its "cav concept" in Vietnam in Septem-

ber 1965 and furnished the airmobility and much of the battlefield intelligence that had been lacking.

A typical cav mission includes an OH-6A observation helicopter and AH-1G HueyCobra gunships. The scout pilot pokes around at low level for signs of the VC. Trouble might come in the form of automatic weapons fire from a battalion or a staccato burst from a single AK-47. When contact is made, the scout marks the target with colored smoke and quickly pulls out of range while the Cobras move in to attack. If the area looks promising, the aero rifle platoon of the air cavalry troop is inserted to investigate while the scouts screen escape routes and the Cobras supply fire support. If conditions warrant further support, several battalions could join the battle within minutes.

These hold tactics proved to be a master stroke in counterinsurgency warfare. Commanders quickly learned that the air cavalry squadron could find and fix the enemy and that airmobile infantry—supported by artillery and air strikes—could swiftly deal a decisive blow.

Today, air cavalry squadrons are employed in each corps tactical zone and are in the vanguard of many successful strike operations. The nucleus of the organization is the aero scout pilot and observer with the OH-6 Cayuse, nicknamed the "Loach." This highly maneuverable aircraft is armed with the M-27E1 minigun system which is capable of firing 2,000 to 4,000 rounds per minute. The observer carries the CAR-15 rifle and rides next to the pilot. They fly in either mixed fire teams (one Loach and one Cobra) or in pure scout teams (two scout ships flying low level).

Most scout crews augment their firepower by carrying an imaginative assortment of smoke grenades to mark targets for the Cobras, flush elusive VC out of the underbrush and discourage him from hiding in foxholes and bunkers.

To perform his mission, a scout pilot must fly low, varying his altitude, air speed and direction of flight. Initially, when going into a suspected VC stronghold, air speed must be kept up and flying in a straight path is avoided.

If the Loach does not draw fire on the initial passes, the pilot gradually decreases air speed to take a closer look. The observer keeps his CAR-15 at the ready and the pilot has the minigun in the firing mode. Both crewmen are looking for signs of recent activity, bunkers, packs, equipment, sampans, etc. If there's a platoon or larger size VC unit in the area, it usually doesn't take long to notice it.

If a scout team achieves surprise over a VC squad size element, swift and accurate fire will usually destroy the enemy. If there are any prisoners to be taken, the rifle platoon will land and pick them up while the scouts and Cobras cover. This technique in VC base areas often supplies timely information for the S-2.

Platoon size and larger elements are targets for the gunships. When a heavy volume of fire is received by the scouts, the observer immediately drops smoke and returns fire with the CAR-15 while the pilot takes evasive action and announces on the radio that he's receiving fire. Within seconds the Cobras are rolling in for the attack. Scout aircraft will orbit beyond small arms range and adjust the fire.

Once the firing passes are complete, a damage assessment can be made by the scouts, or the situation may warrant the insertion of the aero rifles to develop the situation. If the enemy tries to avoid contact, reconnaissance by fire can be used.

The life of the aero scout is dangerous and demanding. It calls for courage, confidence and imagination.

Superior training is the key to success for the scout pilot. After the initial OH-6A checkout, trainees fly the observer seat with experienced scout pilots and learn the required techniques during combat missions. After 50 hours of combat time, he receives a checkride with the scout platoon leader to determine if he's ready to handle combat missions. Flying scout style requires low-level flying techniques that encompass maneuvers at and below tree-top level. Quick stops, fast starts, hovering, flying backward, sideways, constant pedal turns and quick and accurate firing passes must be mastered.

The observer handles navigation and radio traffic. His primary duty, however, is to look for the enemy. As an expert marksman with the CAR-15 rifle he adds extra firepower and protection.

Army aviation and Armor have combined to give modern warfare a new and unique weapon in Vietnam: the air cavalry squadron. Although the aero scouts are but a small part of the air cav, the role they play in its success is great. Based on their high achievements, it is clear that the aero scouts are here to stay.

Left: An OH-6 Cayuse and an AH-1G HueyCobra (above) on a mission 50 miles northeast of An Khe. Our thanks for the photo to SP5 Alex Hybel, 7th Squadron, 17th Air Cav. 17th Combat Aviation Group

The AH-1G HueyCobra rests safely at its stagefield at Moc Hoa after being engulfed in a delayed secondary explosion

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Good Safety Prac

Major Curti

In the Spring of 1968 Major Lyle McCarty and Major John Barry were leading a dawn armed reconnaissance patrol of AH-1G HueyCobras in the Plain of Reeds south of Moc Hoa in the Republic of Vietnam. They discovered about 40 large sampans camouflaged along an infiltration route. After reporting their find, they attempted to shoot the camouflage away from one of the boats to determine the nature of the cargo. A delayed secondary explosion caused by the machine-gun fire engulfed the aircraft as it passed over the boat.

The helicopter came out of the fire ball in a 45 degree bank to the left. MAJ McCarty, the pilot, could not see. He had been struck between the eyes with a mud ball. MAJ Barry, the gunner whose eyes were protected by his

Major John Barry (left) and Major Lyle McCarty with their mud-spattered Cobra. . .

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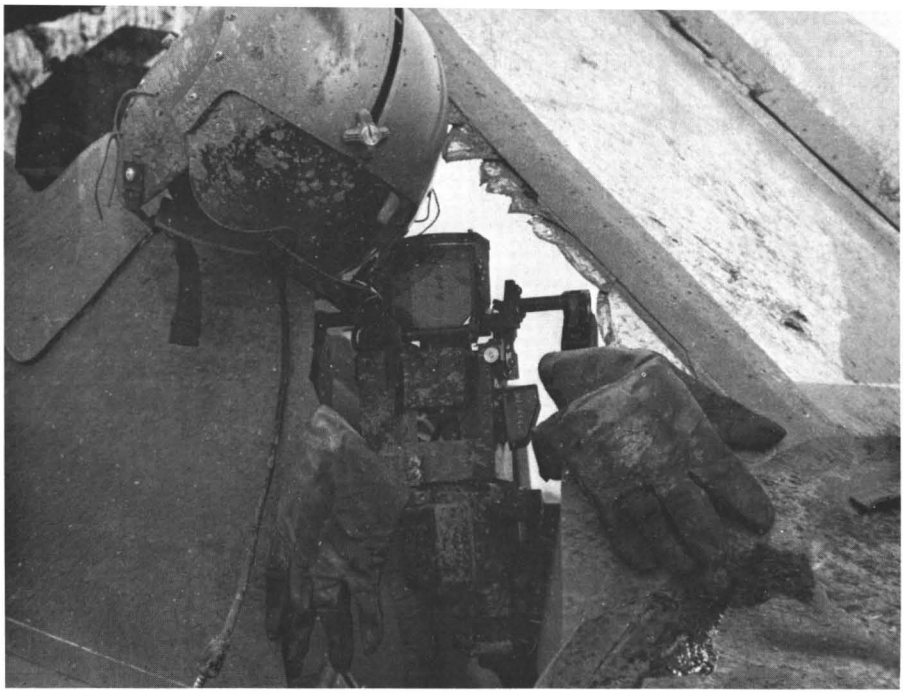


The damage and "mud bath" sustained by the crew and its aircraft are clearly visible in this closeup of the Huey-Cobra's cockpit

ctices Do Pay Off

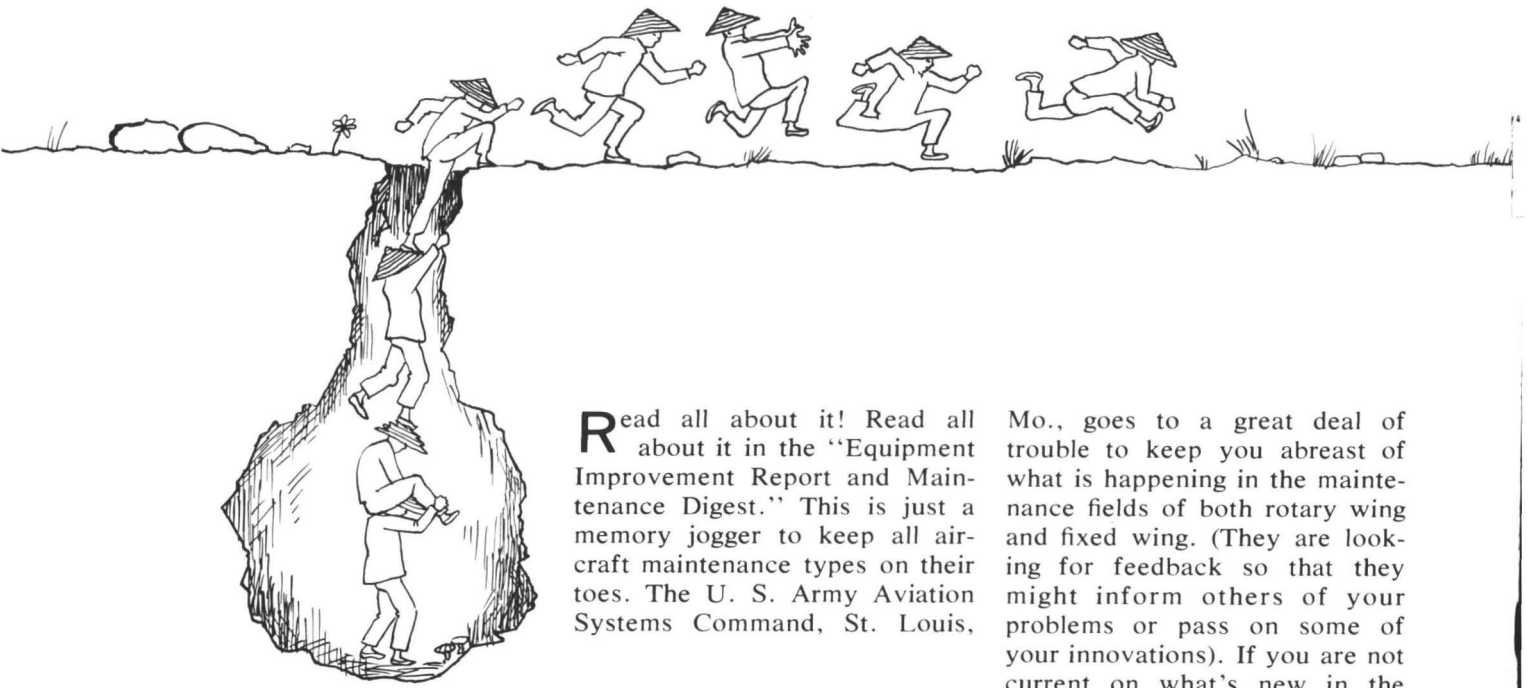
J. Herrick Jr.

helmet visor, stuck his head out through the hole that had been blown in the mud covered wind screen. Fortunately, he was able to orient himself and regain control of the aircraft.

Although the aircraft had lost the use of its engine instruments and radios, it was able to return to the stage field at Moc Hoa.

The good practice of wearing gloves and the helmet visor down paid off. As can be seen in the photographs, MAJ Barry suffered a minor cut on his right hand but it could have been much more severe had he not been wearing gloves. The many sharp pieces of the shattered wind screen were blown over him in the cockpit. This war story illustrates how conforming to good practices can provide that little bit of extra margin of safety that can save the day.

. . . they're happy it's over and firm believers that good safety practices do pay off



Read all about it! Read all about it in the "Equipment Improvement Report and Maintenance Digest." This is just a memory jogger to keep all aircraft maintenance types on their toes. The U. S. Army Aviation Systems Command, St. Louis, Mo., goes to a great deal of trouble to keep you abreast of what is happening in the maintenance fields of both rotary wing and fixed wing. (They are looking for feedback so that they might inform others of your problems or pass on some of your innovations). If you are not current on what's new in the technical manuals or which MWOs are presently in effect, pick up your copy of TB 750-991 (fixed wing) or TB 750-992 (rotary wing). Remember, command emphasis is important to see the mission through and here is a good way to stay on top of it all. Please send any comments to:

Headquarters
U. S. Army Aviation Systems Command
Maintenance Directorate
ATTN: AMSAV-L-FMA (NMP)
St. Louis, Missouri 63166

INSTRUMENT CORNER

Q. When asked for air speed while in flight what should be given, indicated air speed (IAS) or true air speed (TAS)?
A. The Airman's Information Manual, Part I, and the Controller Manuals (ATP 7110.1B, 7110.8A and 7110.9A) all state that speed adjustment requests shall be expressed in terms of knots and shall be predicated on indicated air speed (IAS). Therefore, when asked by the controller for your air speed he is requesting indicated air speed (IAS) and you should read it to him right off the gauge.

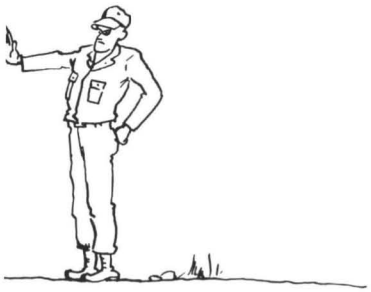
Q. When may an aviator with only a current rotary wing tactical instrument qualification fly IFR?
A. Only when performing rotary wing copilot duties or when so directed in support of tactical or training exercises.

Q. What clearance authority does an aviator with a current rotary wing tactical instrument qualification possess?
A. VFR he has clearance authority for his own aircraft and others under his direct control. IFR when he is at the controls during operations in an actual or simulated tactical environment.

Q. In the Aerodrome Sketch portion of the FLIP instrument approach procedures what is the significance of a notation such as Rwy 17 1dg 4925'?
A. Such a notation indicates that there is a displaced threshold on runway 17 and 4,925 feet is the usable length on runway 17 for landing beyond the displaced threshold.

★ The Army recently received three AH-1G HueyCobras equipped with prototypes of a new day/night fire control system known as SMASH (Southeast Asia Multi-sensor Armament System for HueyCobra). They are presently scheduled for customer acceptance testing.

SMASH is designed to provide helicopter gunships with an



Hold It! Only We Can READ. . .

POTPOURRI

effective and accurate fire control capability under nighttime and other poor visibility conditions.

Major elements of the prototype weapon system include Sighting System Passive Infrared (SSPI) sensor, a Moving Target Indicator (MTI), pilot and copilot/gunner displays and consoles and an Interface Control Unit (ICU) that electronically "marries" the fire control subsystem sensing, display and control units to the aircraft's armament.

Army helicopters are herding buffalo in Alaska!

A major portion of the flight time from Allen Army Airfield at Ft. Greely, Alaska, is being logged to aid the public. Activities include medical evacuation, search and rescue, buffalo herding and emergency notifications for citizens living in remote areas.

Ft. Greely is also the home of the U. S. Army Arctic Test Center (USAATC). This winter the AH-1G HueyCobra, never before flown in Alaska, was scheduled for equipment testing. USAATC personnel will test the Cobra for cold starting capability, mission maneuver suitability and cold weather operations of its weapons systems.

The starboard wing station of the Army's Huey-Cobra carries the radome for the Moving Target Indicator (MTI). Also displayed is the nose-mounted forward looking Sighting System Passive Infrared (SSPI) sensor system

Ted Kontos

Flying is more than a vocation. It is a profession and professional Army aviators

Never Bounce Eggs

WHEN AN OH-6A engine failed to develop full power during takeoff, the pilot landed and made a hover check. He *thought* the engine was operating satisfactorily and tried a second takeoff. At approximately 100 feet, the engine failed and the helicopter crashed, killing two occupants.

A UH-1 pilot made a simulated gunrun during a troop carrier mission. The pilot of another UH-1 demonstrated a dive during a command and control mission. Both helicopters crashed. Combined, these accidents cost ten lives and resulted in eight other injuries.

When a UH-1 pilot performed an autorotation during a *test* flight, he was unable to regain power and landed hard. The helicopter rolled on its side and burned. One occupant was killed and five others injured. *Eight people were aboard for this test flight.*

Failure to secure objects before flight in helicopters with doors removed has caused many mishaps. A recent one occurred when a seat cushion blew out of an OH-58 and struck the tail rotor.

Pilots who depend solely on the accuracy of fuel quantity indicators have often exhausted their fuel. Two OH-6s were destroyed recently during forced landings resulting from fuel exhaustion.

Numerous OH-58A accidents have been caused by aircraft striking trees and other objects *during training in unsuitable areas.*

When an O-1 pilot attempted a 180-degree turn back to the runway after engine problems developed during takeoff, his airplane stalled and crashed.

These and many similar accidents could have been prevented. They occurred because regulations and SOPs were violated, because established procedures were ignored and because instructions received during flight training were not followed. In essence, aviators performing in this manner seem to be saying, "*I prefer to do things my way.*" This attitude is highly unprofessional and it has taken a heavy toll of lives and equipment. It will continue to exact this toll in the future *unless we are willing to admit its existence and make a conscientious effort to change it.*

"So, what's new?" you ask. "For years we've been urged, begged, admonished and even threatened to follow by-the-book procedures—to be professional! We can't attend a safety meeting, see a safety film or pick up a safety publication without being reminded of the need for professionalism. Frankly, we're getting fed up with this constant badgering. Why won't the safety people give us a break and put this tired subject to bed?"

Here's why. During a recent week, Army aviators were involved in 150 reported mishaps. These included 16 accidents and 32 incidents, resulting in five fatalities, three injuries, the destruction of two aircraft and a hardware cost of nearly $2 million. In more than one-third of these, aviators either failed to obey regulations, follow correct procedures, or demonstrated a combination of unprofessional actions. A lack of professionalism was found in nearly all mishaps which resulted in injuries and damages. Hardware costs could have been reduced by approximately $1½ million and all fatalities and injuries prevented had it not been for unprofessional acts by air crews.

Although the number and types of mishaps, as well as cause factors, vary from one week to the next, two facts remain relatively constant:

1. The more serious mishaps which result in injuries and damages usually include unprofessional acts by air crews among the cause factors.

2. Mishaps which result directly or indirectly from unprofessional acts are the ones which can most readily be prevented.

Recently, for example, mechanics removed one scissors from a UH-1H but failed to make an entry or change the status of the aircraft to a red X in the -13. This unprofessional act was compounded by a lack of professionalism on the part of the pilot who checked the aircraft forms, *but failed to make a preflight inspection.* During starting and runup, the helicopter vibrated severely and spun to the right. The tail boom struck a revetment, causing damages in excess of $165,000.

Maybe it's because we have been showered with the word *professionalism* so long that we have become immunized to its true significance. Reduced to simple terms, we know that professionalism involves thorough initial training; provisions for continued training; the acquisition of skill through experience; adherence to correct by-the-book procedures; and strict supervision in all areas. What is probably more important than trying to define professionalism is an understanding of *why* it is so vital.

If you were to suddenly find yourself facing the prospect of major surgery, whom would you select to perform the operation? You'd seek the most qualified surgeon you could find. You'd want him to have ample experience and you'd expect him to have remained current with advances in surgical procedures. You'd further expect him to take a sincere interest in you as a patient—to perform all tests needed and to have all special equipment and supplies available in

case of emergency. You'd expect him to be rested and free from any physical or emotional disorders which might reduce his efficiency. In addition, you'd expect similar qualifications from the assistant surgeon, the anesthetist and all other operating room personnel. In short, you'd seek the best *professional* team you could find. *Passengers who ride in your aircraft and personnel who depend on you for support deserve nothing less from you and your crew.*

Although the road to professionalism begins with the accumulation of knowledge, the knowledge must be applied. Unused, it's much like inheriting a million dollars with a provision that neither the principal nor interest can be used for any purpose. Properly applied, knowledge results in the formation of correct habits. These enhance safety and, in time, become entrenched, remaining with a person throughout his career. Conversely, improper habits thwart safety and, once entrenched, may never be changed.

Try this simple experiment. Mentally picture an apple and an orange side by side. Now, make up your mind, from this moment on, that every time you see an apple, you will automatically think and refer to it as an orange. Similarly, every time you see an orange, you will automatically think and refer to it as an apple. With perseverance, you may eventually remember to call each by its new designation. But it's extremely doubtful you will ever reach a point where you will automatically think of each in this new way. *Because the habits we form and practice for years are too difficult to change, we must make certain that those we acquire are good ones.*

If we don't attack aviation safety problems in earnest, if we don't strive for professionalism, what then? We will simply go along our merry way, trying to bounce eggs. Not literally, of course, but figuratively. Picture what you would do if someone handed you an egg and a child's rubber ball and asked you to put each to use. Naturally, you'd toss or bounce the ball and cook the egg, using each for its intended purpose. Certainly, you wouldn't attempt to cook the ball and bounce the egg. Yet, in a sense, this is exactly what some of us try.

No, we don't start off by tossing eggs against the wall or dropping them on the floor. We work up to it gradually. We may toy with an egg for a while, then flip it from one hand to the other. If we miss, it falls on a pillow or cushion we had the foresight to provide. Gradually, we develop dexterity. We even learn to juggle eggs. Eventually, we may reach a point where we can toss eggs over our shoulder and, without a backward glance, catch them behind our backs. Then it happens. We miss, an egg falls, splattering its contents, and "all the king's men can't put it together again."

When we deviate from correct by-the-book procedures, when we put aside the things we have learned, when we willfully refuse to obey rules and regulations, we are developing undesirable habits which grow and become more deeply entrenched with time, until they develop into accident cause factors. To defend such actions, we can only resort to the old tired argument that aviators are human and will continue to deviate from standard procedures, and that this deviation cannot be prevented. The answer to this is a crude but factual—BUNK!

Recently, the Aviation Office, U. S. Armor Center, Ft. Knox, Ky., was commended for completing more than 5,000 OH-58A flight test hours without an incident or an accident, while conducting the confirmatory tests of the helicopter. Beginning with three OH-58A qualified aviators, five test helicopters and three backup helicopters, 27 aviators were qualified during the first 6 weeks of the program. An additional 170 were qualified by the close of the 8½-month project. You can bet these aviators didn't try to bounce eggs.

Another unit commended was the 154th Aviation Company (Medium Helicopter), Ft. Sill, Okla. During more than 4 years of flying, the 154th never had an accident. It is one of two CH-47 companies presently in CONUS and it has supported activities throughout the United States and Mexico. Missions the 154th handled include rescue, VIP support, school support for the artillery and infantry, disaster relief, and aircraft load and cargo testing. It also trained several CH-47 companies, presently deployed to the Republic of Vietnam, in the techniques of airmobile operations. How did the 154th accomplish this feat? A look at what the unit's historian has to say readily provides the answer:

". . . The aviation safety program in the 154th Aviation Company is an aggressive accident prevention program. *All flights are closely monitored to assure that no deviations from flight safety standards are made. Close adherence to by-the-book flight procedures and planning, coupled with professional attitudes towards safety, is the keynote to the aviation safety effort in the 154th. . .*"

We can obtain the same results. *If we really want safety, we can have it. All we have to do is make up our minds to be professional and never bounce eggs.*

CW2 James Nixon
146th Aviation Company (RR)

Letter from a Dead Pilot

Dear Stick Buddy:

This letter will be a surprise, no doubt, since you were the one who found me and my airplane.

I like it up here. There is never any bad weather, no crosswinds and the maintenance is out of this world. The only thing is, I sure do miss my wife and boy. I even miss you guys sometimes.

The fellow who keeps the books up here says I got here much too early and was not really due to arrive for a good many years. He says a lot of us are arriving early, so he got permission from the Big Scheduling Officer for me to write this one letter. He says my case is an indication of things to come and that you guys down there should know about it.

I had to laugh a little as I sat up here and listened to you fellows and your theories about why I went down and why I never got a mayday call out. You said some pretty nice things about my judgment, flying ability and professionalism, and I thank you for it. What you didn't realize was that you guys killed me. I did everything right and you guys killed me.

Remember the morning I went down? Good weather and a routine mission. No sweat. Well, about 45 minutes after takeoff my gauges started showing that something might be wrong with my engine. I tried then to call you guys, but someone was on the radio making sure he had a jeep layed on to get him to the PX after he landed. I never had a chance to call again. My engine quit and down I went. All our training was really paying off for me. I ran through all the emergency procedures like clockwork, then got on guard to give my mayday and my heart sank. I sat there listening to a fellow aviator telling the world he only had 39 days. As soon as he finished, I tried again. All I got was a loud squeal that ended with a long chuckle and, "Say again, como check, you were cut out by a Mayday." This was followed by, "Get off guard!" Then came, "Get off guard yourself!" The last thing I heard on guard before hitting the trees was a long peal of laughter from a 10-cent store laugh-box.

My landing was in the trees and rough, but I finally came to a stop with nothing more than a few lumps, bumps and bruises. My only concern was that the impact had twisted my feet into the pedals, and I couldn't get out. I sat there 1 hour, then 2 hours, and nobody came for me. The only sound was the drip of fuel. And I waited. And I waited.

I can't say what finally ignited the leaking fuel, but you saw the results. You can never know the fear and anguish I experienced in those hours after my crash. I don't think I will ever really forgive you guys for not allowing me to make my mayday call. I can understand the lack of professionalism and the poor judgment. But I can't forgive you.

Anyway, that's the story. Nothing exotic or strange, just a simple engine failure that would have had a happy ending except for one thing—the guard channel was so crowded with garbage that my mayday was never heard. Simple, huh?

Well, that's the reason I was allowed to write this one letter. The Number One Air Controller here says that if you guys don't wise up and use the guard channel as it was intended, many of you will be joining me before you are due and, since there is a billeting problem, there is only one other place to send you.

Well, friend, you won't be hearing from me again, so would you please promise me this—when you crawl into a cockpit from now on, will you please think of me and don't cause someone else to check in early.

Your Stick Buddy,

Joe

SFC Roger W. Putnam
Aircraft Accident Review and Analysis Department
USABAAR

THE

The man who is able to come up with the part needed for an aircraft that is EDP is looked upon as the hero of the hour in his maintenance unit

THE SCROUNGER has been a part of every army since armies have been in existence. He is the person who comes up with the right item when needed, who gets things that are supposedly unobtainable and who is in constant demand when items cannot be obtained through proper supply channels. This is not written to cast stones at the scrounger, but to put his talents in proper perspective in relation to proper supply requisitioning and the procedures of our modern day Army supply system.

The man who is able to come up with the part needed for an aircraft that is EDP (equipment deadlined for parts) is looked upon as the hero of the hour in his maintenance unit. But was the part he scrounged requisitioned properly? And what of the unit he got the part from? Was it listed as being used? Was a demand still made on his unit's supply system after the part was improperly obtained? All these need to be checked to ensure that proper demands are made on our supply system so it can work efficiently in the way it was intended to function.

If a part is scrounged and a demand is not put on the unit's supply system, that part is not reported as being used and this turns out to be one of the prime examples why we don't have the parts when we need them. Let's take a look at a case in point. A U-8 recently made a wheels-up landing after several unsuccessful attempts to lower the landing gear. The main gear indicated down, but the nose wheel failed to extend through normal or emergency procedures. The pilot landed gear-up and major damage resulted. The aircraft accident investigation board found the probable cause to be improper reinstallation of the repair link (FSN 3020-606-5749) in the nose gear drive chain. The repair link incorporates a spring retaining clip and this clip had been used more than once. The board asked why a new repair link had not been used and found that new repair links had not been ordered for more than 6 months. Although this unit had no repair links on hand, it was discovered that two other units in the same battalion had the parts on hand. When personnel of the unit were questioned about reuse of the repair link, they answered they didn't know if there was a requirement to replace it.

We believe the reason there was no repair link in stock was that there had been no demand put against the supply system. Even though it was not on hand, how hard would it have been to call another unit with the same type airplane to see if they had one on hand?

If this unit had obtained the part from another unit and had still requisitioned it, this would have shown a demand on the supply system and proper supply procedures would have been followed. The scrounger not only hurts his own unit, but the one from which the part is obtained. If he gets the needed part from a buddy and his buddy does not record it as a demand on his unit's supply system, then his unit is not showing the proper usage of parts and he will come up short in the future.

Those of us in aircraft maintenance are the ones responsible for making the supply system function properly. If we foresee our future needs and requisition properly, it will work. The responsibility for properly using the supply system falls on all of us. Let's hope that, someday, the scrounger will be a thing of the past.

SCROUNGER

A RECENT CRASH facts message reported a UH-1 vibrated severely and was autorotated to a hard landing and rolled on its left side. The crew evacuated without injury. Prior to leaving, the pilot took time to close the fuel shutoff valve and turn off the electrical switches. He then ordered the crew members to maintain a safe distance. A few seconds later, it was noted the engine was still running, so the pilot returned to the helicopter, drew his .38 revolver and shot the engine seven times to "kill" it. This is one of many unusual crash facts messages received by USABAAR.

A review of OH-6 crash facts messages revealed the following highly unusual events.

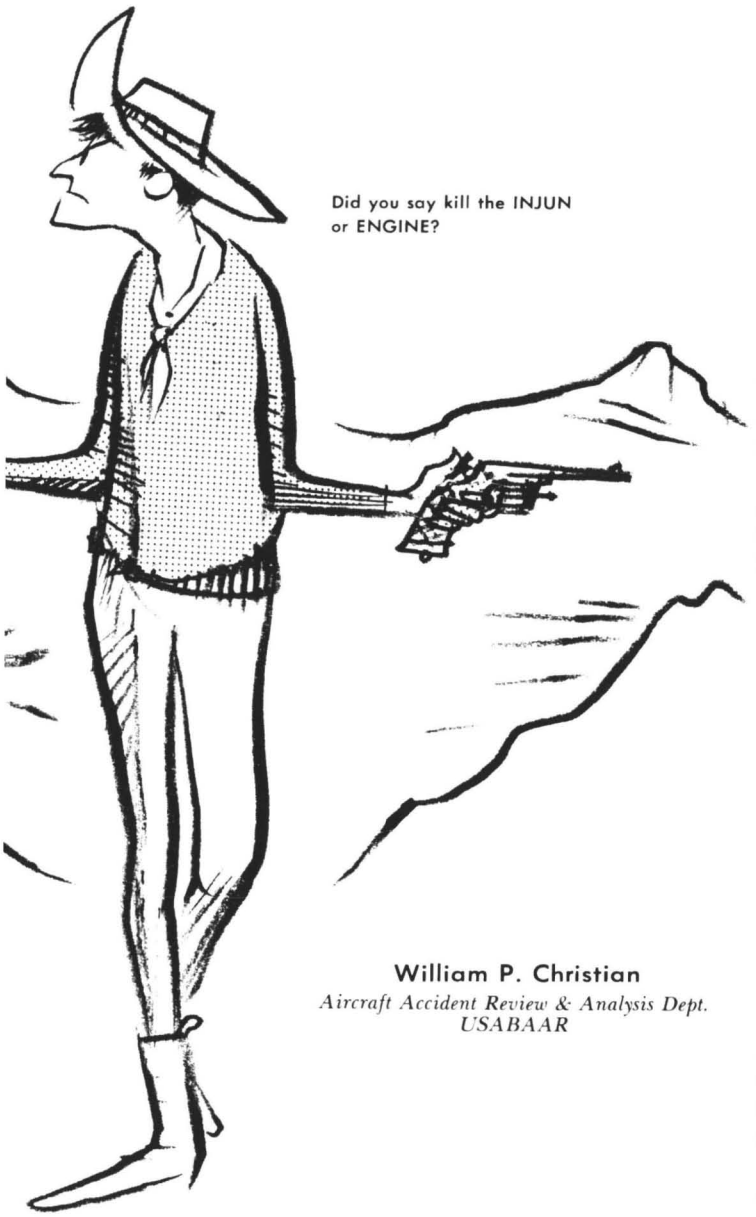
An OH-6 crew was assigned to pick up a passenger and carry him back to his unit. The helicopter was on the ground, ready for takeoff, with the crew waiting for the passenger. As the passenger arrived, he waved his arm to indicate he was the one they were to pick up. After the pilot acknowledged, the passenger turned his back to the helicopter and leaned over to pick up his bag. At the same time, the pilot was repositioning the aircraft closer to the passenger. As the passenger raised up with bag in hand, a loud thud was heard. The next thing the pilot saw was the passenger's body flying through the air. This passenger never reached his destination.

An OH-6 was flying at 50 feet AGL and 70 knots when engine failure occurred. The pilot autorotated, intending to land on a dirt road. As he approached the road, the pilot, too late, saw a truck going in the same direction. He was unsuccessful in avoiding the truck and the right skid caught the truck and was torn off. The truckdriver, completely unaware anything had happened, kept right on going and was never seen again. The helicopter crashed on the side of the road and was destroyed.

An OH-6 pilot was investigating footprints in a rice paddy when the skids struck the water, caus-

ZANY ANTICS

. . . flying is not a game and aircraft are not toys . . . flying is a professional occupation requiring professional people in every position



William P. Christian
Aircraft Accident Review & Analysis Dept. USABAAR

ing incident damage.

An OH-6 was flying low level over a highway when it struck a motorcycle, resulting in a major accident. The pilot made the statement that he *misjudged his altitude.*

Flying low level down a road, another OH-6A struck a motorscooter with its left skid, causing another major accident. Misjudged altitude?

Still another OH-6 was being flown low level at approximately 80 knots over a river when the skids struck the water. As the pilot discovered, skids make poor hydroplanes. Scratch another helicopter.

An OH-6 was at flight idle, having its main rotor blades tracked in a revetment. Located on a nearby ramp was a UH-1H, apparently cleared for takeoff. Above the UH-1H was an AH-1G trying to land. The message stated that after the UH-1H pilot pulled the helicopter off the ground, he had to abort the takeoff by making a quick flare to avoid collision with the AH-1G directly overhead. The flare turbulence from the UH-1H picked up an ammo bunker cover and blew it into the main rotor blades of the OH-6. Only the OH-6 was damaged, *and it wasn't even scheduled to fly!*

During ground runup, an individual attempted to go under the helicopter between the engine exhaust outlet and tail rotor. He walked straight into the tail rotor blades and was killed.

Another passenger departed from the right side of a helicopter, walked to the rear and was met by a blow to his head by the rotating tail rotor blades.

A helicopter was sitting in a revetment operating at idle speed when a soldier approached from the left side. Without watching what he was doing, he walked up the dirt embankment into the rotating main rotor blades and was decapitated.

An OH-6 was on the ground, operating at flight idle, while the pilot was going through his runup procedures. A passenger, assigned to fly on the mission, approached from the left rear. He crossed behind the tail rotor and was struck in the shoulder by the tail rotor blades, resulting in incident damage to the helicopter. The message did not mention what happened to the passenger.

Another crash facts message stated that after the helicopter's engine was shut down and the rotor blades were coasting to a stop, the crew chief, securing C rations from the top of a revetment, lost his balance and fell backwards into the rotating main rotor blades.

It's not too difficult to understand when an individual who is not familiar with helicopters and

Skids and wheels make sorry hydroplanes!

their hazards walks into rotating rotor blades. It's a completely different story when an experienced rotary wing crew member exits a helicopter and does the same. It's hard to believe the number of accidents caused by this unusual situation. For example, several months back, an OH-6 pilot exited while the rotors were still turning. During his departure, he was struck on the head by one main rotor blade. This, in turn, caused the helicopter to go out of control, roll on its side and strike a revetment. It was completely destroyed. The pilot's life was spared *solely by his protective helmet.*

While an OH-6 was at operating rpm on the ground, a smoke grenade was thrown up through the main rotor blades by an *umpire.* Yes, you read it right—an *umpire.*

Attempting to mark a target with a *smoke grenade,* a pilot made an abrupt maneuver which threw the observer off balance just as he was throwing a grenade. The grenade struck the door post and fell back inside. The observer tried frantically to reach the grenade in time, but lost the race as the grenade exploded inside the helicopter. Two serious injuries and one severely damaged helicopter resulted.

Another OH-6 was on a recon mission along a riverbank when a grenade launcher, located between the pilot's and copilot's seats, fell and struck the collective pitch stick. Before the pilot had time to react, the helicopter descended into the river and immediately sank.

A gunner attempted to throw a grenade and his arm caught in his flight helmet cord. The grenade landed in the ammo box. No additional information was given in this crash facts message.

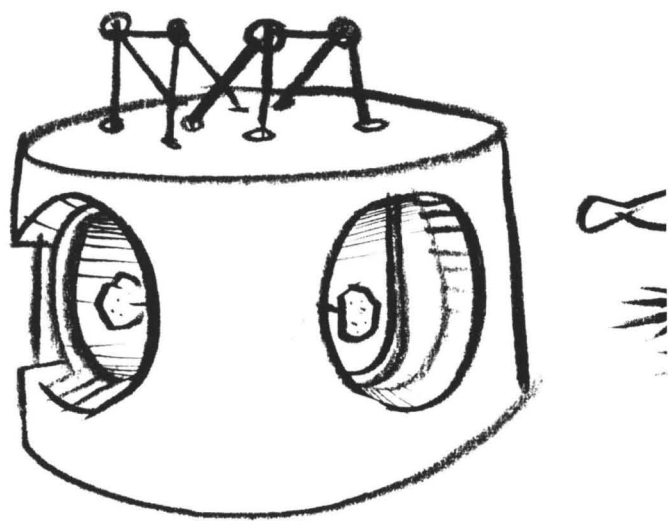
Another gunner threw a *smoke grenade* and the grenade struck the main rotor blades, causing incident damage to two blades.

A gunner was test firing his M-60 and *accidentally* shot up his own helicopter main rotor blades.

During takeoff, an OH-6 was destroyed when it was pulled back to the ground by a refueling hose which was looped around the front of the right skid.

A pilot entered an emergency autorotation due to engine failure. As he tried to apply full aft cyclic, he realized he was in a lot of trouble. His cyclic control was restricted by the *M-16 rifle* lying on his lap. Another major accident was the result.

During offloading, a medic departed with his



stretcher in an upright position and *inadvertently* stuck the stretcher up into the main rotor blades. This turned out to be a very expensive stretcher.

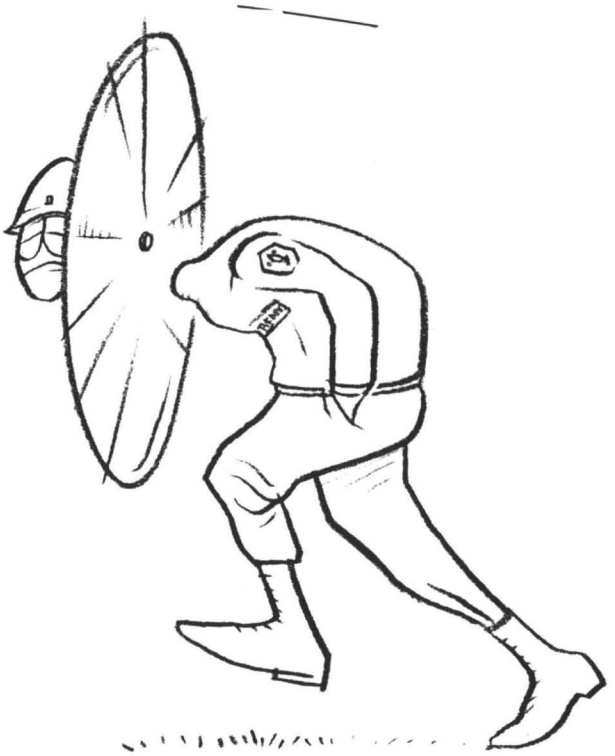
During refueling, a refueling man picked up a *rifle cleaning rod* and tried to remove it from the POL area by tossing it away. The rod struck the rotating main rotor blades, became a deadly flying missile, and nearly hit a bystander.

An LOH pilot was requested to pick up a passenger. The landing area was very confined. "In order for the pilot to land," the crash facts stated, "it was necessary to allow the main rotor blades to hit some tree branches."

While a helicopter was hovering, a *duffle bag* was dropped on the copilot's collective pitch stick, causing the OH-6 to strike the ground, deflecting one main rotor blade which struck a soldier in the head. There was incident damage to the helicopter. The soldier was happy to have his steel helmet destroyed instead of his head.

During flight, a main transmission chip detector warning light came on and the pilot made a precautionary landing. Investigation revealed metal chips in the transmission. Several days later, a supplemental message stated a loose electrical wire to the instrument was the cause. What happened to the *metal chips?*

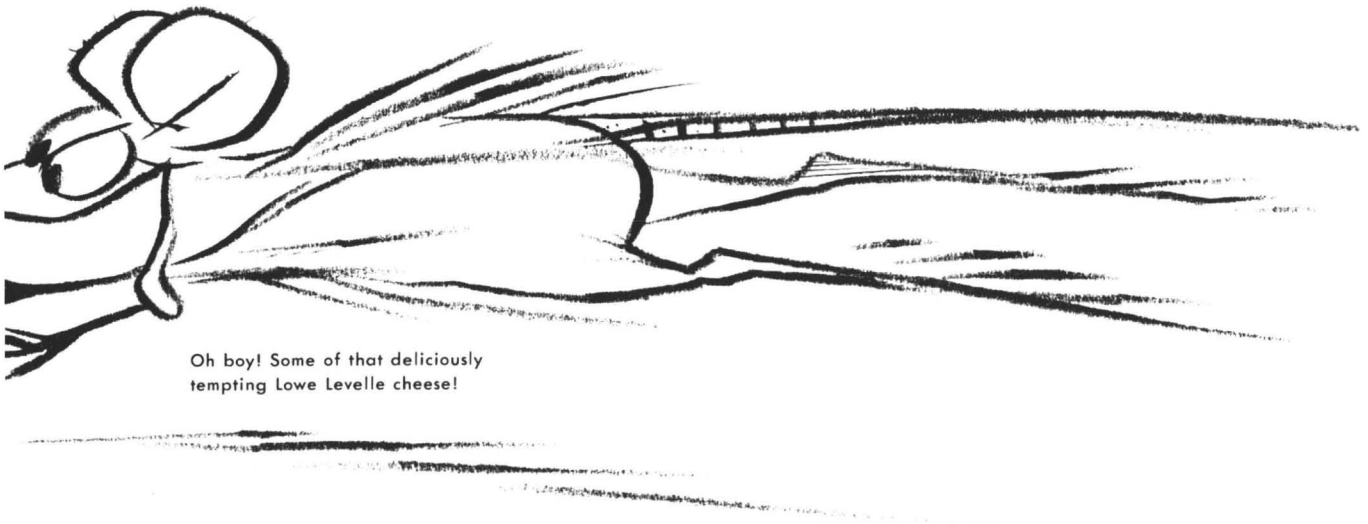
During a training mission, an instructor pilot caught his foot between an antitorque control pedal and the console. While trying to free his foot, he became distracted, allowing the rotor rpm to decay. He finally freed his foot and, at the same time, noticed the low rpm at approximately 100 feet AGL. Due to the low rotor rpm, there was not enough pitch to cushion the landing. In



addition, the helicopter caught fire and a bystander received serious facial lacerations as a result of the main rotor blades striking the tail boom as he was running toward the helicopter to extinguish the fire.

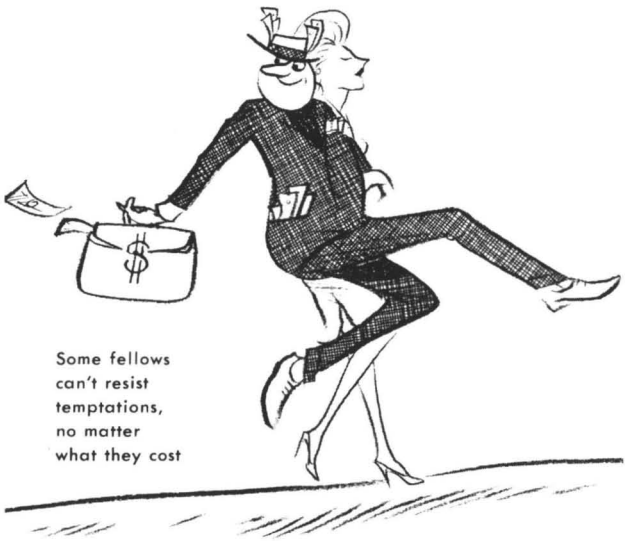
On a low level mission, a pilot was making a sweep to the east, concentrating on the ground to his right, and the helicopter struck a dead tree in front.

A pilot was watching the fine results of a gre-



Oh boy! Some of that deliciously tempting Lowe Levelle cheese!

ZANY ANTICS



Some fellows can't resist temptations, no matter what they cost

nade thrown by his observer and flew straight into a tree.

Attempting a low level takeoff, a pilot was concentrating on watching for other traffic in the traffic pattern and flew into a tree.

On a visual recon, a pilot sighted an unfamiliar object. A right turn was made to return to where the object was first sighted. While the pilot was having difficulty finding the object, a dead tree found the helicopter, causing a major accident.

A pilot was looking out the right door. When he glanced back to the front, he saw a tree dead ahead. He immediately pulled pitch and rear cyclic, but was too late to prevent the helicopter from skimming through the top of the tree, causing incident damage to the underside. He was lucky that time. How long will his luck hold out?

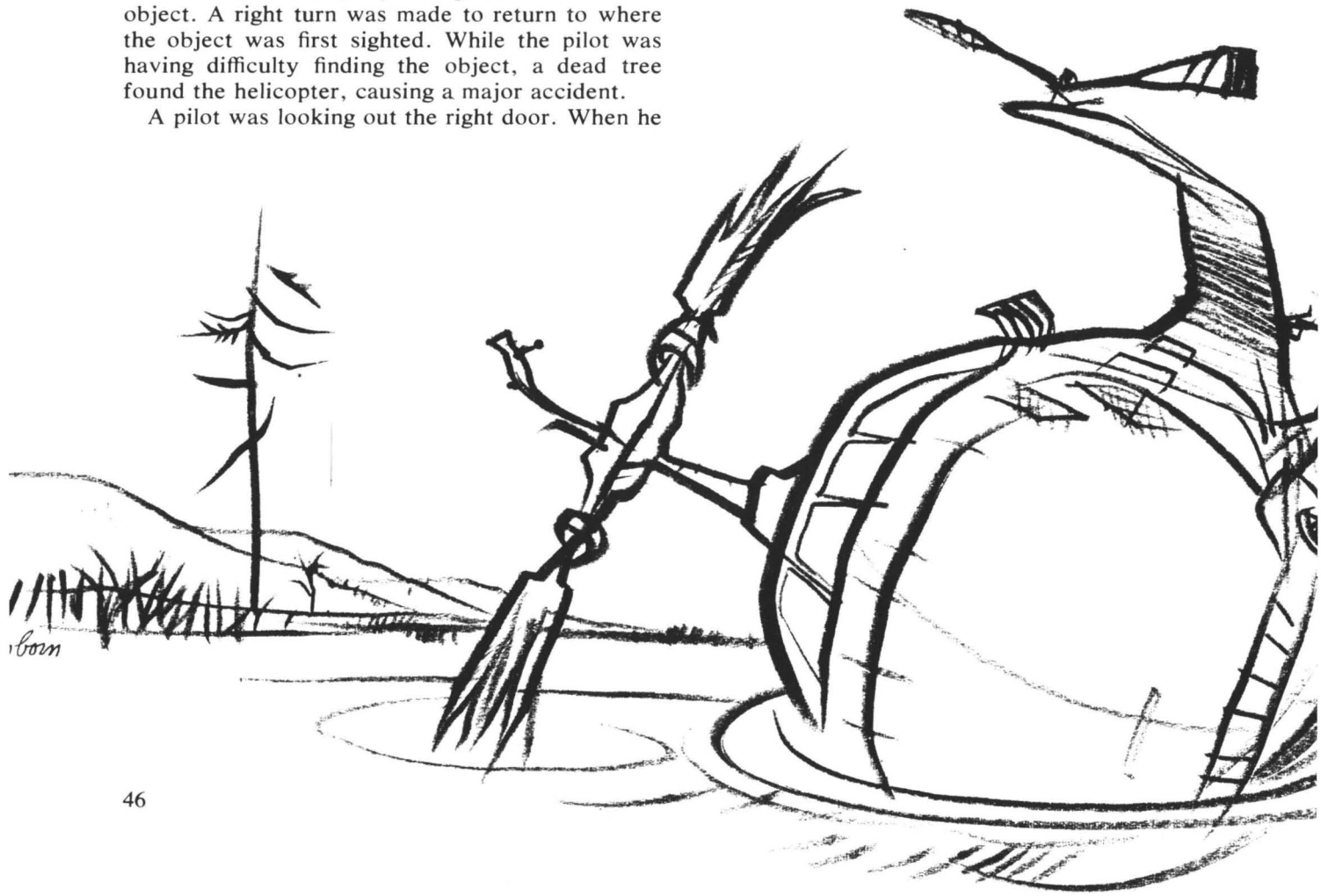
While flying low level, another pilot's attention was distracted and the helicopter struck a tree.

On a low level mission, a pilot made a sharp evasive turn to the right and struck a tree.

Another pilot hit a single dead tree in the middle of a large bush area during a low level mission. The helicopter was placed in a tight turn when the pilot saw the tree, but it was too late.

NEW TYPE OF FOD?

Foreign object damage (FOD) has always plagued Army aviation, especially in rotary wing aircraft. Generally, FOD consists mainly of dirt, dust and small objects, such as nuts, bolts, screws, wire, etc., which are sucked into turbine engines or cause erosion and dents on leading edges of rotor blades. Information received in crash facts messages, however, indicates a new type of FOD is invading our system, one caused



by pure *carelessness* on the part of flight crews. This FOD involves such items as personal equipment, improper preflights and improper preflight preparations, particularly the preparation of securing cargo and other loose items. To elaborate, here are a few examples:

A passenger's *hat* flew out and struck the tail rotor blades, causing severe vibrations and incident damage.

One crew member's *shaving kit* flew out and struck the tail rotor, causing incident damage.

An unsecured *brief case* was blown out and struck the tail rotor blades, resulting in a major accident.

During a resupply mission, a helicopter was flying straight and level at 90 knots when the *metal top of a water cooler* flew out of the cargo door, hitting the horizontal stabilizer and tail rotor.

A helicopter was on the ground, operating at flight idle rpm, when a passenger threw a *radio hand set* out, damaging the main rotor blades.

A *poncho liner* flew out into the tail rotor, causing tail rotor failure. This was one of several poncho liners which have caused incidents and accidents.

During an attempted landing, a *net* flew out, causing complete loss of directional control and a major accident.

A *flight jacket* flew out of an OH-6 rear door and hit the tail rotor, causing loss of directional control and an accident.

A loose *ammo round*, lying on top of an uncovered ammo box, came out of the box and struck the tail rotor blades, causing a major accident.

Helicopter rotors are known for voracious appetites

A crew chief, walking to his helicopter, decided he did not need his *flak jacket*, took it off and threw it into the rotating main rotor blades.

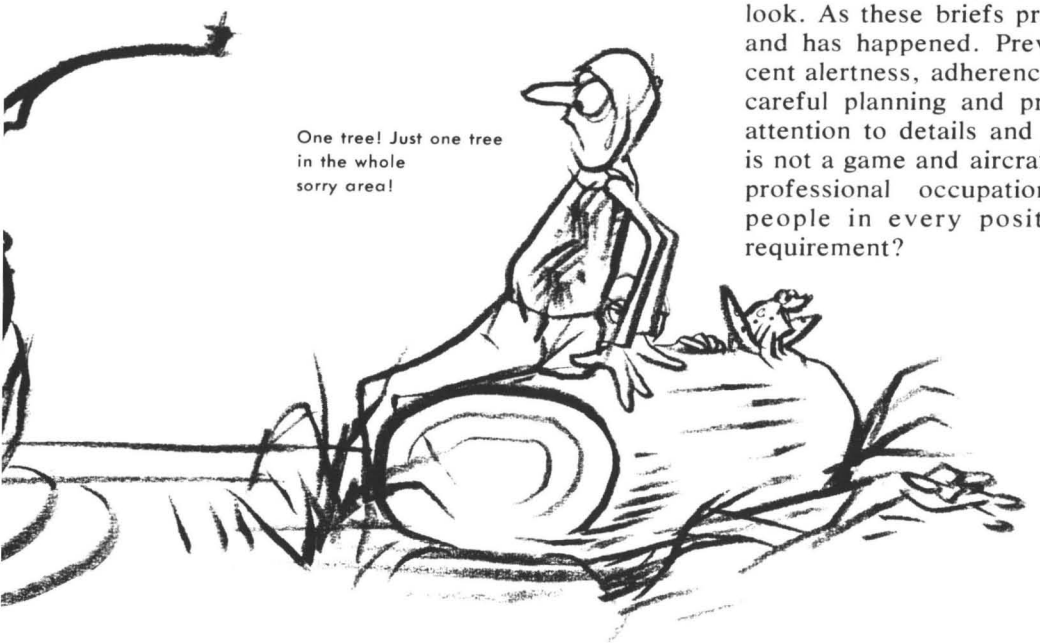
A pilot saw a *flare chute* blowing on the ground. He continued to fly over the chute and it was drawn into the tail rotor blades, causing loss of antitorque control and another major accident.

A *sand bag* flew up into a rotor system, causing incident damage.

While landing at a field location, a *C ration box* was picked up by the main rotorwash and caused major damage to the blades.

Have any of these crash facts message briefs sounded familiar? If not, you should consider yourself very fortunate. There are many more like them and more come in every day.

It's high time for us all to take a hard look at our habits and actions in and around aircraft. While you're doing this, ask yourself if any of these mishaps could have happened to you. If your answer is no, we urge you to take a harder look. As these briefs prove, anything can happen and has happened. Prevention demands 100 percent alertness, adherence to rules and regulations, careful planning and preparations for all flights, attention to details and the realization that flying is not a game and aircraft are not toys. Flying is a professional occupation requiring professional people in every position. Do *you* meet this requirement?

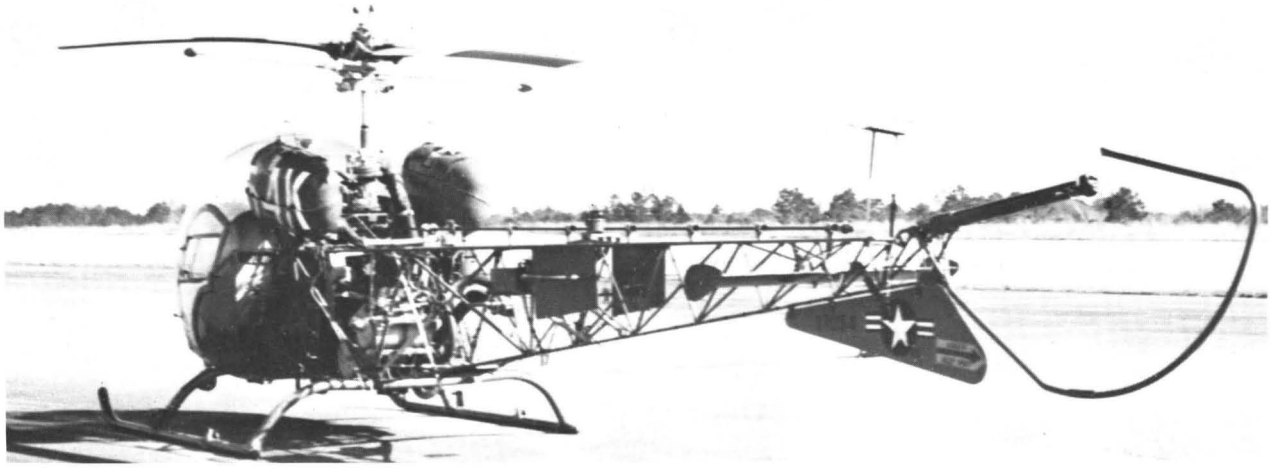


One tree! Just one tree in the whole sorry area!

BROKEN WING AWARD

1LT Elmer L. LaGrelius, left, receives Broken Wing Award from MG Allen M. Burdett Jr., commanding general of Fort Rucker, Ala., and commandant of the Army Aviation School

TH-13T flown by 1LT LaGrelius is shown after landing with tail rotor and tail rotor gear box missing.



1LT ELMER L. LAGRELIUS, instructor pilot, was on an instrument training mission 21 November 1970. Approximately 45 seconds after passing the VOR outbound at 2,500 feet during a practice approach to the Troy, Ala. municipal airport, Captain Richard D. Shipley, the student pilot, felt a high frequency vibration in all flight controls of the TH-13T for 3 to 5 seconds. This was followed by a loud explosion and the helicopter pitched up violently and to the right before he could tell his instructor about the vibration.

1LT LaGrelius immediately took control and entered autorotation. When he rolled throttle off, the TH-13T started rolling and turning to the left, with the nose still high. He applied forward cyclic in an attempt to lower the nose, without success. He rolled on a slight amount of throttle and pulled a small amount of collective. The nose went down and he kept it low until he attained 75 knots air speed. He experimented with the throttle, regained directional control and transmitted a mayday call.

When he saw that he could not reach the runways at the Troy airport with his present rate of descent, 1LT LaGrelius slowly applied power and increased collective pitch. This resulted in a reduced rate of descent and allowed him to clear the trees at the south end of the field. He made a run-on autorotative landing on a runway, using throttle to maintain directional control.

1LT LaGrelius' proficiency and ability were thoroughly tested by this emergency. His rapid analysis of the emergency situation and successful corrective actions warrant the highest praise and admiration. 1LT LaGrelius is from Baltimore, Md.

Ted Kontos

SOME YEARS AGO, a young business executive formed a company which manufactured a much improved version of a common product. He was then faced with the necessity of getting consumers to try it. Wisely, he carried his problem to the best advertising agency he could find. Their professional staff of marketing specialists, artists, writers and photographers planned a highly successful advertising campaign which not only publicized the product, but induced consumers to try it. Once tried, its superior qualities became readily apparent and, today, this company enjoys a thriving business. To what does it owe its success? To a quality product designed to satisfy a specific need and to proper marketing techniques. The key words here are *proper marketing techniques.*

Today, there exists an immense need for a quality Army aviation product—aircraft mishap prevention. Programs designed to produce this

What ingredients go into the making of successful aviation COs? For the answer, let's look at a. . .

RECIPE FOR PROFESSIONAL AVIATION COMMANDERS

product are readily available and they have been publicized by a variety of media. Where carefully planned programs have been tried, they have proved successful. As a result, mishap prevention in Army aviation has steadily improved over the past 12 years. But this improvement is only a token compared to that which could be obtained if everyone connected with Army aviation would give prevention the emphasis it deserves. To reap these benefits requires the same kind of sales efficiency employed by the business executive for his product.

Although the average aviation CO may not picture himself as a sales manager, he is in the best possible position to effectively market mishap prevention. To begin with, COs are not appointed by the flip of a coin. They are selected on the basis of their knowledge, experience and past performance. They have already proved they can be depended upon to accept the full responsibilities of command. To effectively market mishap prevention, they must put the qualities that made them COs to work. First, they must always keep in mind the responsibilities they bear for their units, missions and the individuals under their command. These three are so interrelated that emphasis placed on one is apt to be at the expense of one or both of the others.

Because a mission required flying a VIP in IFR conditions, the most experienced aviator available was assigned. That he was suffering from loss of sleep and severe exhaustion from a recent mission was given little consideration. He delivered the VIP on schedule, but crashed during his return flight. Accident investigators unanimously agreed this pilot's exhausted physical and mental state was a major contributing factor.

To satisfy mission requirements with minimum loss of time, a unit operated U-8s in overgross conditions. As one aviator in the unit phrased it, "The practice of flying overweight had gone on for so long, it had become SOP and *nobody* could change it." This policy was changed, but only after a fatal accident when ice formed on the wings and one engine failed while the airplane was overgross.

A professional CO learns the skill levels, experience, capabilities and limitations of personnel under his command. He knows their strengths and weaknesses. If he doesn't, it's only a matter of time before mishaps occur. In one recent instance, the newest and least experienced aviator in a unit was assigned a test flight in marginal weather. The aircraft crashed. In another, two inexperienced aviators were paired to fly to an unimproved fieldstrip. During landing, the airplane veered off the strip and struck trees. Both pilots escaped injury, but the airplane caught fire and burned.

A professional CO is also an efficient administrative and supply officer. He ensures that ARs, TMs and other pertinent publications are available and current. He makes certain that aviators have proper flight clothing and protective equipment. He sees to it that necessary equipment, special tools and replacement parts for aircraft are on hand to support maintenance personnel. These are essential for a successful mishap prevention program.

A professional CO assumes the role of athletic and social director. It's his responsibility to see that ample means and opportunities are made available for all personnel to take part in and enjoy recreational and sports activities, vital for physical fitness, mental alertness and morale. Although he can't always ensure his personnel are getting the right combination of exercise, rest and balanced nutrition, he can be alert for signs or symptoms of physical or emotional strain and refer individuals to the flight surgeon for professional care.

A professional CO is also a skilled training coordinator. He makes certain that meaningful training programs are provided all members of his command. He sees to it that newer aviators gain experience under the guidance of seasoned veterans; that maintenance personnel are crosstrained so that a nucleus of experienced mechanics is always available as personnel are rotated; and that safety meetings are carefully planned, with meaningful presentations.

A professional CO is, in addition, an astute business administrator. Although the responsibility for making decisions is his, he does not hesitate to consult other professionals or use the services available from outside his unit. He uses special facilities, such as those available through ARADMAC, to analyze failed parts and determine causes. He makes certain his unit is actively engaged in the oil analysis program and he is quick to use the services of factory technical representatives as the need arises. He is extremely selective in the assignment of key personnel.

A few years ago, some college freshmen volunteered to collect specimens for laboratory study. None had been on a field trip before. Under the

leadership of a graduate student, they drove to a swamp and trekked in. They had gone only 100 yards when, to their surprise, their leader halted them in a relatively clear area approximately 50 feet in diameter. The ground was devoid of vegetation, only two dead trees stood in the clearing and a large log lay half sunken in the marshy soil. The students eyed each other skeptically, wondering what their leader expected to find in such a naked area. Under his guidance, they began splitting the log with axes, digging under and around it and the dead trees, as well as scooping water from the many potholes and sunken areas. In less than 3 hours, they filled every test tube, specimen jar, cage and box. Their collection included snakes, salamanders, frogs, tadpoles in every stage of development, larvae and a variety of insects—all from an area which, to the untrained eyes of the students, appeared barren. The difference between the students and their leader was that the experienced graduate student knew *what to look for and where to find it.*

Similarly, experienced aviation personnel know the value of gleaning as much information as possible from all mishaps and the necessity for disseminating this information as widely as possible. They expend greater effort to make sure crash facts messages contain all available information and they ensure timely submission of EIRs. Not only is it important for commanders to be selective in choosing these individuals, but it's of equal importance to listen to what they say and take appropriate action. It does no good to be informed about problems or hazards if no corrective action is to be taken.

In one unit, the maintenance officer complained about high foreign object damage (FOD) to aircraft caused by small rocks and pebbles. No mechanical sweeper was available to sweep the parking and taxi areas, but a sweeper was available to keep the streets and roadways clean. The unit aviation safety officer was able to make arrangements for using the street sweeper on a regularly scheduled basis— *twice a year!*

Aviators in some units find it difficult to obtain proper flight clothing and protective equipment. They use what they happen to have. True, protective clothing won't prevent mishaps, but it can make a big difference in the number and degree of injuries sustained when mishaps occur.

The ingredients that go into the making of a professional aviation commander are as many, varied and complex as those found in the recipes of the most demanding chefs. As stated, he must be a personnel director, training coordinator, administrator, social and athletic director, psychologist, investigator, analyst and, when necessary, the magician who provides a mechanical sweeper. Yet another indispensible ingredient is required to produce the desired result. We call it *supervision.*

Supervision begins with the commander who must make it explicitly clear that deviation from correct by-the-book procedures will not be tolerated and that all duties will be performed efficiently and correctly. He must further emphasize this by the example of his own personal habits and actions. The old cliche, "Don't do as I do, do as I say do," is out. The professional commander must set the example, insist that it be followed and provide the supervision necessary to ensure it *is* followed throughout his full span of command.

This kind of leadership will instill pride, build confidence, encourage development of good habits, stop the spread of bad habits, reduce the likelihood of mishaps and provide the nutrients needed for unit personnel to develop into true professionals in their own right. Commanders then find they need no advertising agency to sell mishap prevention. Their product will have sold itself.

How do *you* stack up as a professional commander? Check your cupboard to see if you have the vital ingredients for a meaningful and effective aviation mishap prevention program.

RELATIVE FLAMMABILITY OF GAS TURBINE POWERPLANT FUELS

AIRCRAFT FIRES, post-crash or in-flight, never fail to bring terror to everyone who flies, even the very brave. Although much research is underway to improve aviation safety, fires still take a large toll in thermal fatalities and injuries. Fire prevention for both in-flight and crash situations can, theoretically, be accomplished in several ways: By maintaining environmental temperatures to such a low value that ignition of fuel vapors is practically impossible; eliminating all ignition sources from the fuel vapor environment; eliminating oxygen from the fuel vapor environment; preventing fuel from coming into contact with ignition sources; or reducing the volatility of the fuel prior to its need as an energy source (i.e., until burning is desired).

Reduction of environmental temperatures is impractical. Elimination of ignition sources can and has been accomplished to a considerable degree for in-flight situations. However, it is difficult, if not impossible, to eliminate *all* ignition sources in crashes. This has been experimentally verified by the Dynamic Science Division of Marshall Industries (formerly AVSER Division of Flight Safety Foundation) in a series of instrumented crash tests for the U. S. Army Aviation Materiel Laboratories.

Oxygen elimination from the fuel vapor environment has been accomplished in experiments by displacement with inert gases. Surrounding fuel tanks with inert gases has been tried by the Air Force and the method is feasible. But trade-off studies are necessary to determine whether this is applicable to production aircraft. There is a serious loss of volume to the inert gas in such a system. The separation of oxygen from spilled fuel vapors is next to impossible during crashes.

The last two prevention methods appear to offer the best approaches for solving the fire problem. Much research has been done on ways to prevent fuel from coming into contact with ignition sources by the Army Aviation Materiel Laboratories in two areas: (1) To increase the viscosity of fuels by jelling or emulsion additives so volatility is reduced, and (2) containment of fuel in burstproof tanks, lines and fittings.

The fuel containment concept has proven both feasible and practical for use in small aircraft where the fuel volume loss has been less than 5 percent. Some volume loss is inherent due to added thickness and stiffness of the burstproof tank material. The Army is currently installing burstproof fuel tanks, lines and fittings in UH-1D/H series helicopters. It plans to install similar

systems in the majority of Army aircraft. A complete retrofit of all Army aircraft will likely take more than 5 years.

Volatility reduction of fuel is primarily applicable to turbine engine fuels, since gasoline, by its very nature, must remain a highly volatile fuel. The use of low volatility (kerosene type) fuels in turbine engines has been considered since the advent of the turbine engine. Several factors have prevented widespread use of kerosene by the military services, with the exception of JP-5 used by aircraft aboard aircraft carriers.

In many impact survivable accidents, the cause of fires resulting in thermal fatalities or injuries is main fuel spillage. The ignition source in these accidents is usually difficult to find because little remains to be investigated after a postcrash fire. Nevertheless, it is known that a great deal more heat energy is necessary to ignite a kerosene (low volatility) fuel than JP-4.

Consideration of flammable properties of various aviation fuels requires knowledge of some commonly used terms. The ability of a substance to evaporate or become volatile is directly related to its *vapor pressure* (the pressure exerted by

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the vapor in equilibrium with its liquid state). Pressure exerted by the vapor depends on temperature and rises rapidly with relatively small temperature increases. Vapor pressure does not depend on the volume of liquid or vapor present in the system.

As a fuel or any substance evaporates into its surrounding atmosphere, it forms a mixture with the atmosphere which, in the case of fuels, is often flammable. A fuel, to burn and spread away from the ignition source, must be vaporized and mixed with enough oxygen. There are two limits of the oxygen-fuel mixture which must be considered. These are called *flammability limits*.[1] The *lean* mixture limit contains the least amount of fuel vapor necessary to be flammable, while the *rich* mixture limit contains the most amount of fuel vapor possible to be flammable at a specific temperature. The lean limit is obvious, but the rich limit may be obscure. If, however, a confined volatile fuel displaces most of the air around it, a rich mixture which does not contain enough oxygen to support combustion results. It is the fuel-oxygen ratio of the total, falling between these two limits, that is flammable.

The amount of oxygen in the surrounding atmosphere, temperature, pressure and other factors directly affect the flammability limits of fuels. Atmospheric pressure and ambient temperature are of primary concern. Flammability limits may be simply defined as the fuel-temperature range, at sea level, within which vapor in equilibrium with its liquid will form a flammable mixture with air. Flammability limits of various mixtures of fuels are not proportional to the amounts of each fuel in the mixture. Instead, they are dependent on the most volatile component in each mixture.[1] Note in figure 1 that the flash point of kerosene is reduced from 110 degrees F. to 75 degrees F. by the addition of only 10 percent of JP-4 fuel.

The *flash point* of a substance

Sequence of photos of helicopter which did catch fire after occupants escaped show ignition of fuel from broken fuel line, burning and complete destruction of helicopter

is, in many cases, easier to relate to the flammable characteristics of the substance. In most circumstances, this flash point is very close to the lower flammability limit and may be defined as the temperature at which a fuel will vaporize enough to form a fuel-air mixture which will ignite with a specified ignition source. This flash point does not necessarily indicate the minimum level of flammability under all conditions, but it does give a reasonably good idea of its flammability in relation to other substances.

The *specific gravity* or *density* of a fuel represents the weight per unit volume of the fuel at a certain temperature. The higher the density of the fuel, the greater the weight which may be stored in a constant tank capacity. Generally speaking, the density of a fuel is somewhat proportional to its distillation range. It is also a function of temperature.

Flammability limits, applied to the problem of the relative flammability of aviation fuels, can often give a rough idea of what may be expected in terms of fuel-oxygen mixtures at various temperatures. Figure 2 shows vapor flammability temperature limits for various fuels at different altitudes. Both aviation gasoline and JP-4 turbine fuel appear on the left side of the graph, while JP-5 and other kerosene type fuels appear on the right side.

JP-4 limits extend from approximately −20 degrees F. to 60 degrees F. at sea level, and −30 degrees F. to 50 degrees F. at 10,000 feet. These limits place JP-4 almost continuously within ignitable range for most common flight conditions.

JP-5, at the other extreme, has limits from about 100 degrees F. to 150 degrees F. at sea level and approximately 85 degrees F. to 140 degrees F. at 10,000 feet. This indicates JP-5 is out of its flammability range, on the lean side of the limit, under most flying and many landing situations, with the exception of extremely hot weather in excess of 100 degrees F.[3,4]

The lean flammability limits of JP-4 and kerosene are compared with the usual environmental atmosphere to an altitude of 40,000 feet in figure 3. The two dark lines represent the pressure altitude-temperature relationship for an extreme hot day and the NACA standard day, while the other two lines represent the lean flammability limits. The areas above and to the right of the lean flammability limit lines represent the flammability regions of the two fuels. It is readily seen that kerosene vapor is almost never flammable at normal altitudes and temperatures,

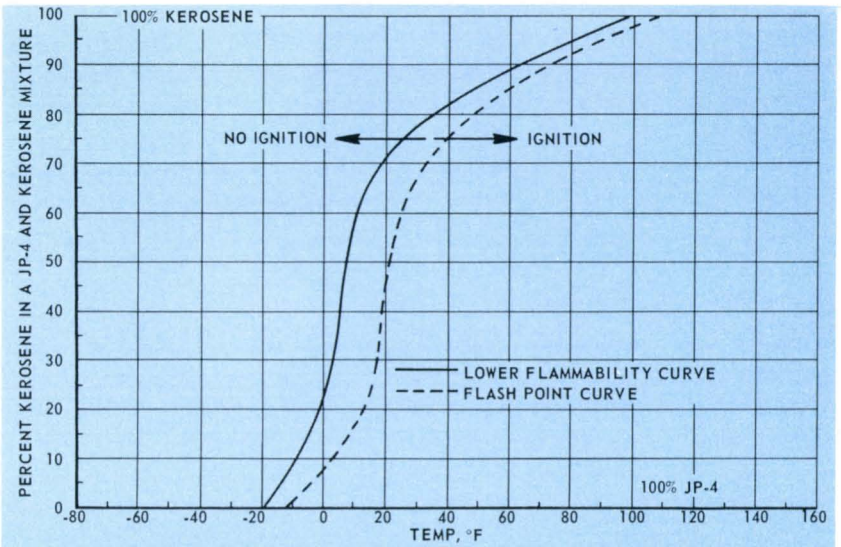

FIGURE 1
Lower Flammability Limit and Flash Point for a Mixture of JP-4 and Kerosene[2]
(Sea Level Atmosphere)

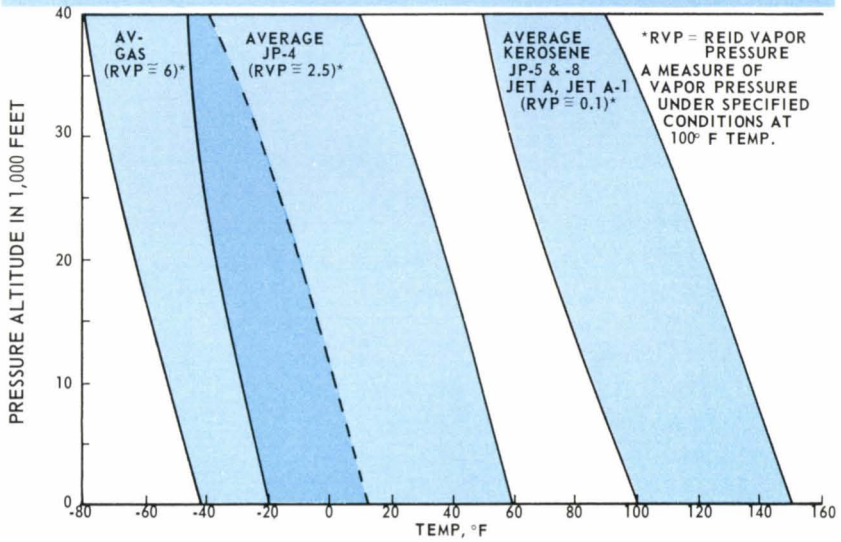

FIGURE 2
Vapor Flammability Temperature Limit Change With Altitude for Various Vapor Pressure Fuels[2]

while JP-4 vapor is almost always flammable under normal flight conditions. The only time kerosene would be flammable is during an extremely hot day at sea level. Aviation gasoline, much like JP-4, is almost always flammable under normal flight conditions.

Flash point differences between various fuels, as shown in table 1, are large. JP-4 has a flash point of -10 degrees F. while the other kerosene type turbine fuels have a much higher flash point. Another major physical difference is shown in the vapor pressure column. Here again it is obvious that JP-4 is far more volatile than all the kerosene type fuels. This difference in physical properties may be explained in part by the distillation range of these fuels, shown in the right column of table 1. This range includes the approximate temperatures at which the fuels are taken during the refining process. It is evident from this data that the lower ranges impart the low flash point and high vapor pressure properties to the respective fuels. It is this, called the *low boiling fraction*, that is directly related to the volatility of aviation gasoline, JP-4 and commercial grade Jet B fuel. This low boiling fraction, on the other hand, provides good low temperature and flame-out restarting characteristics for these fuels which are not evident in the higher boiling fraction turbine fuels.

These facts are significant when considering in-flight fires and ballistic damage to aircraft in combat. Considered alone, however, differences in flammability do not prevent fire hazards under all flight conditions, especially those resulting from the use of incendiary ammunition in combat. If a round is fired into a fuel tank, there may be more than enough energy transferred to the fuel and its vapor to raise the temperature in the surrounding region enough to cause ignition. Although the danger of fire in this case would be significantly reduced by the use of JP-5, or another kerosene type turbine fuel, rather than JP-4, this danger would not be completely eliminated.

In a crash situation involving ruptured fuel cells, the fire hazard caused by fuel contact with hot external and internal engine parts is probably about the same for all fuels. A study of turbine engine temperatures, completed by the National Advisory Committee for Aeronautics in 1958,[6] found that external engine parts, including tail cones and cases, retained a high enough temperature for a sufficient length of time to ignite all aviation fuels.

Crash situations involving losses of fuel from fuel systems can be separated into three general types. The first and most severe occurs when fuel cells burst at impact and subsequent motion causes fuel to form a mist in the surrounding air. This is a most dangerous situation and it almost always leads to a catastrophic fire. Almost any flammable substance will readily ignite in this state from a variety of ignition sources present during a crash sequence.

In the second situation, fuel cells burst or fuel lines leak fuel toward the end of the crash sequence, just before motion stops. Spilled fuel, in this case, would not form a mist or spray and the less volatile and higher flash point kerosene type fuels would not ignite as easily as the more volatile, lower flash point JP-4 fuel.

The third and least severe situation involves small ruptures or leaks from the fuel system, causing fuel to pool on the ground. An example of this kind of fuel leakage was an accident in which fuel spattered upward from a pouring stream. The rising fuel vapor from this situation on a hot day can be readily appreciated. In this case, however, the helicopter did not catch fire, possibly because the hot engine parts were too high above the spilled fuel to cause ignition. In another case, leaking fuel from a punctured tank or broken line did ignite after all occupants evacuated. The exact ignition source was not determined, but the fire started near the base of the transmission, near the belly. The fire spread is shown in the accompanying photographs.

The question arises, would kerosene type fuel have prevented this $1¼ million fire? This question cannot be answered from information in the accident report. But it is known that kerosene has a much higher flash point than JP-4 and the flash point would be a factor in this type accident. In a crash situation where hot contact ignition is not a major factor, kerosene type fuel would hold a distinct advantage over JP-4 for the usual range of temperatures.

Kerosene fuels are safer to handle during refueling operations. At ambient temperatures, kerosene fuel vapors will not ordinarily ignite, while JP-4 fuel vapors will ignite explosively.

Few documented major accidents have been attributed to direct lightning strikes. However, many lightning strikes have occurred with minor damage to aircraft. The most serious concerns for lightning protection are fuel systems, rotor or propeller blades and plastic structural sections in which large amounts of energy develop due to the high dielectric (nonconductive) nature of the material. Nonconductive plastic type materials are an integral part of most aircraft to-

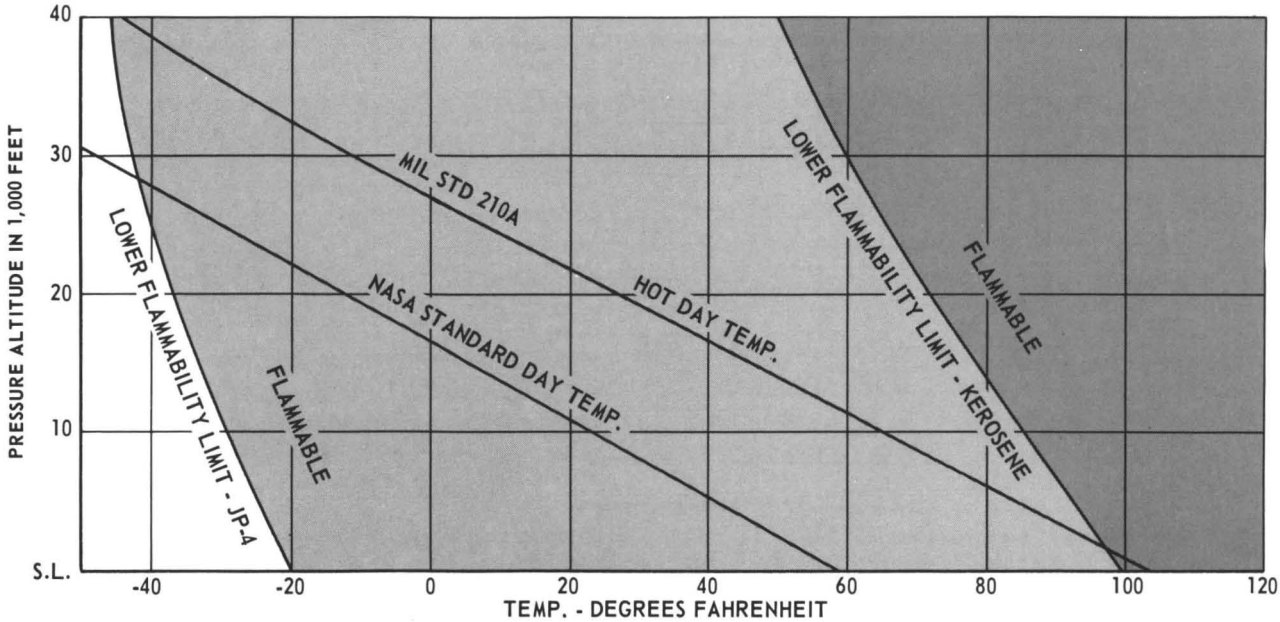

FIGURE 3
Comparison of Standard and Hot Day Atmospheres With Fuel Flammability

day. A lightning strike to any plastic part would cause a tremendous heat buildup and substantial damage to the part.

The FAA recently completed a study of fuel system vents and found that, under many conditions, JP-4 formed a highly flammable mixture with air in these vents.[7] It is possible that a lightning strike could cause an explosion of major proportions under the proper conditions in both fixed and rotary wing aircraft. A kerosene fuel would not usually form an explosive mixture with air.

Aviation experience has shown that explosions in fuel systems are a definite reality. It is also considered possible that these explosions could be induced by lightning strikes. In view of this, it is apparent that JP-4 is something less than an ideal fuel to carry into or near thunderstorms. It is well within its flammable limits under storm conditions, while kerosene type fuels are well outside the lower flammability limit of approximately 100 degrees F.[8]

Since lightning strikes are not a major cause of aircraft accidents, they may not seem significant. However, coupled with many other circumstances governing aircraft safety in connection with fuel, it is an important point.

Because of the great amount of JP-4 used by the Army and Air Force, the cost and availability of other turbine fuels must be considered. A mild shortage of commercial Jet A fuel exists in the United States.[9] JP-4 was outlawed by U.S. commercial aviation some years ago as a result of a lightning strike accident and subsequent ignition of JP-4 vapor in the fuel vent system which caused a catastrophic integral tank explosion.

It has been reported that enough Jet A kerosene type fuel could be made available in the future if the demand was present and the consumer willing to absorb a 5 to 10 percent increase in cost. This cost increase is attributed to the more expensive hydrocracking process necessary to obtain a larger percentage of suitable kerosene type fuel from currently available crude oil. It is also estimated it would take at least 5 years for industry to modify and expand its refineries to meet the demand for enough kerosene type fuel to supply all commercial and military needs.[10]

In summary, kerosene type fuels are the least volatile of all turbine engine fuels during all phases of usage, from manufacture until burned in aircraft engines. Lower volatility characteristics dictate that kerosene fuel will freeze at higher temperatures than higher volatility fuels and will be slower to restart or light-off turbine engines in very cold climates. The

TABLE 1
Physical Properties of Various Aviation Fuels[3,4,5]

FUEL TYPE	FREEZE POINT °F	FLASH POINT °F	VAPOR PRESS. PSI	AVG. SPECIFIC GRAVITY 60/60° F	APPROXIMATE DISTILLATION RANGE* °F
AVGAS 100/130	-76		6.0	0.71	150-338
JP-4	-76	-10	2.5	0.77	140-470
JP-5	-55	140	0.1	0.83	365-550
JP-6	-65	90		0.81	250-550
JP-8	-51	116	0.1	0.80	320-550
JET A	-40	110	0.1	0.80	330-550
JET A-1	-58	110	0.1	0.80	330-550
JET B	-60		2.5	0.78	140-470

*Lower limit is usually not indicated in military specifications and appears here as an approximate figure.

very low vapor pressure of kerosene, all factors being equal, indicates that in-flight fires due to lightning strikes, line leakage or electrical sparks, are less likely to occur. Fire is less likely to break out in some crash situations where kerosene, rather than more volatile fuels are used, particularly in near vertical helicopter impacts in which spilled fuel is not atomized. In other crashes, in which considerable forward velocity is involved and spilled fuel is atomized by the airstream, kerosene fuel will show little, if any, advantage over the more volatile fuels.

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AFTER A RECENT CH-47 accident, the pilot stated the helicopter started vibrating and entered *ground resonance* during a maintenance runup. The term *ground resonance* has been with us a long time. Ask any CH-34 or UH-19 pilot about ground resonance. You'll get everything from moans and groans to a 3-hour lecture. You'll hear terms such as "shook like a wet dog"; "beat itself to death"; "rolled over and died"; etc.

Do you know what ground resonance is—what causes it—how to recognize it—how the helicopter reacts—what corrective actions you should take? Ground resonance is a vibrating condition that may develop when a helicopter is on the ground with rotors turning. It occurs when unbalanced forces in the rotor system cause the helicopter to rock on its landing gear at or near its natural frequency. These unbalanced forces, called blade-depatterning, may be induced in several ways—a landing with touchdown on first one wheel, then on the other; a high power setting with very light gear to ground contact; or taxiing over rough terrain.

There are also mechanical deficiencies which can cause this unbalanced condition, such as improperly serviced landing gear oleos; defective

GROUND RESONANCE OR PILOT INDUCED OSCILLATIONS?

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rotor blade lag dampers; or improperly inflated tires.

Ground resonance can be recognized as a rocking movement around the roll axis of the helicopter. This movement progresses very rapidly to the point of destruction in a few seconds, if immediate corrective action is not taken.

Recovery from partial ground resonance may be made by:

• If at operational rpm, lift the helicopter to a hover.

• If below operational rpm, go to minimum power and shut the engine(s) off.

Pilot induced oscillation (PIO) is not nearly as familiar as *ground resonance.* However, around CH-47 pilots, particularly those who have flown the earlier A models, you will hear the term *thrust bounce.* They are one and the same. Thrust bounce (PIO) is a vibration transmitted from the pilot through the controls to the rotor system. This vibration is a vertical movement of the helicopter and it can be induced on the ground or in flight. Although induced by the pilot, there may be other contributing factors. Worn rod end bearings, defective viscous dampers and out-of-track blades are some conditions which could cause a slight vertical bounce.

Now picture yourself in the cockpit of a CH-47. You have a slight vertical bounce due to one of the above conditions. You are sitting on a springy seat cushion with your hand on the thrust rod. The vibration is transmitted to you from the rotor system and magnified by the movement of your body on the seat cushion. Consequently, your body movement results in a movement of the thrust rod, which, in turn, is transmitted to the rotor system. This cycle, if not stopped, can cause the helicopter to become uncontrollable.

When airborne, the helicopter is most likely to enter thrust bounce while descending with a heavy load. On the ground, the critical areas are:

• Weight of helicopter on aft gear, with light ground contact on forward gear.

• Helicopter weight on all four wheels, brakes locked and cargo ramp down (in contact with ground).

The corrective action for thrust bounce is to break pilot to rotor system contact by removing your hand from the thrust rod. This breaks the vibratory cycle and the vertical movement will stop.

USABAAR records for the period 1 January 1957 through 30 June 1970 show 10 mishaps attributed to ground resonance. None were in CH-47s. There was one major CH-47 accident caused by PIO (thrust bounce). More important, several accidents occurred when helicopters began a slight vibration on the ground and the pilots lifted them into the air, lost control and crashed. As in the PIO-caused accident, ground resonance was mentioned or there was evidence the pilots took corrective action for ground resonance (i.e., lifted the helicopters off the ground).

Is it possible that, with helicopters on the ground, pilots are associating any vibratory condition with ground resonance? A brief look at the aviator training cycle may reveal this possibility. In primary training, student pilots receive classroom instruction on helicopter vibrations, with emphasis on ground resonance. During this instruction, he sees ETV tapes and a UH-19 ground resonance film. Many of these students receive their primary instruction in TH-55s. This helicopter, if not properly flown and maintained, is subject to ground resonance, so the student hears about it daily. After primary, students go on to fly TH-13Ts and UH-1s. Neither of these are subject to ground resonance with their semi-rigid rotors and skid gear with no oleos. Because of this, students hear little more about the subject.

Following graduation, some of the students will go to the CH-47 transition course. Since ground resonance hasn't been a problem in the CH-47, the only instruction they receive comes during a 1-hour *precautionary measures* and *critical conditions* class. Thus, pilots leave school having had ground resonance pounded at them for the first half of their training and hearing almost nothing about the subject during the last half. The idea of ground resonance is never dispelled. It is still in their frame-of-reference, or memory banks. Is it not feasible that, at some future date, in an emergency, they will draw on and react to this information? USABAAR records indicate that this has probably happened. Pilots have taken corrective action for ground resonance, lifted their helicopters into the air, found themselves in a situation beyond their capabilities and crashed.

We can never ignore vibrations of any type in helicopters. Just as we learn to distinguish between a vertical and lateral vibration, we must be able to identify and react correctly to other type vibrations.

Ground resonance in a CH-47? NOT LIKELY!
PIO (thrust bounce)? VERY POSSIBLE!

complacency and the instructor pilot

Every student and every maneuver presents a new challenge. . . when meeting this challenge, you can't afford complacency

WHAT IS THE one most important ingredient in an efficient pilot training program? My answer, based on 28 years of aviation experience, of which 15 were spent in flight training programs, is adequately trained and conscientious instructor pilots. It would be nice to have a large reserve of professional flight instructors to draw on when needed. This is not possible. It's also been proven unnecessary.

During World War II, if an individual had any kind of pilot's rating, he was subject to becoming an instructor pilot. My primary instructor was a civilian glider pilot. He was given a short training period in a prop-driven trainer and made an instructor. He did an outstanding job. This type of instructor procurement was repeated during the Air Force buildup for the Korean conflict. It's the only way to get the job done in an emergency.

Pilots with relatively low experience levels can be put through an instructors course, usually with good results. The Army aviation training program proves this. Selected students are put through instructor training immediately after graduation. Within 60 days, some are instructors. It's surprising how well a new instructor performs when he first starts instructing. The danger period comes later. My personal experience will make the point.

When the Korean Police Action started, I was working for the Navy, engaged in aircraft overhaul and repair. The Air Force opened a primary training base 30 miles from my home. They were begging for instructors. Deciding I would rather fly airplanes than repair them, I submitted my application.

When I arrived at the base, an Air Force captain told me to get into a T-6. This surprised me as I had never flown a T-6 before. He put me in the front seat, showed me how to start the engine and crawled into the rear cockpit. We took off and did a few basic maneuvers. Then he told me to enter the traffic pattern and shoot some landings. After two landings, we exchanged seats. When I crawled down into that rear cockpit it was as if someone had lowered a window shade in front of me. I began to have doubts about instructing from the rear seat of a T-6. We took off and made two more landings. I told the captain I couldn't see the runway very well. He said, "Good. It proves you're lined up O.K." Finally, he told me to taxi in and park. When we got out he told me I was hired and cleared for team rides

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with another trainee instructor. Not only did I have doubts about my ability, I then had serious doubts about his.

I was sent to a pilot instructor school where, during a highly concentrated course, I was given 60 hours of dual and solo flight time. I was now trained as an instructor. All I lacked was actual instructing experience, something an instructor must get for himself. The trick is to stay out of trouble while you're getting it.

I'll never forget graduation day for my first class of students. They all passed their check rides and were in the top third in class standings. My chest swelled with pride as they went up for their certificates. I honestly believe that first class was my best. Could it be that I just worked harder?

My next two classes were O.K. Not as good as the first, but still no real problems and no accidents. My students passed the course, but their grades dropped. I was becoming complacent and didn't know it. I rationalized by saying the students just weren't so good as they used to be. It couldn't be me—I was an experienced instructor now and getting better every day.

It didn't take long for some dangerous signs to appear. During a simulated practice forced landing, I let a student go below the minimum altitude of 300 feet. The engine loaded up. When I applied throttle, it wouldn't take. I retarded the throttle and gently applied it again. Just as I was getting ready to flare for a wheels-up landing, the engine came to life. The treetops kissed us as we climbed out of the clearing.

A few days later, I was giving one of my students a review flight in preparation for his phase check ride. He was doing a fine job, or so I thought. We were at 6,500 feet and I was comfortable in the rear office with my feet propped up on the bar that supports the rudder pedals. I was leisurely smoking a cigarette. I told him to give me a three turn spin to the right. Our SOP called for us to be recovered from spins at 5,000 feet. When you consider that a T-6 loses about 1,000 feet every 15 seconds in a spin, I wasn't leaving much margin for error.

The student entered the spin smoothly. During the recovery, he was slow to release opposite rudder pressure, then he applied abrupt back pressure on the stick. We snapped into a secondary spin in the opposite direction. The T-6 is a

reliable old bird but it's really vicious in a secondary spin. It was going around so fast the sky was a blur. I managed to get my feet down and get on the controls. After telling the student I had it, I started the recovery. We were below 2,000 feet when I recovered back to straight and level flight. For a long time there was a lot of silence in the airplane. Then I asked the student how he felt and he said he thought he was going to be sick. I told him I felt kind of sick myself.

After flying around for a while to calm our nerves, we went back to the field and landed. Another one of our rules was to bail out if you were still spinning at 3,500 feet. When you consider this, you can see why we didn't feel like flying any more that day.

This incident served to get me back on the ball again for a while. But it wasn't long before complacency began to get me again. This time, I wasn't so lucky. While I was out with one of my students, a weather front moved over the field. As we entered traffic, the tower operator announced the wind was variable, gusting up to 40 knots. Good judgment told me to land. Complacency told me to let the student land. Good judgment lost. The approach wasn't bad, but the roundout was started a little late and we touched slightly main gear first. We bounced, then everything went to pot. The first thing to make contact with the runway was the left wing tip. I tried to recover, but was unable to get the wing up. We went from the left wing tip to the nose, then to the right wing tip. During this process, the right landing gear broke off and we slid down the runway backwards. When we came to rest, the engine was broken from the mounts and drooping. That T-6 looked as though it was hanging its head in shame for what I had let happen to it.

Why did this happen? Why did I put that student in a situation that was beyond his capability? I had been instructing for two years in this type aircraft. If it had happened during my first class of students I could have understood it a little better.

The accident report came back with the primary cause listed as supervisory error. The board said we shouldn't have been flying during the time the weather front was passing. They indicated that I was a victim of circumstances. They were right. I was a victim of circumstances—circumstances I had created. There was a supervisory failure. The most important supervision of all had failed—self-supervision.

The designation of instructor pilot carries with it a tremendous responsibility. How far should an IP let his student go before he takes action to correct his student's error or errors? This question is as old as aviation itself and has often been the subject of heated debates between instructor pilots. Some say you must let the student go until he can see his own mistake. This kind of logic can lead to deadly traps, particularly while practicing simulated emergencies, such as autorotations or single engine operations in light twins. The student is depending on the IP to keep him out of trouble. He may think he's doing O.K. because the IP hasn't said anything or taken any action, when actually the situation could be deteriorating to a point where the IP's capability is taxed to the limit to return to a safe flight condition.

Basically, what it all adds up to is that only the instructor can make the decision about how far he should let the student go. He must make this decision based on individual situations. Altitude, air speed, rotor rpm and aircraft characteristics must be considered. In short, how much time does he have to effect recovery and still allow a margin for error in his own judgment or response time?

As the new instructor pilot gains experience, his proficiency in anticipating and recovering from students' mistakes increases. Unfortunately, this is about the same time that complacency has a tendency to rear its ugly head. When complacency overrides good judgment, the situation can deteriorate to a point where the limitations of the machine and instructor are exceeded.

When a new instructor allows a situation to deteriorate to a point where an accident occurs, it is usually because he failed to recognize or properly analyze the accident producing situation. The answer to this is improved initial instructor pilot training and higher standards. However, as experience increases, the real problem is complacency. This is where the instructor pilot must enforce self-discipline and not be lulled into a false sense of security that can cause him to exceed his own capability—not because he didn't recognize the situation, but because he waited too long to take corrective action.

Be proud of your title of instructor pilot. It's the mark of a professional. Be confident of your ability. But remember that every student and every maneuver presents a new challenge. When meeting this challenge, you can't afford complacency.

I AM A PROFESSIONAL ARMY AVIATOR

Major Alfred G. Borth
Life Support Sciences Department
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"I STUDY THE dash 10 manual for my aircraft and abide by it. I wear my protective equipment the way it was designed to be worn. I make certain my passengers are thoroughly briefed before takeoff to ensure their safety in case of emergency. I maintain my qualifications as an instrument rated pilot, keeping current with all procedures and regulations."

Sounds good, doesn't it? But are these statements really true? Do they apply to each of us? Let's take the first sentence—*"I study the dash 10 manual for my aircraft and abide by it."* When was the last time *you* looked at a dash 10 for *your* aircraft? Has it been so long you don't remember? If you don't care about yourself, think about your crew and passengers. Their lives are in your hands. The dash 10 contains weight and balance information which may surprise you if you really look at it. Examples from accident reports show what happens when this information is ignored.

In one instance, a UH-1, one of a flight of four, scheduled to haul supplies from a fire support base, arrived late because of unscheduled maintenance. To complete his mission by noon, the pilot of one elected to take a double load, making his gross weight 10,400 pounds. After loading, a hover check showed 98.3 percent N_1 and 42 pounds of torque. The engine was placarded at 96.7 percent N_1 maximum. Continuing to ignore dash 10 procedures, the pilot hovered to the extreme corner of the pad and attempted to take off. You guessed it. A crash. Results: Both pilots were seriously injured, the helicopter destroyed and an additional burden to complete the mission was placed on the remaining three UH-1s. The dash 10 for this helicopter lists a maximum gross weight of 9,500 pounds at sea level.

In another instance, each of four helicopters was loaded with seven soldiers and flown 40 minutes to a pinnacle pad. The airfield elevation was 58 feet and the pinnacle elevation was 4,000+ feet. Chalk one and two landed and departed without incident. Chalk three crashed on the pad and rolled down the side of the hill approximately 150 feet. Results: Four occupants killed and three others injured. The helicopter was destroyed. All four were at maximum gross weight during takeoff and over maximum permissible gross weight during the pinnacle approach, because of the higher altitude. Cause factors included operational error, supervisory error and failure to plan and conduct the flight in accordance with dash 10 procedures.

designed to be worn." Enough has been said about this subject that it should not need repeating, except to say we should *dress to live.* Helmets, gloves, boots and Nomex flight suits should be worn *properly.* And don't forget your passengers. Remember that signal equipment (radio, mirror and/or flares), knife and matches should be *carried on your person.* Equipment which burns with the aircraft can't be of any help to you.

"I make certain my passengers are thoroughly briefed before takeoff. . ." Passenger briefings are probably the most neglected area of safety. For combat assaults or extractions, personnel are supposed to be briefed by their units before they board aircraft. Briefings for all other flights are covered in AR 95-1 and it is the aircraft commander's responsibility to ensure that passengers are briefed. Briefings should include normal procedures, such as wearing of seat belts, keeping sleeves rolled down, etc., as well as what to do in an emergency. Sounds simple, doesn't it? But USABAAR accident files bulge with cases in which people were injured or killed because they were not wearing seat belts or did not know what to do during emergencies. Your crew and passengers are your responsibility. Take care of them. As an AC, you are literally your brother's keeper.

"I maintain my qualifications as an instrument rated pilot, keeping current with all procedures and regulations." Do you try to maintain instrument qualifications, file IFR, put the hood on and fly instruments? Or do you end up making a frantic phone call to the link trainer department, crying that you have a ticket to renew and need some time?

"I am a professional Army aviator and live by a creed that I have done everything within my power to ensure the safety of my passengers, aircraft and myself." Can *you* get up in the morning, look squarely into the mirror and truthfully make that statement?

USAASO Sez

The U. S. Army Aeronautical Service Office discusses

NOTAMs and flight safety

A new pamphlet to assist operations officers

The FLIP, quality and you

How Is Your NOTAM IQ? Does a NOTAM qualify as a first class system to serve the aviator? Prompt dispatch, revision or cancellation of your airfield NOTAMs is vital to flight safety and successful missions into your airfield. Here is a brief rundown on key actions:

a. *Initiation of a NOTAM:* Should be accomplished when the establishment or condition of, or change in, an aeronautical facility service or procedure may be hazardous to flight.

b. *Revision of a NOTAM:* Should be accomplished promptly when a published NOTAM does not reflect the current status of the aeronautical facility service or procedure.

c. *Cancellation of a NOTAM:* A temporary NOTAM should show its effective as well as its expiration date, otherwise, a cancellation NOTAM is required to show its expiration.

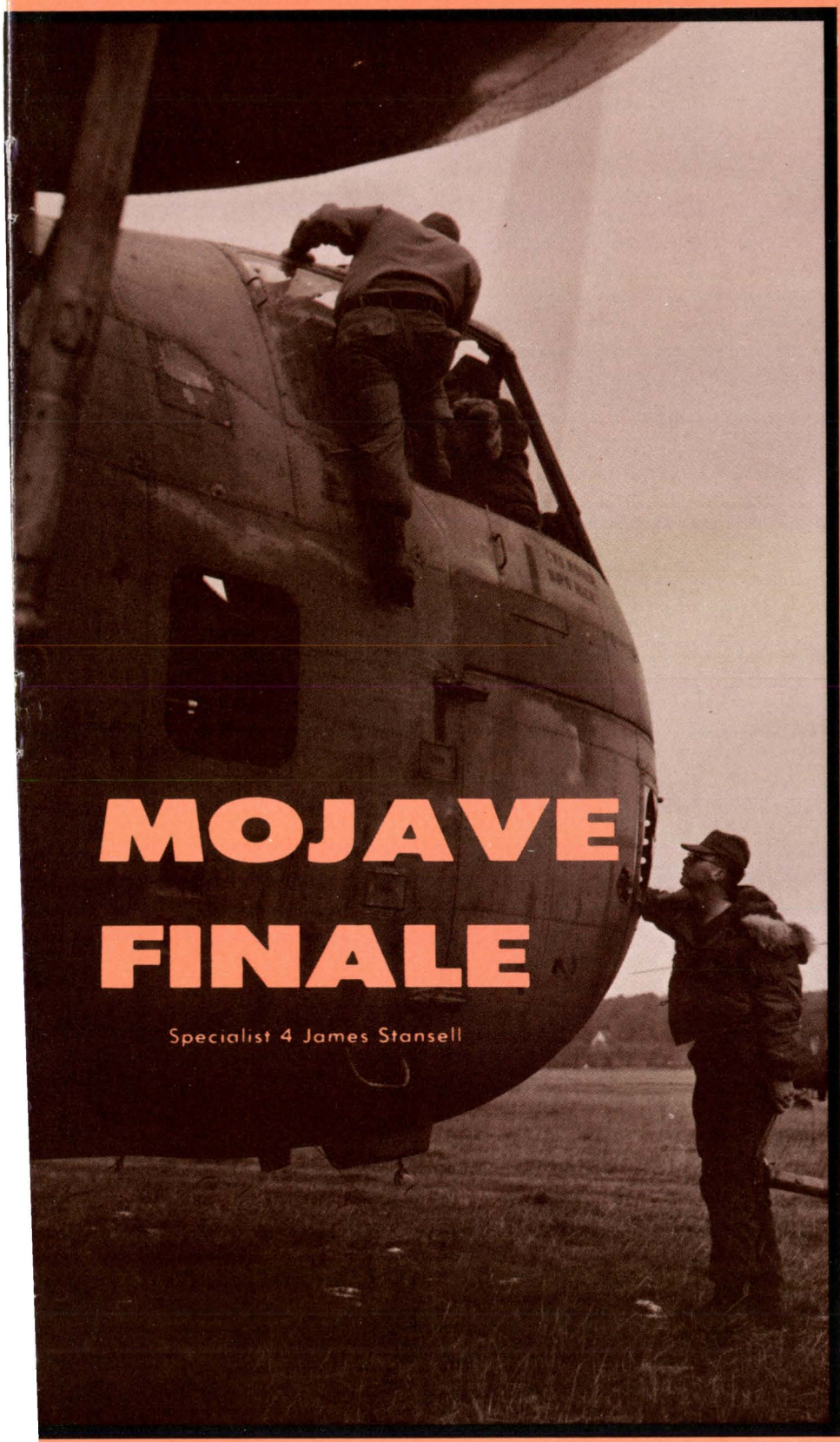
d. *Reviewing of NOTAM summaries:* The NOTAM summary should be accessible to all pilots and updated when individual NOTAMs are received. Post the latest review and updating time in the upper left-hand corner. And, remember, your local tie-in Flight Service Station is ready to accept your NOTAM and serve the aviator planning to use your facility.

Operation Of Army Airfields: Operation officers, are you spending your valuable time on research of publications to find solutions to problems of Army airfield operation? Help is on the way in the form of a Department of the Army Pamphlet 95-15, Guide for the Operation of Army Airfields.

This pamphlet makes extensive reference to regulations, technical manuals, field manuals, technical bulletins and other publications, and complements local airfield operating procedures by providing a reference to appropriate regulatory publications.

In the body of the pamphlet are chapters on airfield operation functions, to include air traffic control, flight dispatch and airfield service. Areas of particular interest may be personnel manning and training, airfield inspection guides or airfield safety, all covered in chapter 2 with reference made to appropriate regulations for further guidance. Maybe you are concerned with landline and radio communications, required reports and logs and forms to be maintained by air traffic control personnel. These and other items are covered in chapter 3. Appendixes A through G list publications pertaining to airfield operations, control towers, ground control approaches, approach controls, flight planning and SOP format, as well as excerpts from the Federal Meteorological Handbook. The pamphlet aims to assist you in solving Army airfield operations problems and, as a consequence, in increasing safety and efficiency.

Flight information Publication (FLIP): This product is only as good as the quality of information that's printed. Aviation personnel are in the best position to provide this quality. So, let's have a FLIP checkup in your area of operation. Send the omissions, errors or deletions via COMM Cards to USAASO.



MOJAVE FINALE

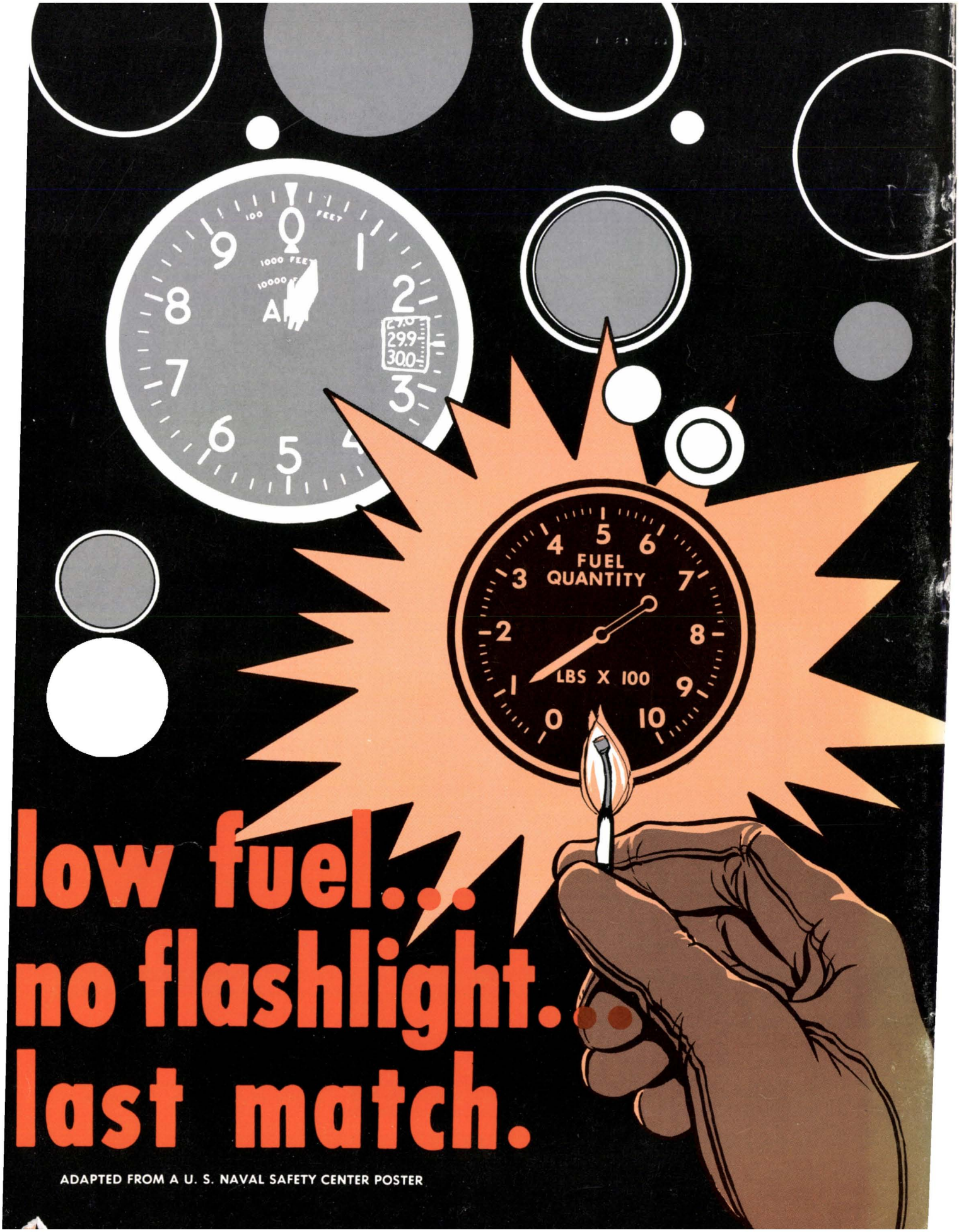
Specialist 4 James Stansell

MANY MILITARY aircraft have won special places in the hearts of Americans. Some are "immortal" not merely because they are inanimate, but because of their associations with victorious campaigns or renowned individuals.

One military aircraft is achieving an immortality of its own. Perhaps it will, in a sense, fly forever. CH-37 Mojave helicopters are being retired and salvaged amidst the whine of electric drills and the cracking of removed rivets at VII COSCOM's 48th Transportation Company (Aircraft Maintenance) of the 87th Maintenance Battalion in Goeppingen, Germany.

The 48th has received six of the aircraft, half of the group of 12 which flew with the 4th Aviation Company in Schwaebisch Hall (4th Aviation is part of the 15th Aviation Group under Seventh Army command). These aircraft represented the last CH-37 group in the active Army (National Guard units will still be flying the Mojave). The 48th's mission is to disassemble the aircraft and to salvage approximately 65 of its aviation standard pieces of equipment for use by other units. As each frame is dismantled it is lifted via the CH-54 Flying Crane to a PDO yard in Nellingen where it is sold on the open market as scrap. Disassembly is being undertaken in Europe rather than in CONUS in order to save shipping costs, for most salvagable parts are being used in Europe.

The project represents "the end of an era in Army aviation and the beginning of a new one in corps support command." Purchased by the Department of the Army in 1956, the CH-37 was the first heavylift helicopter in the Army inventory, but recently has given way to the larger and more powerful CH-54 and CH-47 Chinook.



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