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UNITED STATES ARMY SEPTEMBER 1969

AVIATION DIGEST

SAFETY FOR COMBAT READINESS

part three—page 36

UNITED STATES ARMY AVIATION DIGEST

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SEPTEMBER 1969 VOLUME 15 NUMBER 9

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ABOUT THE COVER

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

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VIEWS FROM READERS

Sir:

I just read the article "Weather Violation" in the February 1969 issue and it appears to have some contradictions which result in a superb collection of barnyard litter. The board states that the pilot at no time was flying solely on instruments during the 8 minutes in instrument conditions. Earlier the statement was "after flying into instrument conditions." By definition, he couldn't fly without them. I know from personal experience in a similar situation that in fact you do rely solely on the gauges, however briefly.

The board says weather was a factor because it existed and that the accident would not have occurred if the weather had been better. Then they turn right around and say it was not an established or probable cause factor. Ridiculous!

The pilot's lack of knowledge about the discrepancies which may have become obvious prior to entering the bad weather were probably forgotten in his anxious concentration on the situation at hand. I'm certain they too were definitely a contributing factor.

The conclusion that the main cause of the accident is a violation of a regulation is preposterous. The board's conclusion would seem to indicate that if the pilot failed to file a flight plan or fill out a weight and balance form, he would have an accident. Very brilliant reasoning.

What was the purpose of this article?

MAJ Wilbur R. Mixter
Chief, Maintenance Div
Army Avn Elm USA IAGS
Ft. Clayton, Canal Zone

• Correctly quoted, the article reads: "The board *feels* that at no time during the 8 minutes in instrument conditions did the pilot fly solely by reference to instruments. . . ." The board's opinion was based on the fact that the pilot was attempting to maintain visual contact with the ground, evidenced by his altitude and witness statements that he circled the town twice before flying away in the direction he crashed.

If the pilot had lost all outside visual contact, he probably could not have flown for 8 minutes without using his instruments. However, the weather, as stated, was an obscured 200-foot ceiling, with visibility one-tenth of 1 nautical mile, and he was flying at approximately 50 feet. Paragraph 1-2r, AR 95-2, defines instrument flight conditions as: "Weather conditions below the minimum prescribed for flight under visual flight rules." Therefore, by definition, contact flight can be attempted in instrument weather conditions, though it certainly is not advisable, as evidenced by this accident.

Paragraph 11-12b(4), AR 95-5, states: "A weather deficiency should not be assessed as a contributing factor if action was required to avoid the element but willfully not taken; e.g., pilot is ordered to return if IFR weather is encountered and no unusual circumstances exist to preclude compliance with the order." The weather in this case was seen and avoided by the pilot of the number 2 helicopter of this flight.

The facts proven by this investigation were: 1. A command regulation prohibited aviators from using helicopter weather minimums of less than 500-foot ceiling, one-half nautical mile visibility, clear of clouds, and at airspeeds low enough to permit perception of obstructions in time to avoid collisions, under visual flight rules. 2. Though the hills ahead were seen to be obscured by clouds, this pilot continued into the described weather conditions and crashed. This was clearly a violation of the command regulation.

The purpose of this article was to illustrate the dangers of attempting VFR flight in IFR weather.—The Editors

★ ★ ★

Sir:

The article by Captain Alfred S. Rushatz on physical fitness which appeared in the April 1969 issue of the AVIATION DIGEST prompted some thoughts.

CPT Rushatz noted that " . . . participating in physical exercise an hour or so after the evening meal should be an aid for more efficient digestive process in addition to keeping in good physical shape." This point, I feel, requires some clarification, as most persons will find some difficulty in exercising one or even two hours after a meal.

The reasons for this are as follows:

• Immediately, and for about three hours after eating, the stomach and the intestines require a good blood supply for proper digestion and absorption of food substances.

• During moderate or severe exercise the muscles also require a large blood flow for proper functioning and the skin uses a large amount to maintain body cooling mechanisms.

• If the digestive and muscular systems are placed in competition for the same blood supply by exercising too soon after eating, the efficiency of both systems will be impaired due to insufficient available blood flow. In addition, the strain on the heart, which is called upon to provide a large blood flow to the two systems, may be excessive. The readers should experiment and judge for themselves by comparing their own pulse rates immediately, and five minutes following, a quarter mile jog at one hour and at four hours after a large meal. Give it a try! And good exercising!

LTC George R. Helsel
HQ, 25th Medical Battalion
(Inf Div)
APO San Francisco 96225

• It is generally accepted by the medical community that strenuous exercise following a heavy meal is to be avoided. The rest period prior to exercise is an individual factor, but should be no sooner than two hours after the meal. This is based upon the physiological factors of blood supply required for the digestive process versus the blood supply required for muscular activity as indicated above.

Although jogging or swimming should be avoided for several hours after eating, a casual stroll after dinner is definitely an aid in the digestive process and is recommended therapy in the older population. No pun intended, colonel.—The Editors

You Too Can Adjust Artillery

Too few aviators are taking advantage of the tremendous firepower made available to them by the numerous artillery fire bases scattered throughout Vietnam. By calling on the artillery instead of gunships, one aviator may prevent the unnecessary death of others

Captain Charles E. Hoskinson

"THIS IS Hot Stuff two-two over Ben Suc. I just received automatic weapons fire from approximately one-five Victor Charlies in woods. Request gunships or tac air, over."

"This is Square Lobster Cu Chi, gunships or tac air not available, but artillery coverage is available from Cu Chi. Will you adjust? Over."

"This is Hot Stuff two-two . . . er . . . ah . . . negative . . . ah . . . just forward as an intelligence report, out."

Every aviator has a responsibility bestowed upon him by virtue of the observation capability possessed by his aerial view. This aviator evidently refused to engage hostile troops with artillery merely because he could not recall the artillery instruction he had received in flight school. Let's look at a recurrence of the situation on another day with another aviator:

"This is Casper five-one over Ben Suc. I just received automatic weapons fire from approximately one-five Victor Charlies in the woods. Request gunship support, over."

"This is Square Lobster Cu Chi, gunships not available but artillery coverage is available from Cu Chi. Well you adjust? Over."

"This is Casper five-one, roger, over."

"This is Square Lobster Cu Chi, from this frequency go to Charlie frequency; contact Big Boy two-zero and send your mission, over."

"This is Casper five-one, Wilco, out."

(break)

"Big Boy two-zero, this is Casper five-one, fire mission, over."

"Casper five-one, this is Big Boy two-zero, fire mission, out."

"Five-one, from Ben Suc, east three-five-zero, north one-five-zero, one-five VC in trees, quick and delay in effect, adjust fire, over."

"Two zero, from Ben Suc, east three-five-zero, north one-five-zero, one-five VC in trees, quick and delay in effect, adjust fire, out."

Was the foregoing mission sent by an experienced artillery observer? Not at all. It was sent by an LOH pilot—a warrant officer recently graduated from the Warrant Officer Rotary Wing Aviator Course of the U. S. Army Aviation School. The artillery training that he received while going through the school was quickly recalled as he was told by the artillery advisory, Square Lobster Cu Chi, to send his mission to the Fire Direction Center (FDC) of the Big Boy element (Big Boy two-zero).

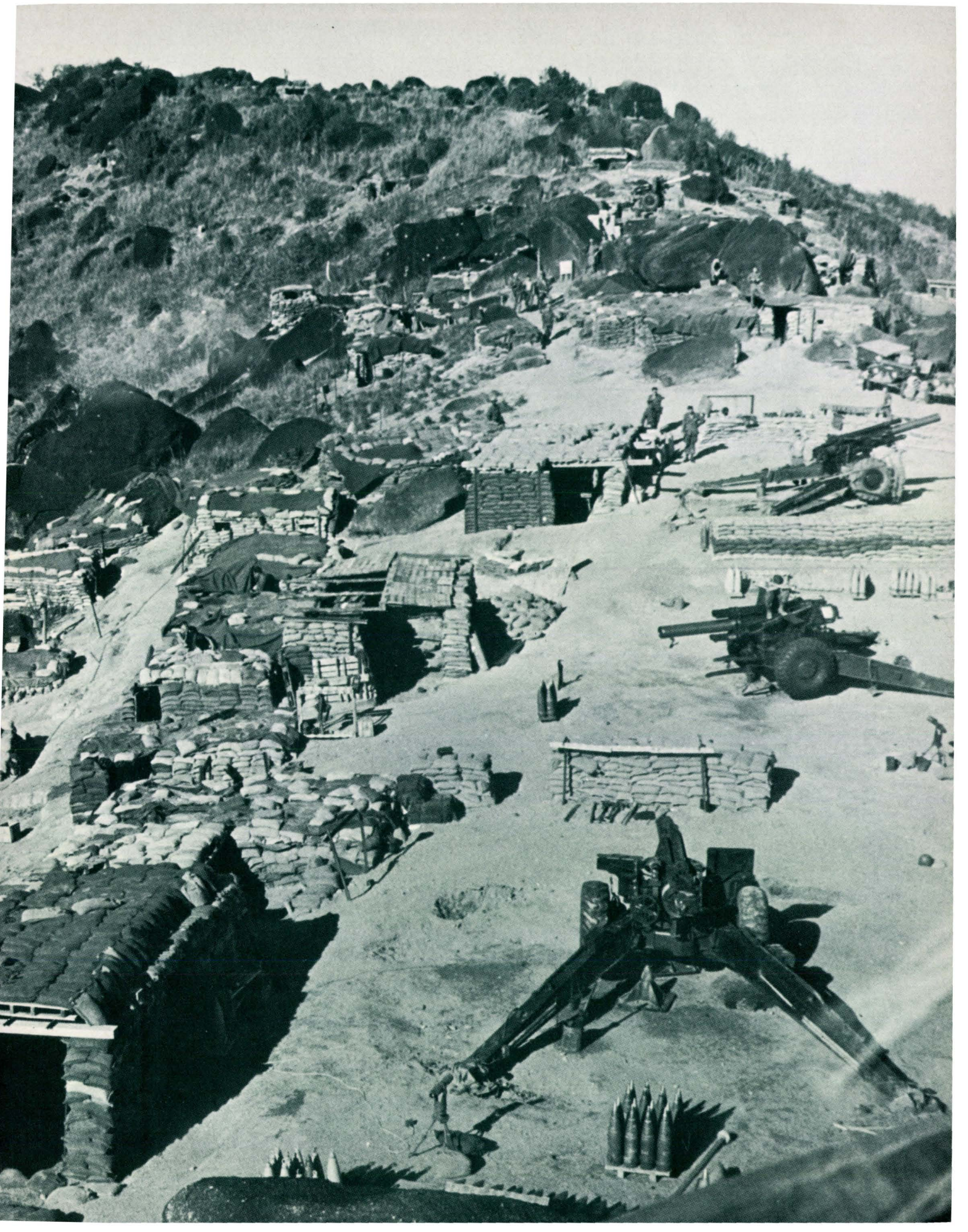
After identifying himself to the FDC, he alerted them and achieved communications priority on that frequency by stating "Fire mission." Using the short-phase readback, the FDC repeated for possible correction his entire transmission, as they would each succeeding transmission. On his next transmission, recalling the elements and order of the call for fire, the aviator sent the remainder of his initial request for fire. Let's break it down and see why he said just what he did.

Five-one—his brevity call number. Used before each transmission, it insures that his transmissions will be positively identified.

From Ben Suc, east three-five-zero, north one-five zero—his method of locating the target was the known point shift method, using cardinal directions. He realized that the FDC must have a map of the area, and could plot the center of Ben Suc on their firing chart (Figure 1). He could also have used grid coordinates.

One-five VC in trees—a brief, informative description of the tar-

Artillery fire bases such as the one at right are within easy firing range of almost every possible trouble spot in Vietnam. Yet, because many aviators do not recall their artillery adjustment training this accurate and deadly firepower is sometimes not used



get. This allows the artillery S-3 to determine a priority, what ammunition to use and volume of fires.

Quick and delay—the fuze action with which the observer *desires* to attack the target, subject to change by the S-3. Quick and delay fuzes will give high and low air bursts beneath the tree canopy. This is what he wants when he fires for effect, at which time he will get 50 percent of each fuze action.

Adjust fire—tells the FDC that an adjustment is necessary. It means the observer can see and will adjust the artillery rounds and that the unit may begin firing when ready; as opposed to fire for effect, which would mean that the target location was accurate enough to bring effective fire on the target without adjustment.

After reading back the call for fire for possible correction, the FDC then plots the data and the S-3 issues a fire order to the guns, extracts of which are sent in the form of a message to observer.

Let's listen as the FDC sends the message to observer:

FDC: "Two-zero, Bravo, two rounds, target Alpha Bravo four-zero-zero-one, over."

Observer: "Five-one, Bravo, two rounds, target Alpha Bravo four-zero-zero-one, out."

Now let's break down the message to observer and see what it tells him:

Bravo—"B" battery will fire the entire mission. In fire for effect, all weapons of the battery will fire; in adjustment, only two weapons will fire. Had it been "Battalion, Bravo," the observer would have known that an entire battalion would fire for effect and two weapons from Bravo battery would adjust. The adjustment will be performed with fuze quick only.

Two rounds—this tells the observer that when he fires for effect, two rounds will be fired from each weapon in Bravo battery. (Mixture of fuze quick and fuze delay.)

Target Alpha Bravo four-zero-zero-one—this gives the observer the designation of the target for future reference, if it is recorded.

The observer, in preparation for the firing of the first rounds, assumes a flight pattern which will allow him continuous visual contact with the target. Also, since his target is dispersed, he selects a small prominent, immovable feature near the center of the target as his adjusting point. (The point with reference to which he will make his corrections.)

"Two-zero, shot, over."

"Five-one, shot, out."

Shot—this tells the observer that the rounds have been fired and that soon he should be at a point in his flight pattern which will allow him to observe the rounds.

"Two-zero, splash, over."

"Five-one, splash, out."

Splash—this tells the observer that the rounds will impact in five seconds.

The observer sees the rounds (Figure 2) and uses the imaginary line (gun-target spotting line) from the guns to the target to make his corrections.

Since the rounds did not hit his adjusting point, the observer now wants to establish a range bracket using a quantity which can be evenly split to arrive at a 100 meter bracket (400, 200, 100, etc.); i.e., he ultimately wants two volleys 100 meters apart with the adjusting point between them, allowing him to add or drop 50 meters and bring effective fire on the target. Concurrently, he desires to correct his rounds onto his spotting line to the nearest 10 meters. Since he now has a specific point from which to shift, *the midpoint between the rounds,* he gives his initial subsequent correction (rounds were short and to the right).

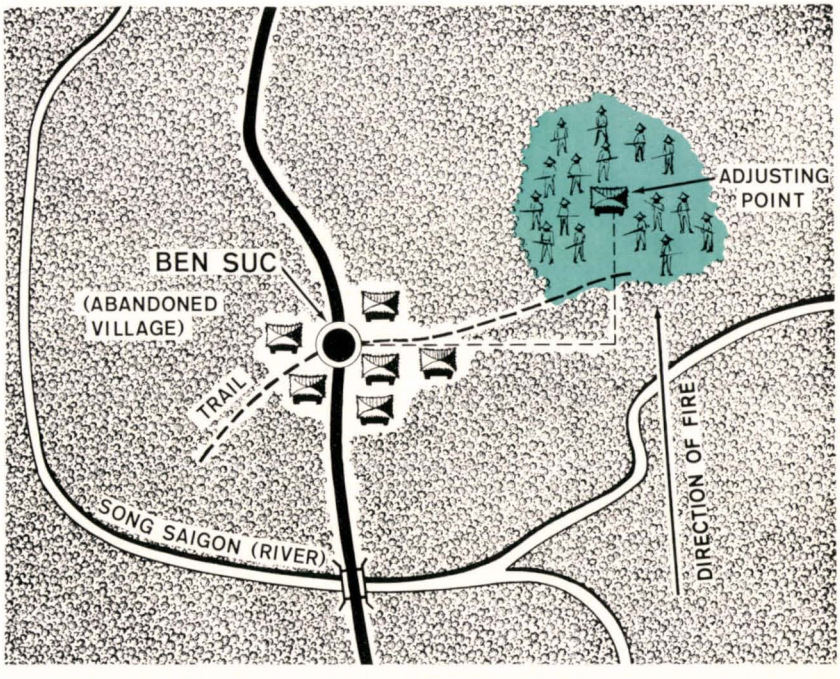
"Five-one, left two-zero, add two-hundred, over."

"Two-zero, left two-zero, add two-hundred, out."

Left two-zero—the observer's deviation correction with respect to his spotting line.

Add two-hundred—the observer's range correction with respect to

Figure 1



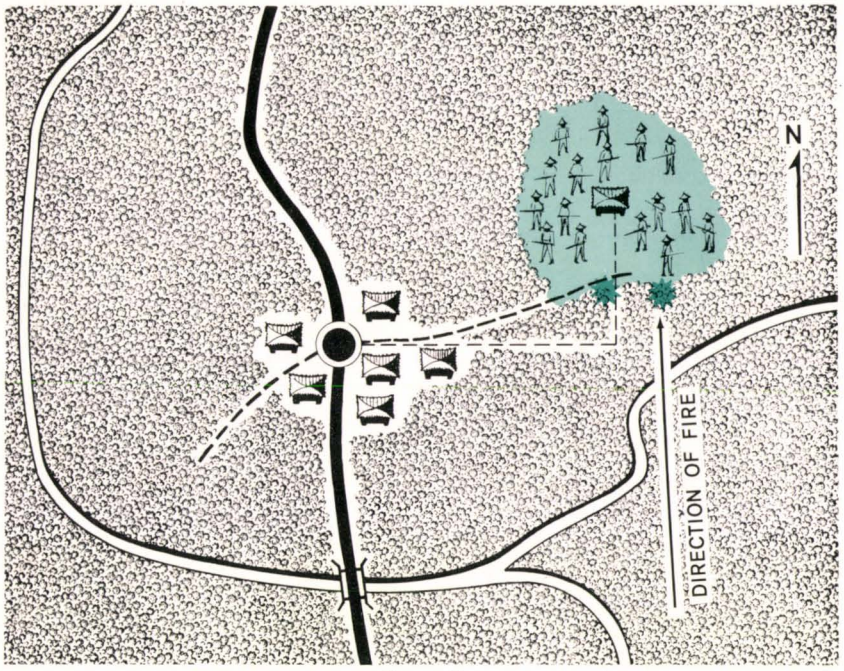


Figure 2

his adjusting point. He estimated that a 200 meter correction would result in rounds over the target.

The correction is plotted by the FDC, the observer receives "shot" and "splash" and the next volley impacts (Figure 3) over and on line. Successively splitting his range bracket, the observer transmits:

"Five-one, drop one-hundred, over."

"Two-zero, drop one-hundred, out."

The next rounds land short and on line (Figure 4). The observer knows the two preceding volleys were 100 meters apart, and that by adding 50 meters, he may bring effective fire on his target. In addition to his correction, he must change his method of control to fire for effect, thus causing the entire battery to fire two volleys.

"Five-one, add five-zero, fire for effect, over."

"Two-zero, add five-zero, fire for effect, out."

By establishing a bracket and successively splitting it, the observer has eliminated the necessity of making speculative range estimations. He needed only to determine whether the rounds were over or short until he split the 100 meter bracket, at which time he knew that a 50 meter correction would insure that fire for effect would be within 50 meters, the prescribed accuracy for range. In addition, bracketing in hilly terrain eliminates the requirement for the observer to send corrections pertaining to elevation changes, a factor which is extremely difficult to determine from the air.

The last correction was plotted by the FDC, all weapons in the battery fired two rounds each, the observer received "shot," "rounds complete" and "splash," the rounds landed, and he counted 15 bodies on the ground (Figure 5).

"Five-one, end of mission, one-five enemy casualties, over."

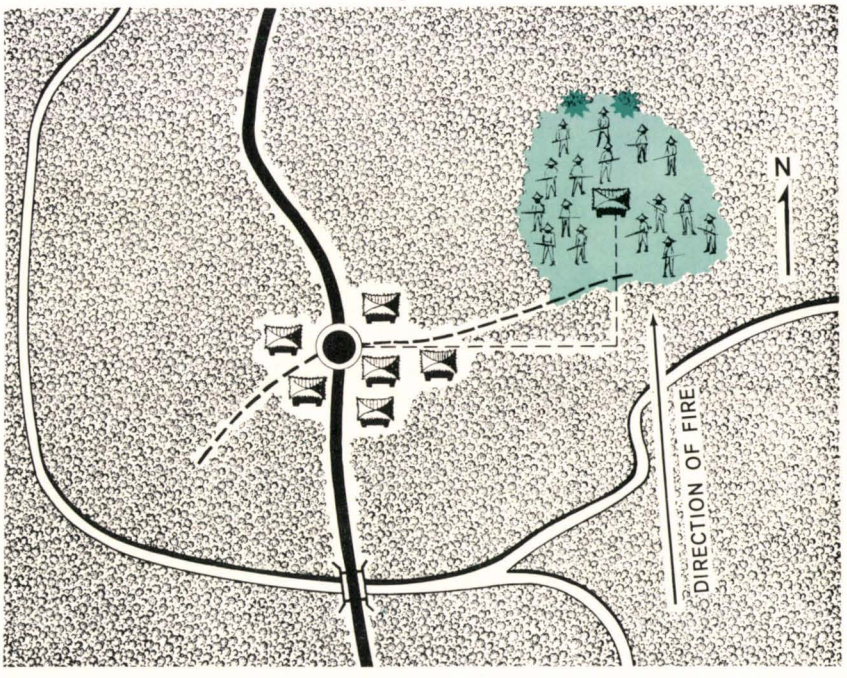
"Two-zero, end of mission, one-five enemy casualties, out."

End of mission—this immediately releases the unit for other missions.

One-five enemy casualties—this is the observer's surveillance. It provides valuable intelligence information and is sent through S-2/G-2 channels.

Artillery coverage is available in nearly all sectors of today's modern battlefield. Knowledge of the procedures pertaining to artillery adjustment will allow anyone to

Figure 3



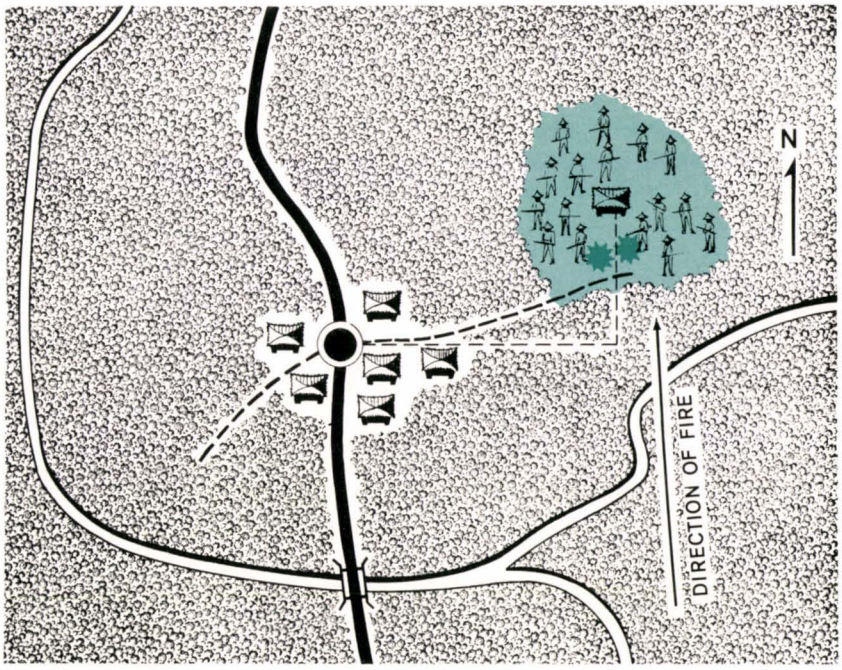


Figure 4

efficiently and effectively engage an enemy. Although the artillery has a language all its own and the most efficiency is derived from speaking to them in their language, a potential observer can attack a target by merely transmitting certain elements of information. Although the mission might take a little longer, we can and must accept the responsibility of observers by virtue of our superior observation capability. Today's aviator, because of the vantage point afforded him from his aircraft, is more than any other individual soldier, the "eyes" of the artillery. He has the potential of controlling a great amount of "the most explosive force the Army possesses." The ideal situation would, of course, be a firm knowledge of artillery adjustment procedures and communications. However, the use of a few key words will help to remember the essential elements of a call for fire.

WHO—the observer's identification

WHY—fire mission

WHERE—location of the target

WHAT—target description

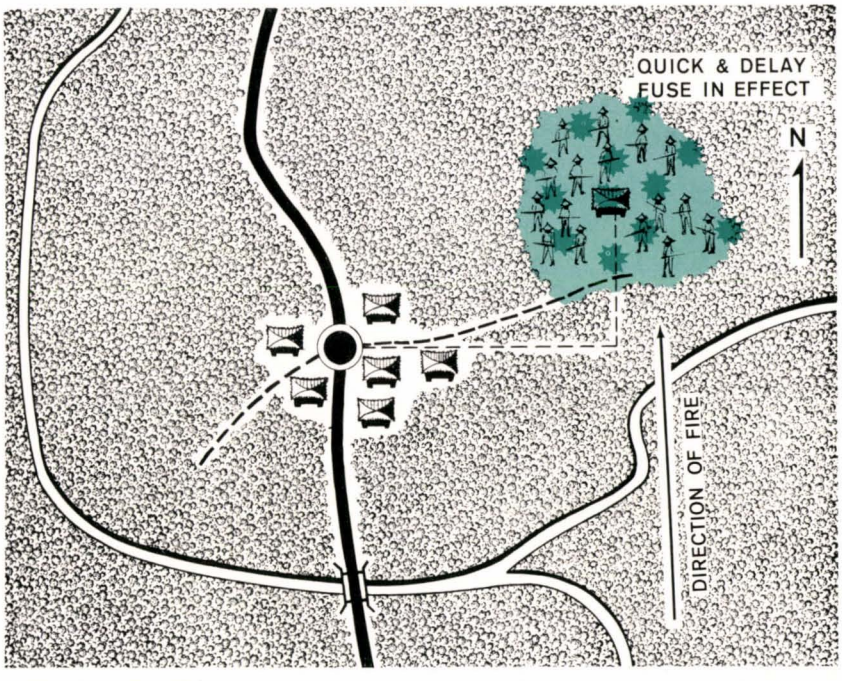
HOW—how the observer intends to attack the target (i.e., shell, fuze, whether he wants to adjust or fire for effect, etc.)

The fire direction center is keyed to this order of receiving a call for fire; but the essential elements, in any order, will get the job done. It may take a little longer, but mission accomplishment at the fastest rate possible is also their goal, so they will provide the maximum amount of assistance to you.

After the rounds come out, the best way to adjust them is the method shown, by moving deviation onto a spotting line and establishing and successively splitting a range bracket; but any method, even so much as saying, for example, "east one football field, south two football fields," will result in positive action by the fire direction center. Actually, the only limitations are the individual aviator's imagination and his ability to communicate.

So, the next time Charlie decides to pick on your aircraft, and before you call for gunships or the Air Force and give your adversary time to di-di across the border, remember that you have an on-hand response by hitting your transmitter button and calling upon "one of the greatest killers on the battlefield."

Figure 5



Although intricate, the Army supply system works smoothly when you

Eliminate That Scrounger

Major Lewis A. Smith

HOW MANY TIMES has your crewchief said to you, "That supply room never has anything I need?" How many times have you stopped to realize *why* that supply room never has anything you need?

One of the big reasons may be the scrounger. Yes, the scrounger—the guy who doesn't have the supplies right at his fingertips, but he sure knows where to get some in a hurry.

Tech supply, as we commonly refer to it, is the element at unit level that keeps new aircraft parts coming in and old ones going out. The tech supply system at unit level as established by AR 735-35 is one of the finest military supply systems ever established. If given a chance to work, the system will support an aviation unit under the most adverse conditions. The key is *if given a chance to work.* It won't if the scrounger has his way.

The scrounger is generally found in two forms. First there is the *poor-planning scrounger.* He is the crewchief or mechanic who will always wait until his aircraft becomes EDP (equipment down for parts) before scrounging the required part. He knows the supply room does not have the part because it didn't have it yesterday, so he doesn't even bother to check today. He goes straight to his buddy who has one locked up in his toolbox.

By not going to the supply room first and letting the supply sergeant know he needed the part, no demand is recorded and no levy is placed on the supply system. Consequently the supply section will never have the part on the PLL (prescribed load list).

Of course, the poor-planning scrounger is the first man to complain to the platoon sergeant, "That lousy supply room never has any parts I need." He's right too, because no one *knows* he needs them.

The second type is the *long-range planning scrounger.* This individual is generally directly connected with the supply system. He costs the Army a lot of money by stocking every part he can get his hands on, to include those that are above the maintenance capability of his unit.

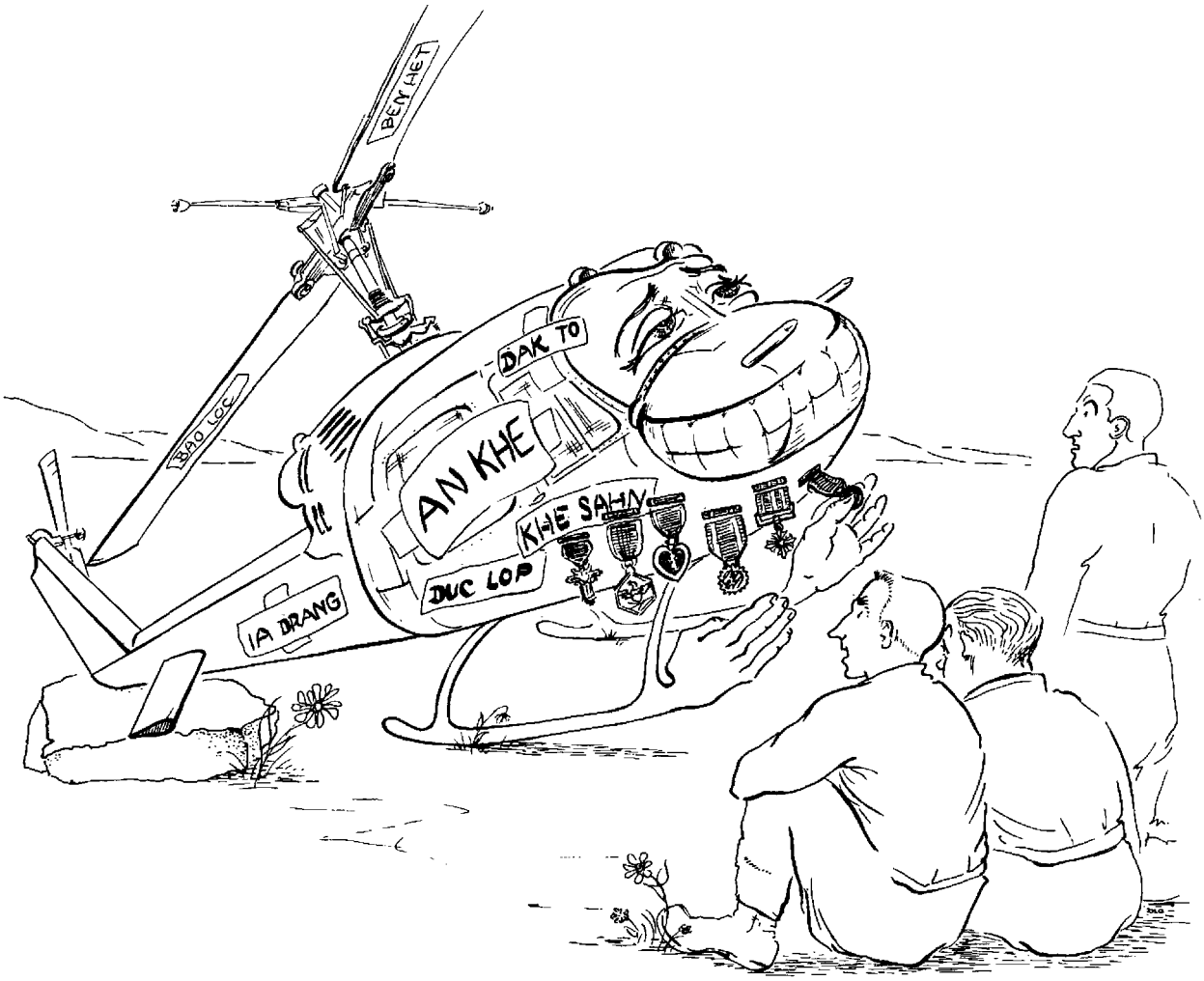
I was assigned to an aviation section in the Republic of Vietnam. Shortly after reporting, the section commander decided he needed a new tech supply officer. Since I had some previous experience in the field, I got the job. One of my first duties as the new supply officer was to inspect the parts room. Lo and behold, there were enough parts in there to build a complete U-6. Yes, even the wings, horizontal stabilizer, vertical stabilizer and rudder. Not only were we not authorized to stock approximately 80 percent of the parts on hand, but if such parts had to be installed it would have had to be done at a higher echelon of maintenance.

Let's say for example your aircraft needs a generator. Your supply room doesn't have one and must request it for you. The aviation company 100 miles north has one on hand because there is a long-range planning scrounger in the supply room. You request one from your DSU (direct support unit) and are told it will be a week before the part comes in. No one knows about the one up north except the long-range scrounger of that unit. A lot of good it is doing you. So you sit and wait while his sits on the shelf collecting dust the same as it has been doing for the past six months.

The next question is, What can I as a commander do about this guy? I don't have time to become a supply expert and inspect supply records all day. But it is simple to determine if your supply section is applying the proper procedures.

First pick up a dash 13 from any aircraft in your unit. Look at any writeup on it that required a part replacement. Check to see if the part is on your PLL. If so check to see that the balance on hand has been reduced by the number of parts used on or before the date the replacement part was installed on the aircraft. If the part is not on the PLL, have the supply clerk show you the entry in his document register where he requested the part from the DSU. If he did not request the part and it was not on your PLL, then someone in your unit had to scrounge it.

This may seem like a long drawn out procedure but the whole process should take about two minutes. By employing this procedure over a short period of time you will find your scrounger. The finger will point directly at the individual responsible. Eliminate his scrounging activities and *give the system a chance to work.*



Am I A Machine?

You'd better believe it—I couldn't have done it alone

CW2 David R. Shriner

I AM A HELICOPTER, a UH-1 Delta, or as my friends call me, "Huey." Although I am young in terms of years, only five, the hours have been long and the skies have been rough.

My L-11 heart has been replaced many times and my main rotor is no longer the same. In fact, there is very little left of my original self. Yet, I am still the same helicopter, as can be proved by looking at my 2408-15 birth certificate. I am the same old number 64-9718 and proud of it.

I was born of Bell Helicopter in the spring of 1964. From Texas I moved to Georgia and received my introduction into Army aviation at Ft. Benning.

Oh, what old memories come floating back from Benning. How many of you could sit and talk with me about the 11th Air Assault? We could talk and laugh about everything from bloused flight suits on down. We could talk about the long hours we spent trying to develop a working solution out of a new concept called airmobility. We experimented with everything imaginable and I am still laughing and wondering at some of the things you had me try to do. Many people said it wouldn't work, this idea of a division being transportable by helicopter.

Where are my critics now? Is there anyone now laughing at me or at my division? We left Ft. Benning in 1965 with a thousand things to prove and even more things to learn, but I left the States with the best men and equipment the Army could send with me. I learned, and the division learned, and while learning, we proved.

I went into combat; I have many sheetmetal grafts in my side to show of my CAs (combat as-

saults). War stories? Place like the Ia Drang Valley? I remember well. I was the first one into that valley and I was the last to leave. From a place called An Khe, chopped out of the jungle for my home, I have been to every corner of that land.

If it sounds as though I am blowing my own horn, I am. I had much to learn as a newcomer, but now I know. If they gave medals to such as me, I would proudly wear everything from the Good Conduct Medal to the Distinguished Service Cross.

While in that distant and strange land I developed a cancer of corrosion in my crossmember and was sent home to die. At a place called Corpus Christi, Tex., and at a hospital called ARADMAC I was given a reprieve. The doctors there, some of the best civilian and military maintenance men in the world, gave me a complete overhaul. Warm sea breezes from the Gulf helped soothe my battered frame and in a few months I was once again strong and fit.

You can find me now at Evans Army Heliport, Ga., a million dollar home that is as fine as any helicopter could ask. I serve the students and instructors of the Department of Tactics proudly.

Although you have given me a nickname and speak fondly of me, I am only a machine. If I fail you I will not ask for forgiveness, for I cannot; I can only suffer silently. While I have this one chance to speak, listen to what I say.

You pilots, for both your sake and mine, must watch and care for me constantly—both our lives depend upon it. Do not abuse me for I cannot protest. I can only groan from the depths of my inner self when you suddenly twist on my throttle and I am over-torqued.

There have been many books written about me for you. Do you know them? There is very little you need to know about me that is not covered in one of my TMs.

My dash 10 should be the law to anyone who would attempt to operate me. Within its pages you will find instructions on how to direct me to accomplish virtually any mission. My book will take you step by step through preflighting, starting, flying and stopping me. Do you want to know how much I can carry? How to load me? How to operate special equipment? You only have to look.

As I said before, I am only a machine, I can fail. You are only human, you can also fail. Do you know what to do when one of us falls down on his part? This book will certainly start you off on the correct procedure toward saving my sheetmetal skin (over-stressed and patched though it may be). You do not have to be exceptionally bright or talented to operate me, only smart enough to follow some basic procedures, once you have read my book.

I am like you in one respect. I have limitations as to the amount of stress I can take. If I am continually over-worked and overstressed, I cannot be expected to live out a normal life span. We may struggle on every day but it only takes once for us to come up short. We both need rest and maintenance periodically. When you pilots find me ailing, do not ask me to "press on" when I am not able; send me to see my crewchief.

You crewchiefs, you are my key to survival. Do not use folk medicine on me. Read and heed my dash 20 of remedies. I have been known to fail at anytime and in many different ways. If you are familiar with my dash 20 it will help you diagnose my problems and tell you how to repair me, step by step.

There are many parts of me that may appear unimportant to the untrained eye. I cannot perform a mission without radios. I need my clock for accurate timekeeping in flight, especially for instrument flight. I must have a clean unscratched windscreen for clear vision at night. These things and many more are your responsibility to me and my pilot. We in turn have our responsibility to you once we leave the ground. From the time our mission begins with six pair of eyes on a preflight being better than four, we are a team, success or failure of our mission depends on how well we work together. It is through the combined efforts of many men that I survived three years of combat flying, and it will be through the efforts of many more if I survive stateside combat.

I guess I have been fortunate to have met so many of you so far in my flying. I have had everyone from a three star general in tanker boots and 50 hours, through a "wobbly one" with 200 to a "whisky-four" with 12,000 hours at my controls. If there is one thing I could ask for after having met and worked with such a variety of people, it would be for standardization.

There are many ways I can be started, flown and shutdown and maybe I am only getting old, but I don't want to be burned up because someone who "knew it all" forgot to check my governor in the "normal" position. These students who are learning in me, whether they are going to be flying me for three years or 30, if they are to survive they don't need to increase the odds against themselves by taking short cuts. The old saying, "That's the way we did it in my old unit" is out. The "in" thing to say is, "That's the way we do it in the Army."

You have listened to me rambling long enough. Just remember that men everywhere regarded me as the best. I have proven my ability, dependability and friendship to all, but I am still a machine.

THE ANNUAL WRIT

Captain David B. Bradley

WITH PROPER tools, a person can do a lot of jobs well. This also applies to Army aviators who certainly are provided with many aids—one of the most valuable being the annual writ.

The annual written examination is a comprehensive test which covers virtually every facet of preparation for and completion of a realistic, if not routine, operational mission. It includes pertinent questions on regulations, weather, flight planning and filing (both VFR and IFR) and actual execution of the flight.

The fact that it is a comprehensive and realistic training tool has been heralded by other services and various branches within the Army alike. Some critics have suggested literally that individual branches would gain by emulating this aviation practice and giving, for example, a field artillery annual writ every year or two to its officers.

It appears clear that we do have a good thing going for Army aviation when we require every rated soldier to prove his abilities now and again, and it should be looked on by any individual aviator as an excellent chance to improve himself by pointing up and resolving any weaknesses.

Grumblings concerning the annual writ basically appear to condense to the idea that the examination was of benefit when there were many people on ground duty. However, it does not really serve much purpose when an aviator is flying continuously, as in the Republic of Vietnam (RVN) or with an aviation school. This argument continues to the effect that virtually everyone with wings now is primarily concerned with flying, and is thus "up" on all this exam material anyway. There are a number of fallacies in this argument.

First, assuming that everyone primarily concerned with aviation is "up" on all facets of the job is not as effective as helping to guarantee this with the help of the annual written examination and other aids such as instrument renewal rides. If it was not necessary there would not be any full-time aviators taking the exam two or three times before successfully completing it, and some of us can verify the fact that occasionally this happens.

The aviator who flies every day rarely performs, in a year's time, a great enough variety of missions to encourage use of all the skills he learned in flight school. It is even entirely conceivable that an aviator may forget how to read coordinates, as he may very well have the milk runs of his day-to-day operational missions memorized from the taxi diagram at home base to the commercial broadcast stations enroute.

Few of us would allow ourselves to weaken in regards to basic pilotage or map reading but there are many other areas where any given aviator may very conceivably be weak. Not many have the opportunity to continually practice every type of mission which our wings qualify us for, and an annual written examination at the very least informs us as to whether or not we could live up to expectations. It reminds us that there are other missions besides the daily courier run, command and control mission or student training mission, and that we are expected to be able to perform them professionally at any time by virtue of the wings we wear.

As an example, let's assume that a captain who has been a contact instructor pilot at the aviation school for a year or more is eminently qualified, with no broken aircraft, no busted students and two broken wing awards to his credit. He has handled every situation with equal aplomb and always has managed to be on time with corrective action. His personal specialty is instructing in autorotational techniques, and he grins at good ones, bounces with bad ones and recovers rotten ones to the enlightenment of his students and to the good of the service. He is one of our average, excellent instructor pilots, extremely professional in his outlook, but he may not have filed a DD Form 175 in months.

In addition he may not know where to look for the instructions on filling out the DD Form 175 block by block. But the annual written examination will bring these faded skills to the surface again, and, if the captain is half the professional his record suggests, it will stimulate him to further research and resultant greater knowledge in the field of aviation.

As another example of a constantly aviating type pilot, take a look at a CW2 who recently was promoted and just returned from Vietnam where he helped establish glowing chapters in the history of airmobility through his professional knowledge of his aircraft's capabilities and his assigned mission.

This CW2 feels more at home in a UH-1 than he does in the green uniform he sports while receiving the DFC and 33 clusters to the Air Medal. He has operated bravely and sanely as a combat

pilot and is justly proud of his success in this ultimate test of a soldier. He is perhaps one of the first to question the advantage of an annual writ. He has proven himself in combat; what further proof does the Army need of his abilities?

The occasional man who thinks like this CW2 tends to ignore the Army's need for men in training environments and in postures of readiness in other than combat areas. A flying assignment other than combat more thoroughly involves the subject of regulations and study on the aviator's part. Our CW2 may not have used an E-6B for a year, or filed a flight plan for a year or thought about such rules as basic VFR cloud separation and minimum visibility VFR in control zones since flight school, and he quite possibly never heard of TERPS [Terminal Instrument Procedures].

An aviator who tries to keep up with regulation changes often finds it close to impossible in a combat zone. The annual writ helps him by pointing up rules that have changed and clarifies vague memories from flight school which have a familiar but less than clear ring. If the CW2 mentioned above accepts the annual writ as a tool and a challenge to professionalism he is well on his way to becoming a well-rounded aviator.

The last example of the aviator who flies daily in the course of his primary duty might be exemplified by a major who has been assigned to Hawaii for two years and has done all of his flying for a headquarters detachment. In two years this accomplished and competent aviator has learned literally everything about the islands pertaining to aviation and could probably go anywhere in his area of operations without a map or an approach chart, VFR or IFR, and hit his destination within three minutes of his ETA every time.

The major has been an Army aviator for some time and is a true professional. He is aware of regulation changes, weather sequences, flight planning and filing and can read a chart, be it VFR or IFR, with the best of them. He will probably only miss one or two questions on the annual written exam and will learn from these missed, as well as from some he answers correctly. If he should max the exam he will know that it is partly because of knowledge gained as a result of earlier annual writs and the interest they fostered, as well as the large number of answers he deemed it wise to look up on this one. There has probably never been an Army aviator who hasn't learned something while taking an annual written examination.

The largest group of aviators, including the above examples, involves the man who flies daily in performance of his primary duty. This is the man who occasionally claims he doesn't need the exam. He flies nearly every day but sometimes ends up having to take the examination twice anyway. The pertinent factor here is the fact that, for example, an instructor pilot can fly the "idiot-circle" every day for a year and never file a cross-country flight plan. He well may be currently familiar with only a small portion of the broad spectrum of Army aviation even if he does fly every day. This same man may be called on tomorrow to lead seven aircraft in a ferry flight across the United States. The annual writ is one way of insuring that he can accomplish, right now, any mission.

Finally, the growth of Army aviation has invariably increased the number of flying-desk jobs. This semi-ground duty category B type assignment, though aligned with aviation, does not always allow an individual to keep personal skills polished. The annual writ certainly is as valuable a tool to these desk aviators as it is to those on ground duty. As a means of keeping up with regulation changes, the writ refreshes and renews their thinking and keeps them abreast of the changes in FAA (and subsequently Army) regulations which continually take place.

The annual written examination has proven itself valuable. It does not limit professionalism. It does help guarantee that the guy sitting in the cockpit with you meets certain standards. For those coming back from RVN and facing the annual writ for the first time, and for those who learn something new from it every year, let us welcome this exam as befits the excellent and challenging training tool that it is.

Who Is In Command?

Captain Jerald M. Kowieski

CEILING: 1,000 feet. Communications: who knows? Nav aid: inoperative. Altitude: 800 feet. Heading: 350 degrees. Fuel: about 30 gallons remaining. Location: somewhere in the Republic of Korea.

Misoriented! Lost! Remain calm, lieutenant, or is that technical knowledge you absorbed in flight training still back in the operations room? Hmm, the colonel's crimson face has changed a few drastic shades. It seems his need for this flight has dwindled. At least, the two sergeant majors have a smile of confidence, or is that smile derived from the satisfaction of viewing the colonel's apprehension?

Oh yes, my other passenger, my cohort in crime, my famous map reader, just lost confidence in his own ability to decipher a map.

Phew! The way the colonel snagged that map. I wonder if he can do any better? What does he need a map for? Didn't he say he had flown this route many times and could do it blindfolded?

Lieutenant! You blunderhead! Who is in command of this U-6, anyway? Wait, just how did you get into this situation? Let's look back.

After a few months with the 3rd Aviation Detachment, I had a good flying reputation and the eagerness of a young aviator in charge of the world.

During these few months the weather couldn't have been better for flying. In fact, until this fateful day, I couldn't imagine what the CO meant when he warned me of the unpredictable Korean weather phenomena.

On this particular day, I could see I wouldn't be soaring through the Land of the Morning Calm with my usual bird's-eye view. Almost instrument-type weather, and I still didn't have my Eighth Army instrument checkout. It didn't matter anyway, I was the only aviator available for the mission.

Drat it. The colonel sure would be mad if I cancelled his flight. But cancel it I would. Summoning my courage, I immediately proceeded to operations to call the colonel and give him the status of the flight. Maybe his wrath wouldn't fall as heavy if I could still catch him in his office. He was a very impatient man and he sure didn't like waiting on young lieutenants. Over-the-bar gossip had it that lieutenants had better give him a wide berth. I hoped to do just that.

"Sergeant, give the colonel's office a call and tell him we are cancelling his flight," I authoritatively announced.

"Too late lieutenant. He just called and is on the way out."

"Well, let me call weather and fill out the 175-1, so I can give the colonel a verified reason for cancelling," I said with determination.

As I finished the 175-1 weather briefing, the sergeant remarked, "The colonel is here and so is Captain Murphy with the two sergeant majors."

"Good morning colonel. I'm sorry but I will have to cancel your flight due to weather."

"You what?" (Boy, why did he have to shout so loud?) "I've flown in weather worse than this! What is the weather anyway?"

"Sir, the weather is marginal, 1,000-foot ceiling with four miles visibility and a slight chance of drizzle."

"Why lieutenant, that's VFR. Let's go!" (There he goes, shouting again.)

"But sir, you have 50 miles of mountainous terrain to cross and some of those mountains are 5,000 feet. Those aren't mole hills in my book."

"Lieutenant," the colonel scanned the map, "do you see this railroad winding between these hills from Taegu to Seoul?"

"Yes sir," I said meekly, "but I have never flown that route, least of all at 800 feet."

"Well lieutenant," he said, as if he'd solved the problem, "I have. Now let's *go*!" Then he took a side-long glance at the captain and remarked, "If you feel I can't direct you from here to Seoul, I'm sure the captain here can read a map. Is that right captain?"

"Yes sir," the captain replied. "I could sit in the copilot's seat and guide our young driver with this map."

"Okay, sir," I said doubtfully, "let's give it a try." As an afterthought I added, "Sir, it will take me about 10 minutes to file my flight plan and give our Beaver a quick preflight."

"All right, but hurry up; I'm already late."

My preflight and runup checked out fine. That is,

move, lieutenant!

"I'm sorry Colonel, but I'll have to cancel our flight."

"YOU WHAT?"

everything was fine except the ADF. There it was, my one and only nav aid swinging 360 degrees, just not knowing where to stop. No bother, we were going to follow the railroad tracks anyway and the colonel was in a hurry.

Everything was going as the colonel had planned. We whizzed in and out around those hills. I wondered if the passengers noted the ceiling was lowering. It made me perspire excessively to think that if it got any lower there just wasn't a place to turn around. Also, what would happen if another crazy aviator decided to fly down from Seoul on the same route?

Ah, there's Taejon. Out of the mountains at last. You might say, home free. But wait! *Where did that railroad go?*

"Captain. Hey captain, sir. I've lost the railroad. What heading do I pick up from here to Seoul?" I asked with all the assurance a young pilot could muster. I sure didn't want to circle around looking for the railroad and waste more of the colonel's valuable time.

"Oh lieutenant," he answered in a tone clearly implying that I was the major problem, "take up about a 350-degree heading. That seems about right."

I wished that he hadn't turned that map in so many different directions to get that heading. Oh well, he did state he knew how to read a map.

"Thank you sir. We should reach Seoul in about 45 minutes," I advised.

One hour later, the only distinguishable landmark among the rice paddies was a nice wide river running approximately east and west (the dividing line between South and North Korea).

"Captain, where are we?"

"I don't know. I lost you on the map after I gave you the heading." (The captain couldn't hear me swear.)

I had been depending on his map guidance. I wish I had my ADF. If I only had taken more time on the ground to have it checked by the radio repairman. It had quit altogether. Well no problem, I guess, there's still radar coverage. I should be in range of Osan radar. Maybe I can get a vector to Seoul.

"Osan radar, Army 767, over." Complete silence ensued.

I raised by voice a few octaves and called again, "Osan radar, Army 767, over." *Nothing!*

I quickly checked all other frequencies and still—*nothing.*

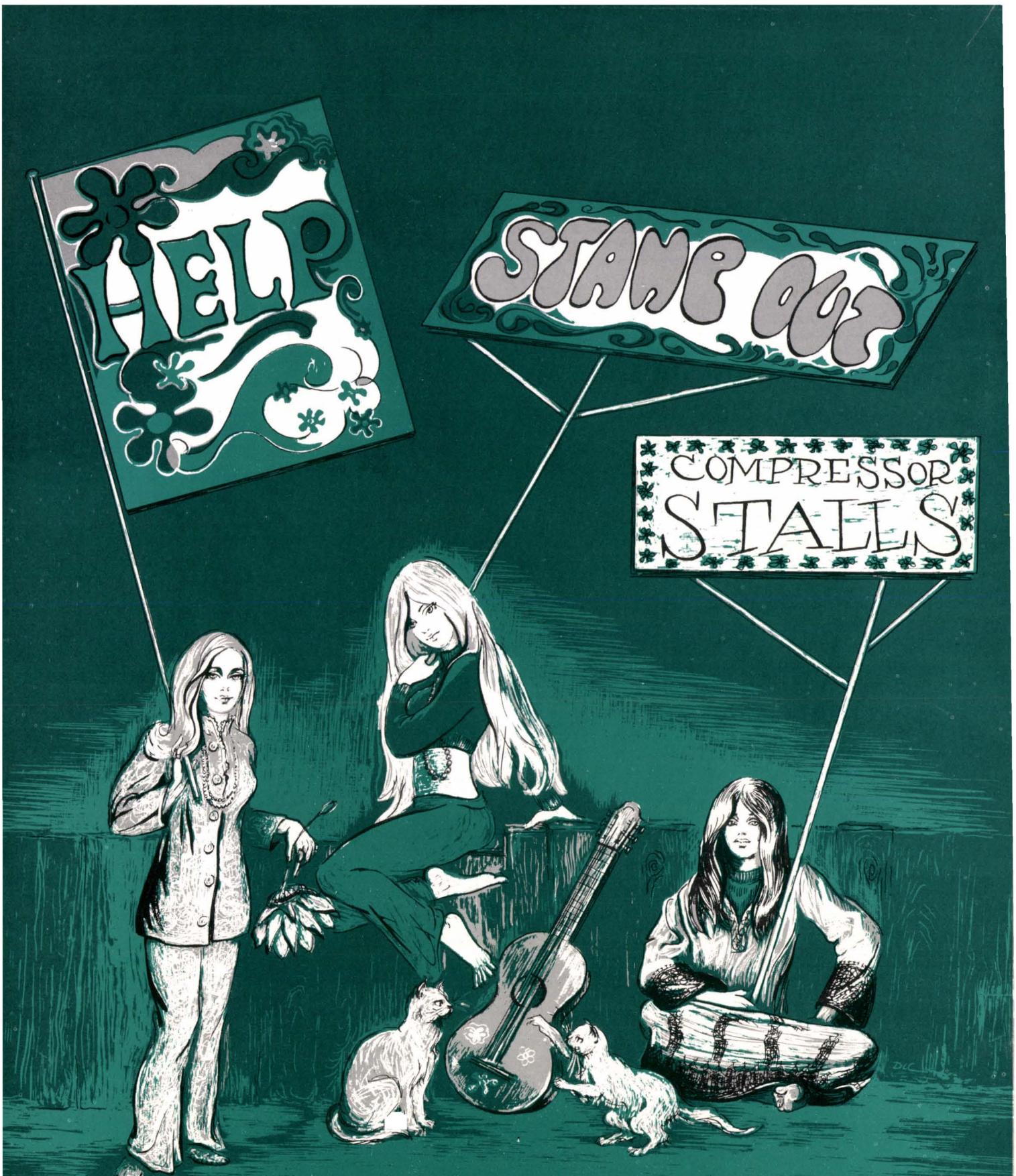
Finally I had to admit I was misoriented, not lost. I was in South Korea, wasn't I?

The ending of this story is not nearly as important as realizing the errors that were made and the disaster that could have happened. Many young aviators could find themselves in a similar situation and possibly a few older, more complacent types as well.

So consider which of the following you have been guilty of:

- Taking a flight beyond your capability. We are all the best, but who wants to admit what we are capable of?
- Incomplete flight planning. All routes of a flight should be checked thoroughly, and all alternatives.
- Flying in marginal weather with inoperative navigation equipment, or for that matter lacking the smarts to request a copilot.

The young aviator should remember that as pilot he is in command of his aircraft and his decisions may spell the difference between success and disaster.



Compressor stall is usually brought to the pilot's attention by loud popping noises—by then there is little time to worry about preventive measures

CW2 Thomas A. Rey

"POWER RECOVERY! Can't you see you're going into the trees?" the instructor pilot shouted at his student. This student had been having problems reaching a clear area on simulated forced landings. He just could not perceive, when making a power recovery, where he would have touched down if he had continued his autorotation to the ground. This was the reason the instructor had always let him descend to the specified obstacle clearance limit before ordering a power recovery.

The gas producer rpm was holding at a steady 60 percent so there should be no problem making a power recovery, even though the student had placed them in a low airspeed, low altitude, high rate of descent situation. There should be no problem, or so the instructor thought just prior to increasing throttle. His rapid throttle increase brought about an immediate response from the engine, not in the expected manner but in the form of loud staccato machinegun like noises. It was the characteristic sound of a compressor stall and in their situation it was a sound as ominous as that of enemy fire. The compressor stall had brought a rise in exhaust gas temperature and a *decrease* in rpm.

The low altitude and high rate of descent of the aircraft precluded any chance of reaching a suitable landing spot, regardless of the instructor's skill in operating the aircraft. They were totally committed and went into the trees.

There were two obvious factors involved in this accident: The instructor pilot allowed the student to go too far in the maneuver, placing the crew in a hazardous situation, and the engine suffered a compressor stall at this most inopportune moment when power was badly needed.

Let us now trace their flight to see if we can determine the reason for the compressor stall which put these hapless aviators in the trees that morning.

The morning was unusually cold for that time of year. The instructor and student were beginning another day of transition training. The preflight inspection and runup procedure were completed with only a slight discrepancy noted. The engine ice detector caution light remained illuminated and there was no change in exhaust gas temperature reading when the de-ice switch on the pedestal was moved to the ON or OFF position. The instructor incorrectly interpreted these discrepancies to mean the indicator light was malfunctioning or that the anti-icing system was inoperative. This did not seem to be of great importance at the time due to the fact that the freezing level had been reported to be above 4,000 feet and the maximum training altitude they would be using that day was below 1,000 feet.

After takeoff, the instructor turned on the bleed air heater to circulate some warmth into the bone-chilling air of the cabin. The training period was almost completed when the instructor initiated the ill-fated simulated forced landing which turned out to be an actual forced landing.

Investigation shows that the compressor stall which contributed to the accident and thereby making necessary the forced landing, could have been avoided if the instructor pilot had been more familiar with the cause of compressor stall and its relationship to the use of the bleed air operated accessories and available engine power.

Compressor stall, also known as engine surge, is a potential problem in the operation of any gas turbine engine. It is usually brought to the pilot's attention by its characteristic loud popping noise, accompanied by excessive fluctuation of engine instruments.

The blades on a turbine compressor are airfoils and are subject to stall just like the airfoil on a fixed wing aircraft. The pitch on the compressor blades is fixed, therefore, the angle of attack is fixed. One may wonder, then, how the blades can stall if the angle of attack is fixed. Although the angle of attack is fixed, the *relative* angle of attack will vary with the speed of the compressor and the velocity of the air moving through it. Compressor stalls occur when the delicate balance between the compressor pressure and the pressure from the combustor is not maintained. Whenever the pressure from the combustion chamber exceeds the pressure from the compressor section, the higher pressure in the combustor section will tend to discharge forward or back through the compressor and cause a momentary airflow stoppage. The relative angle of attack of the compressor blades is, of course, greatly increased and the compressor stalls.

There are several factors which can contribute to compressor stall, some of these factors are not under the direct control of the pilot, but rather depend on the age and condition of the engine and on the maintenance performed on the engine.

Engine deterioration is a contributing factor; erosion of the compressor blades or foreign object damage to the compressor will reduce the amount of pressure it can supply, therefore, increasing the chances of compressor stall.

There are several other causes of compressor stall which are primarily of a maintenance nature since they are due to malfunctions or material failure. These causes

Help Stamp Out Compressor Stalls

include a faulty or maladjusted fuel control. If the fuel control were to put a large amount of fuel into the combustor at one time, the pressure from the combustor could exceed the pressure from the compressor which would have to accelerate before it could match the combustor pressure. A faulty or maladjusted bleed air band can cause compressor stall, for it is through the bleed air band that the excessive pressure is reduced to unload the compressor and allow it to recover from a stall. A dirty compressor has the same effect as an eroded compressor in causing compressor stall. The dirty compressor cannot put out sufficient pressure to maintain the delicate balance of pressures necessary.

Although these causes are not under the direct control of the pilot, I have mentioned them here to bring to your attention that if one of these conditions exists, even if it is not in itself severe enough to cause a compressor stall, the possibility of one occurring is greatly increased. The pilot's actions only help to magnify the deficiencies already created.

Compressor stall, if it occurs, is likely to take place during engine acceleration when the pressure can rise in the combustor faster than the compressor can accelerate to match that pressure. A power recovery from autorotation and starting the engine are two situations when compressor stall becomes more apparent. From the description of compressor stall, it can be seen that anything which would tend to lessen the amount of pressurized air going into the combustor would contribute to the likelihood of compressor stall.

Any restriction of air in the engine inlet area will reduce the volume of air the compressor can move and the pressure it can produce. A dirty or clogged engine inlet or engine inlet filters will definitely reduce the available air to the engine and can possibly cause a compressor stall. The engine inlet and filter area should be inspected visually before and after every flight and all obstructions, such as leaves or straw should be removed.

Misunderstanding and misuse of the bleed air driven components is a prime pilot-induced factor in compressor stall. The various systems which operate off the customer air or bleed air, use air pressurized by the engine compressor and thus they "steal" the air from the engine combustor. The bleed air, in the UH-1 series aircraft, is used to drive the engine and transmission oil cooler, the de-icing system, the bleed air heating and defrosting system, and on the D and H models, the left fuel boost pump.

Misuse of the bleed air cabin heater can contribute to the possibility of engine compressor stall. Precautions to be observed in operating the bleed air heater vary according to the model of the engine installed in the aircraft. These precautions should be strictly adhered to and are found in the dash 10 for each model.

With the T-53-L-9 engine:

- Do not use bleed air heater on takeoff or landing, or during engine restart during flight.
- Do not use bleed air heater with AIR selector switch in position 3 or 4 when above 85 percent gas producer rpm.

With the T-53-L-9A, —11 and —13 engines:

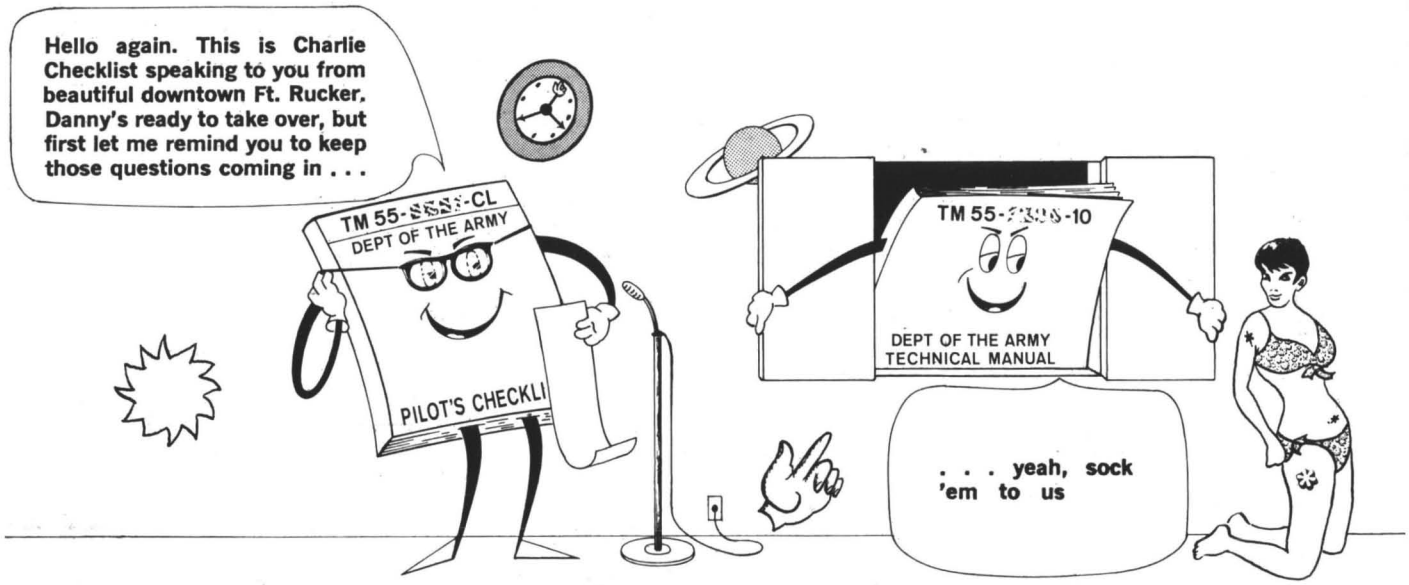
- Do not use bleed air heater above 90 percent N_1 speed.
- Do not use bleed air heater with AIR selector switch in positions 2, 3, or 4 when above 85 percent N_1 speed or when ambient temperature exceeds 50 degrees F.
- Do not use bleed air during engine restart in flight.

Due to basic differences in the models of the T-53 turbine engines, the restrictions on the use of the bleed air heater with the various models are somewhat different. The bleed air heater switch should be in the OFF position during takeoff and landing and other flight conditions requiring maximum engine power available. The bleed air heater should not be used during engine restart during flight.

As mentioned, the de-icing system uses bleed air for its operation. Therefore, when the system is operating it is important to be able to predict its effect on available power and on possible compressor stall.

There are two indicator lights for the anti-icing system, both located on the segmented caution panel. The ENGINE ICING light denotes an engine icing condition. The ENG ICE detector light signifies that the system's detector and interpretor are inactive. The system is a fail-safe type, causing the anti-icing to be continuous when there is a failure in the detection system; therefore, if there is an ENG ICE detector warning light on, and no change in EGT when the de-ice switch is turned on or off, it must be assumed that anti-icing is continuous.

Due perhaps to the emphasis placed on flying in Vietnam, it is not uncommon to find Army aviators who are not fully aware of the effect the de-icing system or the bleed air heating can have on available engine power and in causing compressor stall. A better understanding of the operation and effect of these systems can help the aviator minimize the possibility of compressor stall and resultant unnecessary accidents and equipment damage.



Charlie and Danny's *Write-in*

Danny, I have found an item in the November 1968 UH-1C Operators Manual (paragraph 2-232) which I want you to clear up for me. The manual states that the rotor rpm warning light is set at 339; however, the UH-1D manual shows a setting of 335 rpm. Should there be a difference in the setting?

Danny's answer: You are a most observant aviator. There should not be a difference in the setting for the two series of the UH-1 since the warning systems are identical. The next change to the UH-1C manual will indicate the high side setting of 335 rpm ±5. Another change that will be shown is an engine rpm warning setting of 6100 (±100) rpm. Now that I have answered your question, you can boast to your fellow aviators about how sharp your vision is. Maybe it will cause them to read a little more closely.

Rumor has it here in RVN that the OV-1 Operators Manual is being divided into four separate manuals, one for each series. Is this true? If it is, what about checklists? Will there be one for each series?

Danny's answer: Well, I don't know how this rumor managed to filter all the way to RVN, but it is true. The new Mohawk manuals are now being prepared and will soon be issued for each of the four OV-1 series. Charlie tells me that each series will also have a separate checklist.

Charlie, the old "flip" type checklist which I was issued at the aviation school when I transitioned into the U-8 had power settings, voltage readings, rpm, etc., listed in the engine runup section. Recently, my unit received the new DA checklist and these readings have been omitted. Why?

Danny's answer: Let me answer your question instead of Charlie. The checklist is only a reminder of a sequence of events designed for aviators qualified in the aircraft and is not a replacement for the —10 or IP. The information which was in your old checklist is contained in chapters 3 and 4 of the Operators Manual and you should go to this manual if you are unsure of a procedure or as to what rpm is used for a certain runup step. There is a section in the checklist entitled "Performance Check" which provides amplification of specific steps for those that require it. If your unit's U-8 checklist does not have this section, then it's not complete.

Hey, Danny Dash 10, haven't I found an error in the U-21A Operators Manual? On page 2-25 of the March 1969 manual the fuel system schematic shows a thermal relief valve and line on the left fuel system. I can't find the line on my aircraft. Something is wrong.

Danny's answer: I will accept three licks on the backside with a —10. You are correct; this line is only used on the right fuel system. Now go back to the schematic and look for the following additional errors. The "thermal relief bypass valve" is shown backwards and the "cabin heater fuel intake" line is shown coming out of the transfer sump pressure line instead of the gravity fuel line. All of these errors will be corrected in the next change to the manual. Meanwhile, tell the other aviators in your unit not to get excited if they can't find the line on the left fuel system. It doesn't have one.

A Lesson Well Learned

A few moments dedicated to setting altimeters and checking navigation radios, prior to takeoff, are easy to forget, especially for the pilot who rarely flys instruments. But one terrifying experience is enough to teach anyone a lifetime lesson

CW2 Kenneth F. Wiegand

THE HOT LINE sounded off with that familiar signal to strap on our .38s and scramble the Hueys.

I didn't realize it then, but I was scrambling into my first experience with weather flying.

It was a cool, cloudy evening in November. Eight men, including myself, had been on standby since 0700 hours that morning in our wood and tin standby hutch located a few seconds from eight UH-1Cs. Two of the UH-1Cs were armed and prepared for immediate deployment in support of ground troops and air activity. We were one of two standby fireteams making up an armed platoon called the Firebirds of the 71st Assault Helicopter Company stationed at Chu Lai, Republic of Vietnam.

Our entire day had consisted of missions in support of infantry troops of the Americal Division located northwest of Chu Lai in mountainous terrain. A large percentage of those missions had been search and destroy, with a few suppression missions against enemy snipers.

My fireteam leader and I had not seriously given thought to the increasing buildup of weather activity in the area, or reports of thunderstorms heading in our direction from the vast South China Sea. The U. S. Marine meteorology section had been issuing weather warnings all day with an estimated arrival time at 1700 hours.

We did not actually expect to be scrambled that night due to the forecast weather, but were prepared to go at a moment's notice.

By 1730 hours we had finished our evening meal and sat lazily in our comfortable hutch smoking and swapping experiences ranging from the girl back home to armed helicopter tactics. Tactics discussions usually ended up in a heated argument among the novice members of the platoon.

We frequently discussed tactics, their applicability to many varieties of situations and possible ways to improve their effectiveness; however, we seldom discussed instrument flying or preparation for a flight which might inadvertently find us flying instruments. Since we had never experienced the effects of the rainy season on flight conditions, we simply ignored the fact that weather would actually affect us. After all, one could land at one of the many secure areas in the vicinity before the weather closed in. It was the beginning of the rainy season and ole man weather had prepared a rude awakening for four unsuspecting pilots.

At about 1800 hours I answered the hot line, the phone connecting us to operations. It was the operations officer with instructions to scramble to coordinates XY 123 456 and up arrival contact "Alpha

I waited for Mac to hover onto the taxiway and begin his slow ascent that made his heavily armed ship seem like a weary pelican winging his way home with a full day's catch. That was the signal to hover my ship into position behind him and take off at the proper interval to begin our emergency mission. Only three minutes had elapsed since we had been alerted

A Lesson Well Learned

Bravo 6" on 31.5 fox mike—company in contact. I scribbled the information onto a blackboard located near the phone while the pilots rushed to their aircraft to "light the fires." My team leader plotted coordinates and copied the frequency and call sign of the man to contact for further instructions.

By the time I hung up, the fire-team leader, whom I shall now refer to as Mac, had plotted the route of flight by use of visual land marks. Mac and I discussed the route plan on the way to the aircraft which were at operating rpm. We wished each other luck.

I strapped on my "chicken board"—the armored chest protector—slipped on my flak vest and climbed into the right seat position behind the controls of the aircraft. After strapping in and securing my ballistic helmet, Mac called for UHF, FM and VHF commo checks. We made the final equipment check, as we had done before every mission during the preceding 10 months, and were prepared to be on our way. Mac called Chu Lai tower for takeoff instructions and was immediately cleared for a north departure from the Firebird line.

I waited for Mac to hover onto the taxiway, our active runway. His aircraft shuddered as it strained to lift the weight of its XM-3 syster and crew and hover into place. The aircraft tilted forward gaining speed slowly and after several bounces began to fly, like a weary pelican ponderously winging his way home with a full day's catch. That was the signal to hover my ship into position. I pulled 34 psi to hover onto the taxiway and played the rotor tack between 6400 and 6200 rpm to skip off the ground. We always took off separately to gain proper distance for coverage. I called off and Mac notified operations that we were on the way. Three minutes had passed since we had been alerted.

We maintained treetop level until clearing the control zone and then began our long slow climb to 1,500 feet, the altitude needed to pass the first ridge line on our 30-minute journey into the mountains.

Upon levcling out my pilot took over, holding position on the lead ship's wing. I suppose this was the first time I noticed the thick, widely-scattered clouds stretching

There was no way out except to penetrate the menacing clouds

At 3,000 feet we plunged into what seemed like an eternity

in all directions. The sun was on the horizon almost out of sight and the sky to the east was pitch black with occasional streaks of glaring white electrons bolting a message of warning.

Visibility was unlimited beneath the cloud layers, but at 1,500 feet it was limited due to the innocent looking puffs we were busily circumnavigating. Mac and I considered the possibility of poor weather closing in on us, but decided that we would have enough time to complete the mission and return to Chu Lai before the storms reached the area. The storms were still quite a distance from the mainland and it all looked so easy.

We arrived over Alpha Bravo 6's position at approximately 1840 hours. The company was located in a completely enclosed valley with walls towering 2,500 feet on all sides. It was too dark to identify detail in the base of the valley, therefore smoke could not be used. Mac asked for .50 caliber tracers to be fired into the enemy positions, the only way we had to identify our target. They kept us very busy for the following 25 to 30 minutes until we found our ammunition stores expended down to the several hundred rounds of 7.62 ammunition we kept for protection. During the strikes our attention was held solely to the mission and there was no concern over what was happening above us.

When Mac received a job-well-done and a most welcome release from the infantry commander, we guided our ships toward our point of entry into the valley. Here's where ole man weather surprised us.

The small depression in the valley wall through which we entered

A Lesson Well Learned

was completely socked in and, furthermore, the faint sunlight had disappeared, leaving us in total darkness. Only those who have challenged the darkness in lonely stretches of Vietnam can imagine this frightening experience.

We spent 10 to 15 minutes searching uselessly for a way, poking in and out of the clouds. There was no way out except to penetrate our captor and fly heading, altitude, airspeed and time. Both Mac and I were aware of what would have to be done, but didn't admit it until we were on our way. It was an eerie feeling being trapped by something that, until then, had never threatened our lives. During those short minutes of flying circles to gain clearing altitude, I discovered that Charlie was not my greatest enemy—I was.

Why hadn't I set my attitude indicator before takeoff? Why didn't I check my navigation radios and instruments? The attitude indicator was actually no problem for all I had to do was center the needle on the turn and slip indicator, adjust power and airspeed and adjust the level of the wings with the horizon line. It was then that I discovered that although the attitude indicator seemed to be operating properly, it was not reliable.

Everything seemed to happen at once after that. The VHF and FM radios failed. I could receive only FM, but could not transmit or receive VHF. Luckily, Mac and I were monitoring the same UHF frequency and were able to communicate.

We reached 3,000 feet before plunging into what seemed an eternity. We agreed to fly a heading of 050 degrees with 500 feet altitude separation—Mac at 4,000 and myself at 3,500 feet. We knew that these altitudes would allow us to more than safely clear the tops of the highest mountains between us and the coast. My pilot plotted distance to the coast and calculated 20 minutes at 90 knots. Mac penetrated first. As his grimes light disappeared into the darkness, I had a sickening feeling that we might not make it.

I waited, giving Mac a five-minute lead for spacing. He tried cheering me up by telling me how easy it was, and that he expected to break out at any moment. Mac left the UHF frequency to attempt contact with Moonman approach control at Chu Lai, while I turned to 050 degrees and began a climb to my altitude and actual instruments.

Just before cloud contact I briefed my crew, telling my pilot to stay on the instruments and my enlisted crew to keep a sharp eye on everything.

It began raining very hard after entering the nothingness, and I found my heading varying 30 degrees to each side of 050 degrees and my airspeed decreasing from 90 to 60 knots. I thought of nothing but keeping the aircraft under control and right side up.

After what seemed like hours, Mac informed me that he could not contact Moonman control. We talked like magpies just to keep the frightening loneliness out of our minds. Even though we had our crews to talk with, it was still comforting to hear a voice from outside the ship.

I flew 050 degrees for eight minutes before being informed that we had broken out. It was clear but totally dark outside the cockpit until several artillery flares popped out of nowhere. I had no idea where we were, who was firing flares or where the gun-target line was.

About this time I thought it best to recheck my instruments. Engine and transmission instruments, flight instruments, 500 pounds of fuel—it was then I noticed the magnetic compass indicating 180 degrees. The RMI was not reliable! I turned my ship to 050 degrees by the mag compass and penetrated the clouds again. To this day, I don't know where we broke out. All I know is that it was a large circular impression in the ceiling and artillery was on to something beneath us.

Many thoughts passed through my mind during the following 20 minutes. Would I ever see my friends and family again or would we fly around in the clouds until our fuel supply exhausted, then crash into the thick jungle?

I held 3,500 feet, 90 knots, 050 degrees and prayed.

Then Mac triumphantly announced he had broken out over Tam Ky and would hold until I arrived. We felt helpless having no idea where we were or if we would be fortunate enough to break out.

Twenty minutes had passed when my crewchief shouted that he had visual contact with a large blurred light at our 10 o'clock low position. My pilot looked up and confirmed the contact. I told him to take the aircraft and head straight for it while I stayed on the instruments. It was Tam Ky unmistakably.

Mac and I rejoined over the city and began the short trek to Chu Lai in blinding rain.

Fifteen minutes after shutting down in our respective revetments at the Firebird line, avionics was busy replacing the FM, VHF, navigation radios, attitude indicator and RMI in my aircraft.

A very convincing lesson was learned that night and, believe me, since that day I have never failed to check my navigation and flight radios before takeoff in any type of weather. One terrifying experience is enough for one lifetime.

They Should Have Survived

Three fatal mistakes on the part of the crew turned what should have been a survivable crash into a death trap through which none lived. The gunner didn't snap his chin strap, the crewchief hadn't used his seat belt and the aircraft commander neglected to use a carrier for his breastplate, which during impact broke his neck.

CW2 Wayne K. Roberts

Don't let a little thing like this do a big thing like . . . .

THREE OF THE four crewmembers should have survived.

This thought has haunted me ever since I was president of an aircraft accident investigation board. The aircraft, a UH-1D carrying a crew of four, crashed in the Republic of Vietnam under the following circumstances:

- the aircraft commander had 1,027 hours total flying time (500 in UH-1) and had been incountry six months
- the pilot had 600 hours total flying time (325 in UH-1) and had been incountry two months
- the crewchief had been out of school four months and a crewchief for one month
- the gunner had been incountry for 15 months.

The aircraft commander had flown 81 hours in the previous 30 days and had been off the two days before the accident. He had flown 30 minutes the day of the accident, after eight hours sleep. The pilot had flown 112 hours in the preceding 30 days. He had eight hours sleep before the flight.

The accident occurred one-fourth mile north of the fire support base that was the aircraft's destination. Personnel at the fire support base heard the crash and sent out a patrol which secured the crash site.

The aircraft sustained major damage to all components and all four crewmembers received fatal injuries in the crash.

The aircraft had been on a single ship resupply mission. It had departed home station at 0730. Weather, as reported by a weather observer at the fire support base, was 500 feet with three-fourths of a mile visibility in mist. Winds were from 110 degrees at 10 to 12 knots.

It was the custom in this unit to stay low level in these conditions. The aircraft commander had flown

They Should Have Survived

under these conditions for three months and it was his habit to remain low level.

The aircraft hit tall trees on a heading of 280 degrees about 200 feet from its final resting place. There was a path of wreckage from the point of impact to the final resting place. The point of impact was at the top of a small hill. The path of the aircraft was downhill and downwind, and through the treetops without solid contact for the first 100 feet.

The first really noticeable thing about the wreckage was the apparently low rotor rpm at impact. There was damage to both blades, but the blades and main rotor head were still on the aircraft. The blades were at full pitch and strike marks indicated they had been at full pitch during the initial impact. This was shown by the limited damage to the leading edge and spar and the deep scars and rips on the bottom of the blades in the honeycomb area.

This implied a power loss. The reason for power loss was discovered upon opening the left engine cowling. The main fuel line from the fuel filter to the fuel control unit was disconnected at the outlet of the fuel filter. This type of line has a quick disconnect at this point. The quick disconnect is the type with three pins located 120 degrees apart around the circumference of the barrel. These pins protrude about one-eight of an inch when the quick disconnect coupling is fully locked. The coupling will shut off the flow of fuel when it is disconnected but it does not normally leak if not fully engaged.

This item should be checked on each daily and preflight inspection. If the pins are not protruding, the coupling is not locked and may vibrate loose causing an engine failure due to fuel starvation.

It was noted that the main fuel line had been disconnected during an intermediate inspection the night before while changing the main fuel filter.

A maintenance operational check required to complete the intermediate inspection was performed by the flight crew imme-

. . . .THIS!

A quick disconnect on the fuel line had not been fully engaged, resulting in fuel leakage and a subsequent power loss.

diately prior to takeoff; the crewchief was observed checking the engine area for leaks.

A question arose as to why the aircraft entered the trees with such a high rate of forward speed. Even at low level, the pilot should have been able to slow the aircraft to a more acceptable speed prior to impact.

Examination of the cockpit area revealed that both light bulbs in the rpm warning light had been removed. There was no entry on the DA Form 2408-13. The DA Form 2408-14 was found in the middle of a thick stack of blank forms in the back of the book. The following writeup was on the 2408-14: "rpm warning light burned out." There was an on-requisition statement next to that writeup. This entry had been made two weeks prior to the accident and had not been approved by a supervisor. The 2408-12 and 2408-13 were the first two pages of the book. There was no 2408-18 in the book.

The rpm audio circuit breaker was pushed in. The rpm audio switch was in the off position. Examination of the switch revealed it was not the proper type. The correct switch is spring loaded to the on position with a small electromagnet in the off position. The electromagnet will release the switch when there is a power interruption to it. It automatically goes to the on position when the rpm comes within the normal operating range, precluding a takeoff with the audio system deactivated. The type of switch actually installed was a regular toggle switch that remains in the last selected position. Maintenance records do not indicate when or why this type of switch was installed.

Neither pilot had flown this particular aircraft in the previous 30 days. A light that does not come on is less likely to be noticed than one that does. Personnel who observed the takeoff stated that the runup was very brief, allowing only enough time for the crewchief to quickly check for leaks.

Because of the above facts, it is felt the pilots had neither a low rpm light nor audio warning system operating *and were unaware of this fact.* The rpm control warning box checked okay on a bench test indicating an audio warning would have been available if the switch had been in the on position.

Cause Factors

Maintenance:

- The quick disconnect was improperly installed and inspected. This is considered the direct cause of the accident.
- The rpm warning light bulbs were not replaced after having been written up 21 days prior to the accident. Replacement of just one of the two bulbs would have provided the pilots with a visual warning.
- Installation of an improper toggle switch eliminated the last automatic safety device.

Inspections: The condition of the fuel line quick disconnect was not detected by the technical inspector following the intermediate inspection by the crewchief during his daily or by the pilots during their preflight.

Operations: There was not a proper runup or cockpit check before the takeoff. A good runup or cockpit check would have revealed the inoperative light and the audio switch in the off position plus the lack of an audio signal below normal rpm.

Supervision: Maintenance supervisors allowed a serious condition to go uncorrected for 21 days. The write-up on the 2408-14 should have remained on the dash 13 where it was more likely to come to the pilots' attention.

Additional Information

The gunner was killed by a blow to the head after loss of his helmet. There were no impact marks on his helmet. His helmet was very loose and had not been fitted by the flight surgeon. His chin strap required extreme pressure to snap and unsnap. It was not snapped when found. He was not wearing gloves. He was wearing jungle fatigues and jungle boots.

The crewchief was not using his seat belt which was found connected and drawn tight across the seat. The crewchief's body was thrown from the aircraft at impact and found in a tree. He was wearing gloves, jungle fatigues and leather boots.

The pilot did not have a carrier for his breastplate. He slipped it between his body and the shoulder straps. He was thrown forward at impact and the inertia reel locked the shoulder harness in that position. He leaned back but the breastplate stayed forward as there was nothing to pull it back. On the second impact, he again was thrown forward and downward. His chin struck the breastplate breaking his jaw and neck, killing him.

The aircraft commander was killed by massive crushing when his area of the cockpit deformed when striking a tree. Neither the pilot nor aircraft commander wore Nomex flight suits or leather boots. Both wore gloves.

There was no failure of any seat or restraint device. The deformation of the aircraft in the areas of the crewchief, gunner and pilot was not excessive. These three positions should have been survivable.

While this particular accident hasn't happened—yet—I have observed every single one of the cause factors within the last six months. It could happen—to you!

Double Check It,

Lieutenant John G. Burnside

IT HAD BEEN a long day for First Lieutenant Hasty. Not only was he tired of being strapped into his Huey all day but he was still shaking from inadvertently having gotten too close to the incoming artillery fire he had been adjusting.

However, the artillery had ceased and communications with Comanche 6 (an infantry unit on the ground) had been established. He made another lazy orbit while the ground troops ferreted out the remaining enemy from their entrenched positions. As soon as they could get "Charlie" settled down a little, he'd drop that ammo off and head for some hot chow and coffee back at his home base.

Glancing at the instrument panel he noticed for the third time that day, the oil pressure needle fluctuating. "No sweat," he said to himself, "its just a little fluctuation." He had checked it out during the last refueling and there was plenty of oil in the sight gauge, but that fluctuation didn't help the strain in the least.

Just to be sure, he scanned his gauges more closely. He noticed that his fuel was getting a little lower than was comfortable. Then his heart skipped

Mate

The oil pressure gauge had been fluctuating for five minutes, but the caution light still hadn't come on. Hasty had to decide whether to land or head for home

a beat! The oil pressure gauge began to oscillate like a tuning fork. He knew that it wasn't possible to operate an engine without oil pressure and a fluctuating gauge must surely indicate such a condition.

Instantly, he considered his alternatives, drawing on what he had learned in flight school and in over 600 hours of combat missions. Charlie still had the infantry unit surrounded and would certainly reach a downed ship before the friendlies could. Besides, the chances of a safe autorotation didn't seem too good considering the jutty landscape looming below.

A safe landing into the LZ might solve his problems, if the engine lasted that long. He though of Charlie catching the disabled Huey in the LZ and imagined the morning sun illuminating something similar to a Huey but looking more like a fruit strainer!

He began to wonder, as does every pilot when something happens to his ship, "Can I make it home?" He thought of the lights on the base camp perimeter and how nice and comforting they would look. Then he remembered something mentioned by his company maintenance officer (MO). The W4

Double Check It, Mate

had taken him aside and said: "Always double check son, or you'll be checkmated." It didn't mean a whole lot at the time, but now Hasty couldn't get it out of his mind.

"What can I double check?" he asked himself. "It's obvious that we are low on oil, or are we? But if we are low on oil pressure, how come the caution light isn't on?"

He reached down and pressed the caution toggle switch to the test position. Sure enough, the oil pressure caution light came on bright and strong. He wondered which was the more reliable system, the caution light or the pressure gauge. He resolved to learn more about the indicating systems and what they actually meant if he ever made it back.

The crackle of Comanche 6 boomed over the fox mike radio, "Looks like we've put them out of commission for a while; we're popping smoke."

Hasty noted the yellow smoke, wind direction and started his circling approach. Five minutes had passed since the gauge first started fluctuating and it was still flapping. The caution light still wasn't illuminated so Hasty made the decision to try to make it home.

Three anxious minutes later the ammo had been dumped to the appreciative ground pounders and Hasty was out of the LZ. "Now baby," he thought, "if you'll just hold out another 30 minutes we're home free."

The flight, although uneventful, proved to be a nerve jangling experience.

After the warm food and hot coffee settled his nerves, Hasty looked up the company maintenance officer. He explained how close he had come to disaster in his ailing Huey. The MO looked at him and quietly suggested, "Suppose you get a good night's sleep and we'll talk about it tomorrow."

Early the next morning, Hasty and the MO crawled into the cockpit of the Huey. From their preflight inspection it was determined that the oil level was normal. Obviously, the cause of the anxieties was either the oil pump or the indicating system. The MO explained that the pressure indicators in the cockpit reflect the pressures of the oil lines through a device which electrically transmitted the reading to the instruments in the cockpit. "Now," the MO explained, "the easiest part of the indicating system to check, and generally the most troublesome part, is the guage. So, we'll check it first, and then the transmitter. If both are working correctly, we'll check the pump itself."

After taking the gauge from the panel, Hasty spotted a frayed wire leading into the cannon plug. When the aircraft was run up and the frayed wire was moved, the same oscillations occurred as were present the night before.

"I'm not surprised that you were worried about it," said the MO. "Fortunately, the engineers designed one, and sometimes two, backup systems for most of our instruments. They have also designed visual light indicators which tell the pilot of a situation which may need attention (amber caution lights) or warn him of an emergency situation (red lights) requiring immediate action, once it has been established, through crosschecking, that it is not a false alarm. In this case, you noticed that the caution light, which is a completely separate system, indicated to you that the oil pressure was really all right. In addition to this crosscheck, you might have noted your engine oil temperature. If the cause of the fluctuation was a low oil level, the temperature would also increase, though it wouldn't indicate as rapidly as the caution light. The same principle holds true with the transmission oil indicators.

"I've seen pilots who shut down their aircraft in the middle of busy runways just because of fluctuating oil pressure, and they didn't even think about crosschecking the caution light or the oil temperature. I don't know how many times we've had to recover aircraft from the boondocks because of this same problem.

"Now don't get me wrong," the MO went on, putting in a word of caution, "whenever you suspect a gauge of indicating incorrectly, it should be checked out. But the idea is that the mission dictates what should be done."

Hasty began to analyze the indicators on the panel. "What about the EGT gauge; what crosscheck is available?"

"Well," said the MO, "the EGT, torque, and N_1 are all indicators of engine performance; we should be able to check one against the other to see if any emergency exists. Take the EGT for instance; if it were truly fluctuating, the N_1 and torque should also fluctuate. Of course, should the EGT gauge or the torque meter go out, max power should be avoided if limitations could be exceeded."

"How about the fuel quantity gauge? Suppose the fuel quantity gauge suddenly dropped to zero? Autorotation?"

"Hardly feasible unless you had a hole in your fuel tank the size of a football; otherwise the fuel couldn't drain out that fast. Here again the double check comes into the picture. Look to see if the twenty minute warning light is on.

If the light is not on and you've determined it is functioning properly, there is an indicator problem. Sure, the gauge needs checking, but you should know how long it would be safe to continue to fly and you've still got the warning light."

Taking the cue, Hasty demonstrated his knowledge of the fuel boost pumps, "If the fuel pressure dropped to zero, we might have transmitter or gauge problems instead of actual fuel pressure problems."

"That's right," agreed the MO, "if the fuel boost pressure drops to zero but neither boost pump warning light is on, it's safe to assume there is an indicator problem. On the other hand, if the lights went on but the gauge was all right, we'd probably be having trouble with the lights.

"If both lights came on and the gauge read zero, we would probably have lost both boost pumps. This is unlikely, but if it happens, we can still fly; we must, however, observe certain limitations. For all the Huey models, we must stay below 4,600 feet pressure altitude. In addition the "B" model Huey is limited to five minutes fuel when the 20-minute warning light is on. If we follow these rules, we are safe to continue flight, preferably to a secure landing zone."

The MO went on with his explanation, "Let's also consider the engine-driven fuel pump. This is a dual element pump, or, if you prefer, two pumps enclosed in the same housing and driven by a common drive shaft. This pump supplies fuel to the engine and it will do this even if both boost pumps fail. The boost pump alone though, cannot sustain the engine if the engine-driven pumps fail."

Hasty wanted to know how this engine-driven pump could be monitored. The MO explained that one way is with the engine fuel pump warning light on the caution panel. "However," he cautioned, "we are only being told that one of the pump's two elements isn't producing pressure. Either element of the pump is capable of sustaining flight and there is no need to set down immediately. The pilot should fly the ship to the first available maintenance facility where the pump can be checked out and, if necessary, replaced.

"If both elements fail, or the common shaft fails, the engine will quit and the engine fuel pump light will probably never indicate that

there is a problem. The lights are controlled by a switch that is activated by a difference in pressure. If neither pump produced any pressure, there would be no difference between the two, and the lights would not come on."

The MO continued to explain the idea of crosschecking to Hasty, "If the N_2 tachometer acts up, check the N_1, EGT and the torque. If they don't reflect the indications on the tachometer you can assume that it isn't the engine, but the indicating system that is acting up.

"Also, when the hydraulic caution light comes on in flight, don't immediately switch the hydraulics off and try to make a running landing. There is a good possibility that the hydraulic caution light is the villain. The caution light will probably come on about the same time the controls become stiff, if there is really something wrong. It is best to wait until the controls indicate the hydraulics are really off before you try anything like a running landing."

Hasty was very interested and could hardly wait to ask, "How about the chip detector caution light?"

"That is one of the few cases," said the MO, "where there is no choice but to believe that the indicated contamination has occurred. Landing as soon as possible is the only choice you may have, keeping in mind that the majority of detection lights come on as a result of electrical problems or normal wear of the engine. Still, yours may be the one which doesn't fit either category.

"Another point that many aviators don't understand is that the emergency fuel control caution light is not connected directly to the fuel control, but to the emergency auto governor switch. Whenever the light is on, the only thing this indicates is that the switch is in the emergency position. A fuel control or governor failure can be ascertained only by monitoring the engine instruments and tachometers, because no light will come on."

Later, over a cup of coffee, Hasty reflected on the information that he had tried to absorb. Most of it was merely common sense. On each system they had discussed there was a primary instrument plus another instrument or caution light that could be used to crosscheck a suspected system failure or malfunction, except the chip detector system. It all boiled down to just one little item, summed up as a parting shot by the MO. "Mate, if you don't want to be checkmated, then you'd better double check."

Is Fate The Hunter?

. . . all the skill and daring and airmanship in the world will not offset a moment's inattention or neglect

Major W. F. Gabella

RECENTLY WE have witnessed a thinning of the ranks of outstanding aviators. In pulp magazine parlance "they went West." Their names read like an honor roll in an aviation hall of fame: Paul Mantz, famed movie stunt pilot for three decades; astronauts Elliot See and Charles Bassett; Captain Max Schumacher, Los Angeles' flying traffic-reporter; X-15 test pilot Joe Walker of NASA; and, the famed Swiss glacier pilot, Hermann Geiger.

It is interesting to note that three of the five accidents which took the lives of these truly remarkable aviators were midair collisions.

Captain Max Schumacher, the only professional helicopter pilot of this group, had his life snuffed out in a midair at night near Dodger stadium when his helicopter collided with one belonging to the LA police. The ex-Marine aviator was a glib traffic reporter as well as an outstanding helicopter pilot and had a wide following on the West Coast.

The tragic death of famed test pilot Joe Walker ended a truly shining aviation career. Although he possessed only 4,998 hours of flight time, Walker had been the mainstay of the X-15 program and had qualified for astronaut wings by virtue of the altitude records he set in that sleek, black bird.

Walker died when his F-104 collided with an XB-70 during a formation flight, picture-taking session. The copilot of the XB-70, Major Carl Cross was also killed when he failed to eject. Bob White, the XB-70 pilot, ejected but suffered arm and internal injuries to the extent he may never fly again.

The human as well as the dollar loss of this collision was staggering—three highly experienced and valuable test pilots, a $700 million test aircraft, plus the cost of an F-104.

For more than a decade, Swiss aviator Hermann Geiger had performed scores of high altitude search and rescue flights in the Swiss Alps. His skill and courage saved dozens of lives and earned him the title of "Angel of the Alps" —an appellation he modestly disdained.

Beginning with a stripped-down Super Cub on wheel-ski gear, Geiger pioneered high altitude landings and takeoffs on Alpine slopes and glaciers. Flying among the high peaks in a light, unsupercharged aircraft demanded the utmost in skill, daring and alert airmanship. Geiger had a superabundance of these qualities.

Yet, like Schumacher, Walker and Cross, Geiger met a premature end in a midair collision. A glider struck Geiger's light aircraft just after he had broken ground on a takeoff run. The collision altitude was less than 100 feet above ground.

Mantz and astronauts See and Bassett met different fates. Mantz crashed in an experimental aircraft made from the tailboom of a C-82 Packet during filming of the movie, "The Flight of the Phoenix." The astronauts clipped the top of a factory roof while making an ILS approach to St. Louis' Lambert Field.

The moral of all this should be abundantly clear—all the skill and daring and airmanship in the world are no substitute for a moment's inattention or neglect of the airspace surrounding the aviator when he is aloft. The working environment of the aviator is crowded and becoming more densely populated all the time.

The airspace surrounding Army aviation's major training complexes can be bewildering to fledgling aviators logging their first few hours of solo time. To avoid even a near miss the fledgling (and the senior aviator too) should adhere religiously to the following:

• *Discipline.* Lock-on to the proper entry and departure altitudes and patterns in-and-around training complexes.

• *Alertness.* Analysis of near-miss and midair collision statistics indicate that both occur more often

during VFR conditions. There is a distinct tendency among aviators to "let their guard down" during sunny, blue-sky weather. Be extremely cautious in confined area and pinnacle sectors where helicopters are constantly changing altitude and direction. Keep your head on the proverbial swivel.

• *Act!* Don't rely on the other guy in the sky to take evasive action. Don't just sit and watch if you are on a converging collision course—a slight loss of altitude or a shallow turn is usually all that is necessary to assure safe passage between aircraft.

The gross irony of midair collisions is that as an aircraft accident category it is the type accident that is always avoidable and the type aircraft accident nearly almost always fatal. The midair can be avoided but it is up to you to do the avoiding.

MY! HOW THOSE

OR DI

Major William G. Caput, M.D.

YOU SAY YOU can't get into last year's greens; you have trouble climbing into the front seat of a U-6; and your friends are referring to you as jolly? Sounds like you may be suffering from the most common disease of aviators —obesity.

It's hard to get a man to admit that he's fat. Generally, he prefers to think of himself as "a little heavy," "large framed," or "muscular." To admit being fat is to admit failure, and to recognize that you're on the decline—on a highway marked by declining vigor, declining resistance to disease, declining appeal to the female and declining longevity. Many of the ills laid at the door of advancing age actually should be blamed on obesity.

It is true that good nutrition is essential to good health. And, unfortunately, the public has come to consider a little plumpness as an indication of health. But actually, overweight—even a little—is a health hazard. The more you're overweight, the greater the hazard.

Obesity is the bane of Army aviators. A recent study carried out in the Physical Exam Division at Ft. Rucker, Ala., revealed there are almost as many overweight aviators as lean aviators. The study showed that, overall, one out of eight Army aviators could not pass the weight requirements of the flight physical if the weight standards were rigidly adhered to. This further drops to one out of five if the group is limited to those who have been rated five years or more. I have been told many times by students that the flight training program really sweats out the work. I agree with this, for while it sweats out the work, it doesn't sweat out the fat. There is more weight put on than taken off during the course. In connection with our overweight study, we followed a class of students to try to measure this impression. We obtained the weight at the time of entrance in the course and again at the end of the course. I can say as a class they put on close to one-half ton of fat.

What is obesity? First, let me define obesity. Webster defines it as a state of being overweight, of being excessively fat.

Dorland's Medical Dictionary

GREENS HAVE SHRUNK

D THEY?

Once you've been fat, you must continually exercise self-control in eating and drinking

defines it as having an excessive and disproportionate amount of adipose tissue in relation to bone and muscle tissue. Whichever you prefer, it simply means having too much fat in one's body. Don't misunderstand, obesity is not exclusively being 25 or more pounds over the ideal weight. Even as little as 10 extra pounds represent obesity.

What causes obesity? Simply stated, the body will gain weight when the food intake exceeds that which is utilized by the body. The human body requires food (carbohydrates, protein and fat) to serve as the fuel for its function. The food supplies, among other things, the calories necessary for this human metabolic furnace. The average aviator requires approximately 3,000 calories per day to meet his body's requirements. To maintain a state of equilibrium, he naturally must consume enough food to supply 3,000 calories. When excess calories are consumed over those which are burned, the excess is converted to fat at the rate of about one ounce of fat for every 300 calories. An individual consuming just 300 calories a day more than he needs will have, over a year's time, gained about 25 pounds. It is a slow but sure process.

How much is too much? The major insurance companies have developed an ideal weight table by correlating longevity with body weights, and their tables for ideal weight are about 10 percent below Army aviation standards.

We can also measure fat quantitatively. It is rather difficult and time consuming but can be done either through radioactive water dilution techniques or by whole body water submersion techniques, utilizing Archimedes' principle and taking advantage of the fact that fat displaces water differently than bone or muscle tissue. The figure we come up with as the optimum percent of body fat is about 17 percent. Percentages of fat greater than this figure begin to reflect obesity. This system has the advantage in that it permits us to measure the amount of fat in a large individual who really may be all bone and muscle and may be considered overweight solely because of his massive bulk.

Obesity is a detriment to everyone's health . . . . . .

Obesity is a detriment to everyone's health but it also carries some special dangers for flying personnel. There are both immediate hazards as well as long term hazards to being overweight. The majority of young aviators are not particularly concerned with the late effects of prolonged obesity which may occur 15 to 20 years in the future. Now they're robust and healthy and can carry 10, 15 or 20 pounds extra weight without any significant restriction in their activity. But as they get older this excess fat will become a greater burden and will begin to compromise their health and vitality.

We physicians in the field of aviation medicine are vitally concerned with the long term effects of obesity on flying personnel. We are seeing for the first time the effects of overweight on a large group of aging World War II and Korean War pilots in the Air Force. There is a large number of these people in their 15th to 25th year of flying and now in the 40 to 50 age group whom we are able to observe. Many of the medical problems of this aging group can be attributed in part to a prolonged life pattern of being overweight.

We are concerned because the Army has a tremendous investment in you. Your value to the Army five years after being rated represents a figure closely approximating one million dollars. If after say 15 years in the military your flying career is terminated prematurely short of your full potential because of the medical complications of prolonged obesity, you have lost and the Army has lost. Even being as little as 10 percent overweight for a period of 15 to 20 years gives the fat fellow a distinct statistical disadvantage over the lean chap in terms of developing disease and even death itself. Let me be explicit. I'm not talking about developing the medical complications of obesity in the 60s, I'm talking about developing them in the 40s, and on occasion even in the late 30s—a time when you are at the prime of your life and the most valuable to yourself, your family and the Army.

Heart disease is the number one cause of death in the United States. A man's prospects of being struck down by a heart attack are increased enormously by obesity. Even if you're only 10 percent over the ideal weight, your chances of having a fatal heart attack are 50 percent greater than if your weight were normal.

Brain hemorrhage or stroke is the number three cause of death in the United States. A man is 57 percent more vulnerable to a stroke if he is overweight.

Diabetes is closely related to obesity and represents a 150 percent increase in incidence among those of middle age who are overweight.

Kidney disease, diseases of the blood vessels and arthritis are all associated with an increased incidence in the face of obesity. Even suicide shows a similar effect of obesity. The fat man is 30 percent more likely to take his own life than one of normal weight.

Of course the longer you remain obese the more significant the hazard and depending upon several factors you may be voluntarily cutting from 5 to 20 years off your life expectancy. A statistic which was always impressive to me was the life insurance company observation that a man 50 pounds overweight at the age of 50 has only a 50 percent chance of living to age of 55. A rather significant finding in view of the fact that on the average a man can expect to live to about 67 years of age.

What are the special dangers of obesity for fliers? Let's discuss the immediate hazards to an aviator of being overweight.

Fatty tissue is notoriously capable of selectively dissolving nitrogen gas from the blood and is likely to release excessive amounts at high altitude. At best, such gas released at altitude can cause bends. At worst, at high altitudes —and especially in case of sudden decompression—the freed bubbles of gas can push little particles of fat into the blood stream where they can be carried to the heart or the brain and cause death. Such cases have occurred in the Navy and Air Force in high performance aircraft. Now I know exactly what you're saying and I realize we don't fly high enough to ever develop the bends. But let me caution those of you who are scuba divers. There are cases on record of individuals who went scuba diving 24 to 48 hours prior to a flight and subsequently developed bends during a flight. The majority of these flights were below 15,000 feet. Strangely enough, all of these people were overweight.

Another immediate hazard of obesity to an aviator and probably the most practical of the group, is the fact that a fat man is more vulnerable in an airplane crash. First, because of his size he may have trouble evacuating a crippled aircraft. Picture yourself trying to bail out of the front seat of a U-6 with the engine on fire. It's hard enough for a lean little fellow. Second, because of his bulk, he presents a greater surface area to injurious objects and thus increases his chance for injury. Third, because of his mass, he exerts a greater force against his restraint system during a controlled crash. For example, a 160-pound man experiencing 15 Gs in a controlled

crash will exert 2,400 pounds of force against his seat belt and tiedown chain. On the other hand, a 230-pound man experiencing 15 Gs in a controlled crash will exert 3,450 pounds of force against his seat belt and tiedown chain. If the seat belt is rated at 3,500 pounds the fat fellow may find himself a free floating object, bouncing about the cockpit like a pinball. While military seat belts are theoretically rated higher than this (5,000 pounds) many of the seat belts on the market for private aircraft and automobiles fall short of the above figures. Lastly, if an aviator is injured in an aircraft accident, statistically he heals slower, has more complications and generally does poorer than a comparable lean individual.

Considered against this background, a fat fellow is at a disadvantage over his lean counterpart in almost any situation.

What can be done about overweight? The best thing of all is prevention. A few lucky souls can eat like horses all their lives and remain trim. For the rest of us, there comes an age—between 25 and 40 years—when it suddenly becomes very easy to put on excess weight. Usually you can detect this yourself, with occasional weighings, and *then* is the time to cut down on your intake. Eliminate between-meal snacks and foods rich in calories. Beware especially of cocktail parties! At any cocktail buffet, one can easily stow away enough calories to cover his needs for two or three days! A serious and determined drinker can do even worse, for alcohol is a rich source of calories.

Once prevention has failed, and you've become attached to your fat, removal is a long and painful process. The only practical way to eliminate fat is to reduce the intake of high caloric food. This is the cornerstone of weight reduction. Pills, exercise and fad diets may be helpful and at best are only a supplement to a reduced food intake.

We stated previously that an Army aviator requires about 3,000 calories per day to meet his body's requirements. If he consumes less than this his body will obtain the necessary calories from his stored fat supplies to make up the difference. This excess fat will be converted into calories at the rate of 300 calories per ounce of stored fat. Just the converse of the way the fat was formed when caloric intake exceeded that which was burned.

In practice if we take an overweight individual and place him on a 1,000 calorie per day diet he must make up the deficit calories from his fat stored to meet his body's requirements. He essentially converts seven ounces of fat into calories per day and theoretically at the end of a month he should have lost about 13 pounds of weight. I say theoretically because the conversion is not exactly on a 1:1 basis. In reality a loss of a few pounds less would be expected. This is a sound medical approach to the problem. Ideally a loss of 10 to 12 pounds per month is the optimum rate for a reducing diet.

The usefulness of exercise in a weight reduction program is a valuable adjunct to diet therapy. But if not coupled with a simultaneous reduction of food intake, the program will be doomed to failure. The combination of the two form the best overall method. Don't misunderstand my regard for exercise, for while I feel it may be over-rated in a weight reduction program, exercise for the man who is at his ideal weight is essential to maintain overall body tone and conditioning and is to be highly commended.

What forms of exercise and how much is best? Cycling, running, handball, wrestling and weight lifting burns about 10 calories per minute. Swimming, gardening, dancing and walking briskly burns about five calories per minute while golfing or bowling require little more energy than driving a car or playing bridge, about three calories per minute. Even sleeping requires about one calorie per minute. A vigorous 30-minute workout each day of gymnasium type activity will burn about 300 calories or about one ounce of fat. The hooker here is that it also increases one's appetite, hence, we say that reducing food intake is the important factor.

In summary, obesity appears to be the occupational hazard of the Army aviator and may represent both an immediate and future hazard to him in terms of health, longevity and value to the Army. In physiological terms it's easier to gain weight as we approach and pass 25 years of age and it becomes very difficult to lose. The only practical way to eliminate fat is to reduce the intake of high calorie food. Once down to a proper weight you must watch your diet indefinitely or you will regain the weight. An informal diet and simple avoidance of over-eating will often suffice to reduce your weight. If not, you should get a definite and well-planned diet from your flight surgeon. The most important qualities for a successful diet are self-discipline and self-denial. Once you've been fat, you must continually exercise self-control in eating and drinking. If you allow yourself to remain obese you are endangering your health, your career and your very life.

Safety for Combat Readiness

This is the third article of a three-part series adapted from a three-hour USABAAR presentation made to the Command and General Staff College and Army War College. Presentations were made by COL Russell P. Bonasso, director; LTC Jack D. Peavy, chief, Aircraft Accident Review and Analysis Department; LTC Howard L. Collins, chief, Education Department; and LTC Henry E. Dreher, chief, Plans Division.
While rated aviation personnel may find some of this information elementary, remember that it is intended for nonrated commanders. You can help the aircraft accident prevention program by directing these articles to their attention.

control of noncombat accidents

crash sense

the following 28 pages prepared
by the U .S. Army Board for Aviation
Accident Research

ACCIDENTS ARE SYMPTOMATIC of substandard behavior. Substandard behavior can only be corrected and controlled through effective management and enforcement of discipline. Commanders and managers must be able to identify potential problem areas before they can apply the management tools at their disposal. These problem areas cover a wide range of personnel and equipment factors. Once identified, these are subject to control. Noncombat accidents indicate a need for more emphasis on maintenance quality control, effective operational planning and supervision.

The seriousness of the noncombat attrition problem in RVN can be portrayed in one simple statement—*20 percent of our aircraft inventory in RVN is damaged or destroyed in noncombat accidents every year.*

This staggering attrition rate has caused great concern at all command levels. One command letter stated: "The accident loss rate and the recurrence of preventable type accidents is of such magnitude that it tends to reflect on aviator professionalism, supervision, discipline *and ability to manage resources.*"

The question is, to what extent can we control the factors that cause noncombat attrition? The answer has to be based on an analysis of the true source regions of our accident cause factors. We use the term *source regions* to indicate that there is more to accident investigation, reporting and prevention than pinpointing personnel errors. The following USARV statistics reflect recent cause factor distributions:

Pilot factor accidents	58%
Maintenance factor	3.5%
Materiel factor	28%
Other and unknown	10.5%
	100%

Insofar as these figures statistically present immediate cause factors in noncombat accidents, they are undoubtedly correct. However, when these same figures are used to determine priorities in accident prevention programs, they may create erroneous impressions. Are aviators really 15 times as bad as maintenance personnel? Are materiel malfunctions actually responsible for 28 percent of our mishaps? What role does supervision play?

Let's take a look at a more meaningful breakdown of accident types, as published by USARV.

FY 1968 DOLLAR COSTS
BY ACCIDENT TYPES

	NUMBER	COST (X 1000)
1. Materiel failure	213	$29,830
2. Obstacle strikes	161	23,331
3. Lost rpm/overgross	113	14,232
4. Midair/meshed rotors	23	7,467
5. Inadvertent IFR	27	5,838
	537	$80,698
Other accident types (8)	213	28,769
Totals:	750	$109,467

SAFETY FOR COMBAT READINESS
control of
noncombat accidents

The original USARV chart was simplified by listing the first five major accident types in order of decreasing cost and by combining the eight lesser ones under one general heading. These five accident types accounted for about 70 percent of the total number of noncombat accidents and 75 percent of the total cost.

Let's begin with an analysis of the underlying causes of the costliest accident types—materiel failure. When you read that 28 percent (213) of these accidents involved materiel failure, you might be led to believe that some of our equipment leaves much to be desired. However, our equipment is not as bad as implied by these statistics, nor quite as good as we would like to think. We may well have been blaming materiel, when we are actually dealing with self-induced failures.

The UH-1 engine is a good example. Late in FY 1968, the consumption rate of T-53 engines became so serious that the Deputy Commanding General, USARV, warned all responsible commanders that it might be necessary to ration flying hours unless the following steps were taken:

1. *Elimination of unproductive flying time (extended orbiting of lift flight caused by poor planning; unnecessary C&C aircraft; nonessential resupply missions, etc.).* One commander was able to substantially reduce the number of tactical emergency requests for supply missions by requiring the subordinate commander who declared a tactical emergency to explain the reason in detail to him the following day.

2. *Elimination of engine damage caused by ingestion of foreign objects and sand.* He felt that wherever possible, those areas used in helicopter operations should be prepared and maintained to minimize engine damage. In the field environment, this is the responsibility of the supported commander. In more permanent areas, the installation commander/coordinator is responsible. Aviation unit commanders must insure that their aviators use prepared landing areas when it is tactically feasible. Commanders must plan for and habitually use peneprime or landing area membrane when required to control dust and foreign objects on helipads and landing areas.

3. *Allowing sufficient time for thorough inspections and maintenance.* It was the deputy CG's policy that aviation units should be given the maximum daylight time at their home base for maintenance, consistent with demands for tactical employment. He observed that some commanders required supporting aircraft to arrive at pickup points by daylight; remain alert at pickup point for several hours before they were employed; fly troop lifts during daylight hours; fly supply missions after dark; and then return to their home base. In these cases, support units were compensating for their lack of planning with the speed and flexibility of helicopters. He emphasized that planning must begin the night before and be completed before the aircraft are requested, or at least before the aircraft arrive for pickup. To insure adequate planning and proper use, commanders should set a time limit on holding aviation units. Units should be required to launch their operation within 15 minutes after aircraft reporting time, unless an unexpected change has taken place in the tactical situation. Unless aviation units are given more daylight time at their home base, aircraft availability will continue to decline.

The deputy CG's guidance was that every commander should carefully plan helicopter use and that such use must be valid and essential, resorted to only if the mission could be accomplished by no other means. Necessary time for proper maintenance must be programmed and provided. Clean and dust-free landing areas must be prepared and maintained.

20 percent of our aircraft inventory in RVN is damaged or destroyed in noncombat accidents every year

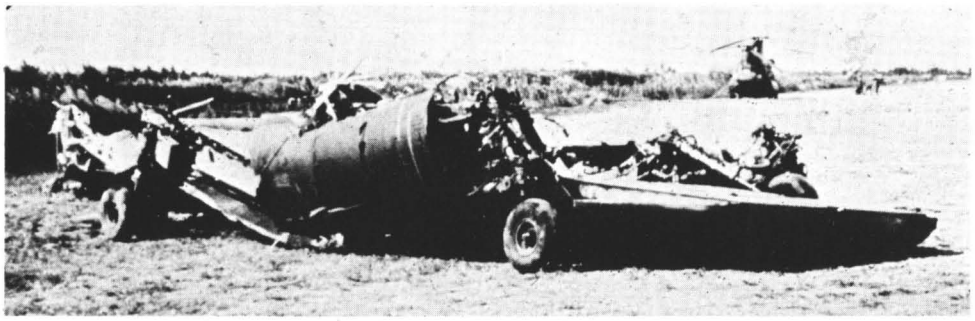
These recommended steps imply that our problem is not so much the engine itself but the way it is used, or rather misused. In a similar letter, the 1st Aviation Brigade commander stated that only 17 percent of our engine failures are due to component failure. The remainder, 83 percent, can be directly or indirectly attributed to *operational abuse, poor planning, inadequate facilities and substandard maintenance*. Further proof of the self-inflicted nature of the engine problem is the following quotation from the same brigade letter: "Why is it that one unit has engine failure after engine failure, while another unit operating in the same environment has none or, at worst, very few?"

It is logical that the answer to this question must lie in the manner in which these aircraft were employed and maintained.

The subject of engine failures is not our only area of concern when dealing with materiel failure type accidents. The complexity of present helicopters requires thorough and frequent inspection of many of the dynamic components. Lubrication and other maintenance services are necessary at regular intervals. Any disregard of these essential tasks can result in accidents. One of our aircraft requires a special inspection of the main rotor blades every 25 hours of flying. This is not a desirable situation, but it is one with which we must live, at least temporarily, if missions are to be accomplished.

Failure to accomplish the required blade inspection caused an accident which resulted in the loss of seven lives and the complete destruction of the helicopter. What valid reason could justify a failure to accomplish this important inspection? The inspection required the use of a special electronic device which, while on hand, had become inoperative. The urgency of combat and the desire to accomplish the assigned mission unduly influenced a maintenance organization which conducted the inspection visually, not realizing that the fatigue area of so much concern would usually originate inside the blade where it was not readily visible. The maintenance officer lowered his maintenance standards to provide the much needed aircraft for his commander. Both were influenced by the urgency of the mission. We're sure neither individual felt his deviation from established standards would result in such an accident.

We hope you have no illusions about the immunity of helicopters to abuse and poor maintenance. The catastrophic failure rate of the helicopter, compared



Required blade inspection was not performed due to mission urgency and need for aircraft

to that of fixed wing aircraft, is at least 30 to 1. Statistically, these accidents generally fall under the broad category of materiel failure type accidents, since they result from the loss of some dynamic component in flight. We now realize that many of these accidents are a direct result of poor maintenance practices.

In many cases, the ground commander unwittingly influences the aviation unit and maintenance detachment commanders to accept a degree of degradation of maintenance standards in order to provide the support requested. The tactical situation sometimes does require such degradation. When this occurs, the commander should be advised of the possible consequence and should make the decision which involves acceptance of the calculated risks involved. Commanders are usually provided operational control of aviation units in support of operations. With this control comes the responsibility to use these resources wisely, effectively and safely in the accomplishment of the mission.

How, then, can we reduce the waste which we loosely place under the category of materiel failure?

Enforce professional and universal compliance with performance limitations.

Demand that managers and commanders respect the limits imposed by maintenance requirements.

We've discussed the costliest accident type. Let's now look at the accident type that follows closely in second place—obstacle strikes.

Aircraft losses in this category are mainly the result of helicopter operations in confined areas, unsuitable landing zones and congested parking and refueling areas. The damage sequence usually starts with a strike by one of the dynamic components (either main or tail rotor) or a fuselage collision with a hidden obstacle. The natural tendency of accident investigation boards is to treat this type of accident as any other collision. They'll probably list the direct cause factors as *inattention, poor technique* or *poor judgment* on the part of the crew. Under the inoffensive heading of contributing factors, they may list supervision in the form of a flight leader who made a downwind approach, or a tactical commander who condoned hazardous conditions in the parking areas. Some accident reports may mention lack of crew coordination. Recommendations to prevent recurrence are only cause factors in reverse.

The accident report's first stop on its progress through channels is the unit commander or appointing authority. Regardless of his concurrence or nonconcurrence with the board's findings, he must list the actions taken to prevent recurrence. Considering the large number of mishaps in this category, hundreds of recommendations must have resulted in hundreds of written corrective actions—mostly of a repetitive nature. Unfortunately, without the desired effect, these accidents continue to occur with regularity.

There is a definite need to inform ground commanders about the vulnerability of the helicopter to tail rotor strikes in confined areas. A propeller can cut its way through tree branches without damage; on the other hand the *tail rotor* is extremely sensitive and any contact with underbrush may cause loss of tail rotor control, with its catastrophic potential.

It is understood that commanders are unable to provide engineer excavation of every landing zone used in the tactical employment of troops around the battlefield. Where possible, every effort must be made to select suitable areas initially. Continuous improvement in landing zones must be made as insurance against the loss of aircraft through obstacle strike accidents. We are not saying the ground commander is responsible for *all* obstacle strikes. Probably the most inexcusable strike accidents are those occurring in and around revetments, often with loss of life. Pilots practically always play a role in these accidents, but so do congestion, lack of clearly established hover lanes, nonstandardized revetment layouts, dust and a general lack of discipline.

One good example of this type accident concerned a helicopter that was to be used in a command and control mission. After all passengers were secured, the pilot started the engine. The aircraft commander then took the controls and applied pitch to move away from the revetment to a position for takeoff. The helicopter assumed a nose high attitude before the aircraft commander realized the right rear skid was caught on the pierced steel planking used as a

Right rear skid caught psp of revetment floor. Action was immediately started to replace psp pads

surface material in revetments. The main rotor blades struck the revetment, the helicopter continued to roll and the rotor blades then struck the ground.

The investigation board labeled this accident "pilot error," in that the aircraft commander failed to recognize the unsafe condition in time to take corrective action. The board labeled the skid shoes catching in the PSP surfacing material as a contributing factor. The board's recommendations included replacement of PSP surfaces in landing pads and revetments with a less hazardous material at the earliest practical time.

The reviewing official concurred in the pilot error cause factor. He did acknowledge that listing the primary cause of the accident as "pilot error" should not serve to lessen the role of the PSP in this accident. Action was immediately started to replace the PSP pads.

No doubt this particular accident might have been prevented if all crewmen aboard were performing clearly outlined duties. This is certainly one area in which we, of the aviation community, do not have absolutely clean skirts. After several years in the combat environment, we have not established clearly defined duties and responsibilities for each rated and nonrated crewmember aboard our aircraft. This failure to establish rules for all crewmembers is also a failure to use all available eyes.

This deficiency is now being corrected and individual duties for each man are being established. These duties will be included in operators' handbooks for each type aircraft.

In summary, accidents resulting from obstacle strikes can be reduced by:

1. *Standardizing and enforcing operational procedures in LZs, refueling and parking areas.*
2. *Establishing crew duties.*
3. *Demanding compliance with minimum satisfactory standards for the layout of parking facilities and refueling areas, to include dust suppression.*
4. *Alerting ground commanders to the sensitivity and vulnerability of the dynamic components of helicopters.*

Lost rpm/overgross—helicopter flight is dependent on rotor blade speed or rpm. When the rpm decreases below the minimum necessary for flight, the aviator loses control of the helicopter and it descends to earth. Rotor rpm can be adversely affected by downwind conditions, density altitudes and overloading. Each of these factors can demand more power from the engine than it has available, and rotor rpm is lost.

Why should we be plagued with accidents resulting from these things with which aviators are intimately familiar? Certainly, they are aware of the adverse effects of atmospheric conditions. They also have some rough idea of the weight of passengers and cargo to be transported. Notice, we said *rough idea* of the weight involved. Unfortunately, this is another area not adequately covered in our present

aircraft. While ammunition and other commodities have established and easily identifiable weights, the weight of other items of equipment must be estimated. Often, estimates made by ground personnel or aviators turn out to be conservative and this results in overgross conditions for the prevailing density altitude. In itself, this should not present an unsurmountable problem. Established procedures throughout RVN require aviators to conduct performance checks of their helicopters' ability to lift the load, without loss of rpm, just prior to takeoff. Frequently, however, it is not feasible to perform this check under heavy enemy fire during an emergency evacuation mission. This is a calculated risk to be evaluated by the aircraft commander. The nature of such emergencies is sometimes questionable. For example, there was the ambulance driver who picked up a man with a broken arm and killed himself and his patient in a wreck on the way to the hospital. Some situations really are *a matter of life and death,* but let's insure this is truly the case when we place the lives of four crewmen in jeopardy for an extraction or tactical emergency.

One fortunate circumstance concerning loss of rotor rpm is that it does provide some warning of impending trouble. The helicopter will respond to corrective actions if they are taken in time. We say fortunate because the experienced aviator is frequently able to identify the symptoms and initiate corrective action to save the aircraft. It demands the utmost in professional skill and judgment, as well as considerable luck. All who have survived this near-accident situation realize they are betting their skill and judgment against the manufacturer's performance data each time they attempt a takeoff with an overgross weight for existing atmospheric conditions. Unfortunately, the odds on this gamble are not in favor of the aviator and he will eventually be involved in an accident. Relatively inexperienced aviators, usually junior in rank, are often placed in positions to accept loads based on the desires of the supported unit. Far too frequently they become accident statistics because of their desire to accomplish the mission.

An aviator flying a UH-1D helicopter found himself in just such a predicament. It was imperative that 1,200 pounds of mess supplies and Red Cross items, plus four passengers, be delivered in a single mission. There wasn't time for two trips. This helicopter lost rpm, bounced several times in a feeble attempt to become airborne and crashed on its side. It burst into flames, destroying those urgently required supplies. Fortunately, the passengers and crew escaped with minor injuries. *We didn't have time to do it right the first time, but we always have time to do it again!*

Early in FY 1968, the 1st Aviation Brigade commander made an observation concerning this type of accident: "Sixty-five UH-1s were involved in major accidents as a direct result of overgross conditions in the first half of this fiscal year—more than enough to equip two assault helicopter companies."

Many of these overgross/loss of rpm accidents occur during landing. Loss of lift, with the resulting inability to fly, becomes even more disastrous when it occurs while attempting to land on a pinnacle or in a confined area. Any downwind condition in a landing zone will adversely affect a heavily loaded helicopter. Here, the commander or planner plays a vital role in selecting landing zones and determining the direction of landing for assault elements. Certainly, the tactical situation must be considered, and there will be occasions when only a downwind approach will be practical. When this occurs, each helicopter payload must be adjusted accordingly.

One aviation group commander became so plagued with accidents resulting from poor landing zone planning and downwind operations that he wrote a command letter to his subordinates, which stated: "When a mishap occurs involving downwind operations, the air mission commander will forward a statement through channels to me that he advised against such operations, but was directed to proceed as a matter of tactical necessity by the supported ground commander." This action did not increase his popularity, but it did reduce his accidents. Was he mission oriented? Was he an effective manager of resources?

Accidents resulting from overgross weight/loss of rpm can be reduced by:

1. Basing operations on the performance data provided by the manufacturer.

2. Standardizing and enforcing the use of performance checks.

3. Taking the guesswork out of helicopter operations with instrumentation that responds to gross weight, density altitude and power available.

Some commanders require supporting aircraft to fly troop lifts during daylight hours and supply missions after dark . . . compensating for their lack of planning with the speed and flexibility of helicopters

Midair/meshed rotors: These accidents are similar to obstacle strikes, with one exception—instead of some stationary object, the aircraft strikes another aircraft in the air or on the ground. The results are generally more expensive and more deadly. When these accidents occur on the ground, in congested and dusty parking or refueling areas, previous comments and recommendations apply.

Meshed rotor blade accidents also occur in tactical landing zones. Usually they are a result of a lack of positive control on the part of the tactical commander. Landing zones must be organized with ground guides who can provide separation between helicopters. All vehicles operating in and around heliports and landing zones must be controlled. Many helicopters have been disabled by vehicle whip antennas. These accidents can be prevented by establishing and enforcing operating procedures which limit and control vehicle movement around aircraft.

You might expect that most midair collisions occur during multiple ship formation flights, since the exposure and potential for collision is at its peak during these missions. This is not the case! Experience shows that aircraft operating in formation are seldom involved in collisions. Positive control, the known relationship between aircraft and the rigid discipline required in such flights account for the comparative safe operation.

Midair collisions do occur during assault operations, but they occur between aircraft orbiting above the landing zone. When this happens, it always seems that there are more command and control helicopters participating in major tactical assaults than there are lift ships engaged in the movement of troops. Everybody wants to see and discuss over the air the progress of the operation. Commanders can assist in reducing these accidents by restricting the participation of command and control aircraft to the minimum essential. Is it really necessary that the S-2, the S-3 and the S-4 each have a separate C&C helicopter? A reduction in the number of C&C aircraft will result in reduced exposure to midair collisions and in the conservation of flying time for more essential missions.

Oversaturation of airspace also results from oversaturation of the terrain with heliports. We have come to think that it is impossible to drive a few miles by ground vehicle. One operational area has tremendous midair collision potential because of numerous heliports, landing pads and runways scattered throughout a vast complex. It seems each headquarters must have its own personal heliport. It is convenient! Here, we've been extremely fortunate! Although numerous near-miss reports have been recorded, there has been only one midair collision.

If you are in a position to do so, we recommend that you limit the number and proximity of heliports in your area. Insist that ground vehicles help to relieve oversaturated skies.

You may be thinking that we are trying to place the blame for midair collisions on the shoulders of ground commanders. This is not our intent. However, as we have stated, there *are* areas in which you can assist. Aviators and aviation commanders have a *grave* responsibility to enforce air discipline in a professional manner. They cannot tolerate any disregard for established policies, practices and procedures.

A command vehicle in a road convoy struck a land mine and made a call for a dust-off helicopter to evacuate the wounded. The call was monitored by an OH-6 that was in the area on a C&C mission. The OH-6 headed toward the scene and the scout team leader was called and ordered into the area. Both helicopters were on a westerly heading. The scout team leader arrived at the scene first, approximately 50 feet above the trees. The C&C OH-6 was to the left, above and behind it, descending. Both were in a turn to the right. After 180 degrees of turn, the second helicopter overtook the first and they collided, killing all occupants of both.

One of our senior aviation commanders in RVN recently made this statement: "There is an apparent reluctance on the part of commanders to take punitive action when warranted. By winking at poor habits, poor techniques or poor discipline, we allow lax or unskilled pilots to put themselves and innocent personnel in jeopardy."

Exaggerated? Fourteen people were killed in two formation collisions because we tolerated the cocky, overconfident behavior of pilots who had habitually ignored established rules for separation.

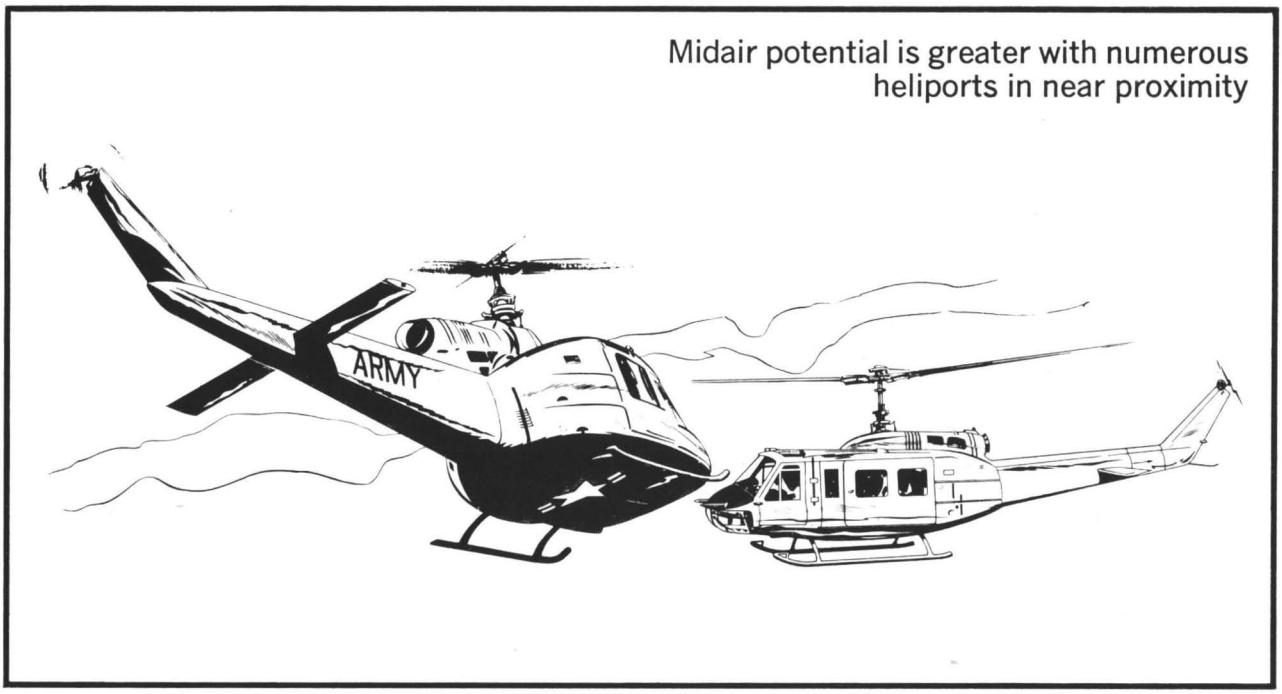
In addition to those corrective actions previously mentioned, collisions can be controlled by:

1. Enforcing compliance with directives.
2. Treating every dangerous departure from written and unwritten standards as a breach of discipline.

Inadvertent loss of external reference: These accidents are particularly destructive, and often fatal because they are characterized by unplanned loss of visual reference, followed by loss of control or flight into terrain obstacles. The loss of visual reference can occur at night, in weather below visual minimums or during takeoffs and landings in dusty conditions.

We say that Army aviation has an all-weather capability. This is true for *fixed* wing aircraft operating from established airfields equipped with instrument landing facilities. Rotary wing aircraft can also fly under instrument weather conditions without external references, but their pilots must be provided with navigational aids to enable them to get from point A to point B. Helicopters, like airplanes, must have some type of instrument landing aids at their destination. These aids are seldom available at landing pads and landing zones in tactical environments.

Most of our loss-of-external-reference accidents result from this loss of reference in close proximity to the ground. This is our major problem. Loss of outside references at higher altitudes provides aviators with time to transition to flight by reference only to instruments. At a few feet above the ground, little time is available for this transition and judgment is easily distorted. The aviator in this condition is easily influenced by a phenomenon known as vertigo or spatial disorientation. He becomes a victim of illusions concerning his flight attitude. When adequate instrumentation is provided and when the aviator has sufficient composure and time to force himself to overcome these illusions, he can escape



Midair potential is greater with numerous heliports in near proximity

this dangerous situation and regain safe flight.

An accident occurred during a zeon light and starlight scope mission. The nature of the mission was tailor-made for the loss of external references. The mission called for an OH-6 equipped with a starlight scope to fly at approximately 200 feet. A UH-1 equipped with a zeon light was to fly at approximately 600 feet and slightly ahead of the OH-6. That particular night, no visual horizon was present. The OH-6 pilot was maintaining flight reference and orientation on the UH-1. The UH-1 pilot called the OH-6 pilot and advised that he was making a right turn to check an area that looked suspicious. Both helicopters started a turn. During the turn, the UH-1 pilot turned off his searchlight. The pilot of the OH-6 lost sight of the UH-1 and all external references. He made an attempt to orient himself by his instruments, but experienced vertigo. Either he did not believe or did not properly interpret his flight instruments. The aircraft crashed at an airspeed of approximately 90 knots. Personal gear, individual weapons and aircraft parts were widely scattered, but the pilot and observer escaped with minor injuries.

Helicopters are not now provided with sensitive instruments able to display accurate airspeeds in slow flight. They cannot provide accurate altitude readings close to the ground. Helicopters, therefore, will not really have all-weather capability until these aids are provided.

One hundred and twenty-four persons have been killed in Vietnam in rotary wing accidents where vertigo or spatial disorientation was a factor. During the last 7 years, accidents of this type have increased more than sixfold! What can you do to decrease this severe loss? You must realize that flight close to the ground in marginal weather conditions is an inherently unsafe act and should be attempted only when demanded by the most grave tactical situations.

When such flights are necessary, you should also realize that the aviator must be provided the latitude

which permits him to perform a 180-degree turn, and return to his point of origin without fear of ridicule. Only the aviator knows his capability in such situations. Trust his judgment and hope that he is able to accomplish the mission. Failing this, he will at least be able to return safely.

You can also assist in reducing these accidents by providing training aircraft to your supporting aviation unit commander so that he can conduct a continuous instrument training program for newly arrived aviators. He will then be able to provide a better qualified aviator to handle critical situations as they arise.

Commanders have a responsibility to maintain helipads and heliports in safe operating conditions. Dust to a hovering helicopter can be just as deadly as a solid fog bank.

The ultimate goal of the commander is to accomplish his assigned mission. He must carefully expend his resources when engaging the enemy in order to deplete the fighting strength of the adversary and swing the balance of power in his own favor. *Successful combat is primarily a matter of resource management.*

Aviation assets are but one additional element of combat power which must be viewed with the same concern as men, tanks and artillery. The needless waste of equipment through noncombat accidents results in a depletion of combat power. *A command safety program enhances mission accomplishment through preservation of assets.*

A prevention program is but an additional management tool. An integrated and coordinated safety management effort is the key to keeping the balance in favor of the conservation of assets. There is nothing mysterious about the operation of lifting devices or the efficiency of powerplants under varying atmospheric conditions, but operation of our aircraft is critical. Unlike ground vehicles, they are unforgiving. Managers must face up to the limitations we have discussed.

The entire Army is mission oriented. Is it any wonder then why Army aviators today are enthusiastic about accomplishing their missions and why they habitually fly their aircraft in Vietnam at the ragged edge of the performance curve? Of course not. They are part of the Army team. However, we remind you that 60 percent of the accidents in Vietnam involve brand new warrant aviators. This is not meant as an indictment. These young Americans, about 19 years old, have tremendous esprit. They will try to accomplish any mission assigned them. Commanders, with the advice of their aviation officers, must insure that assigned missions are necessary and are within the capabilities of aircraft and crews.

MG Ellis W. Williamson, CG, 25th Infantry Division, had this to say about the use of aviation assets:

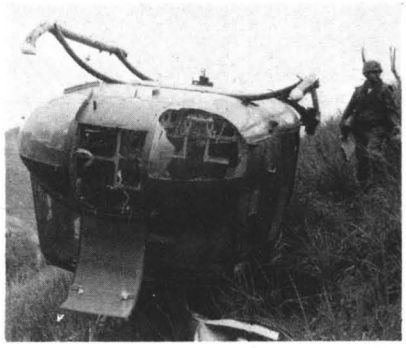
OH-6 pilot lost outside references, and experienced vertigo. Despite severity of crash, pilot and observer escaped with minor injuries

"The cost of aircraft losses through accidents or hostile action is ultimately paid by the ground unit commander. This price is paid in the form of decreased available aviation assets to support the tactical mission. The ground commander, therefore, *must* be vitally concerned and *intimately* involved with the aviation safety program.

"The ground commander is responsible for decisions which directly affect the safe operation of Army aviation assets. It is *he* who determines the degree of risk acceptable in the accomplishment of his tactical mission. It is *he* who makes the final selection of the LZ for combat assaults. It is *he* who selects and develops the field heliport. It is *he, the user, the customer,* who must fully understand the capabilities and limitations of aviation support in order to use it safely and effectively in attaining victory on the battlefield."

The challenge facing all of us is to eliminate all preventable noncombat accidents. We cannot afford the continuous spiral in dollar costs and reduced combat readiness due to aircraft losses. We must properly use aviation assets allocated for mission accomplishment. Our goal must be a zero accident rate. It *can* be done! It *has* been done! It *must* be done!

PREVENTION SENSE



The following accidents are presented to illustrate what happens when the lessons contained in the three-part series — "Safety for Combat Readiness" — are not applied

CONGESTION

A FLIGHT OF SEVEN UH-1Ds, made up of elements from two assault helicopter companies, was landing in a PZ to pick up its first lift of troops. On final approach to the PZ, the flight of seven in staggered trail right formation was joined by the eighth helicopter, placing four helicopters on each side of the formation. As they landed, the last helicopter had to land at an angle behind the third helicopter on the right side because of a 4-foot dike at the edge of the PZ and a canal to the right. The third helicopter on the right side landed extremely close to the helicopter ahead.

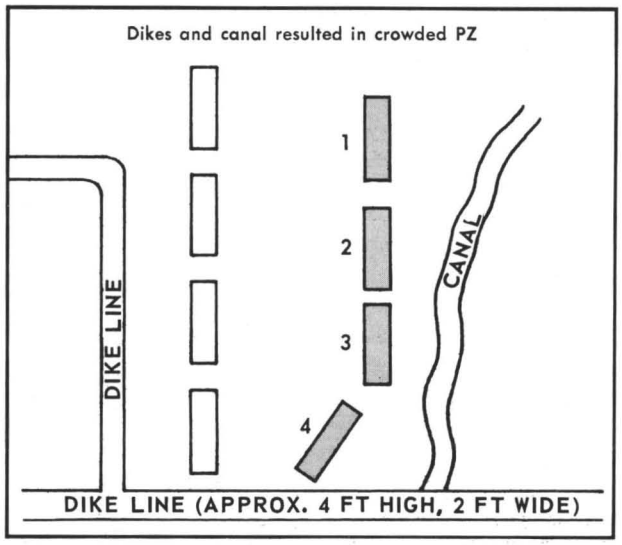
When the troops were loaded, the AC of the third helicopter on the right side lifted off for a hover check. He completed the hover check and was putting the helicopter back down when his main rotor blades struck the tail rotor of the helicopter ahead. The AC of the helicopter that was struck felt two vibrations and his helicopter began to come apart. Debris from it struck and severed the tail rotor and 90-degree gearbox and cut the control cables in the tail boom of the last helicopter parked at an angle.

This $200,000 accident, although caused by one aircraft commander parking too close behind another helicopter because he was aware of the dike behind and the last helicopter, could have been prevented if the PZ had been selected and prepared for the number of helicopters to be used.

REVETMENTS

A UH-1H pilot terminated a night approach and started to hover into a revetment on the pad. He asked his crewchief for clearance and when the crewchief cleared him, he turned into the revetment and his tail rotor struck the main rotor of a parked UH-1H in the next revetment to the rear, causing the 90-degree gearbox and tail rotor to separate from his helicopter. Directional control was lost and the helicopter spun to the right, landing hard and collapsing the left skid. As the tail rotor flew away, it damaged both helicopters extensively, resulting in a $40,000 accident. Investigation showed the cause of this accident to be failure to maintain clearance between helicopters. Contributing factors were:

1. *Revetments were too close together.*
2. *The landing pad did not have sufficient lighting.*
3. *The pad did not have guidelines for hovering and parking.*



BUILT-IN HAZARD

A UH-1H was on a mission to deliver medical supplies to an advisory unit. The advisory unit landing pad was set up at the edge of a river, surrounded on three sides by buildings. When he reached his destination, the pilot made a low reconnaissance of the landing area and started his approach. During the approach, the AC warned him about a building to the right of the pad and the pilot made a 10-degree correction to the left.

As he neared his touchdown point, the pilot flared and struck the riverbank with his tail skid at a point 21 feet short of the pad. The tail rotor struck concertina wire and broke away from the 90-degree gearbox. At this point, the AC took control and attempted to level the helicopter. It made approximately three violent spins to the right and crashed onto a small dock approximately 40 feet from the concertina wire. The crew escaped, but the helicopter caught fire and burned.

This $228,000 accident was caused by an improper approach and the failure of the AC to recognize and correct for it. *The concertina wire placed in front of the landing pad was a contributing factor to the severity of this accident and the investigation board recommended the wire be removed entirely from the approach end of the pad.*

Landing pad was set up between buildings at edge of water

WIRES

A UH-1D loaded with cargo and three passengers was on a resupply mission. The AC made a hover check and was only able to maintain a steady 6400 rpm. He landed, offloaded one passenger and two duffel bags, then attempted to take off.

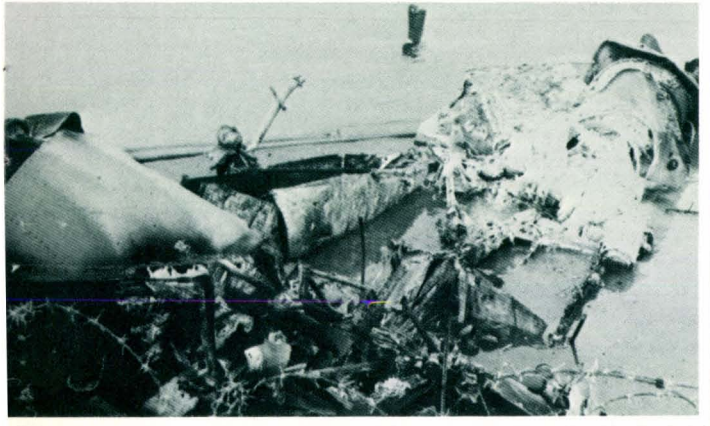
AC: "I backed to the edge of the pad and my rpm remained stable. I started my takeoff, reached translational lift and started to climb by the time I reached the edge of the pad. The climb took no additional power and I cleared the first row of powerlines.

"Just as we passed over the wires, I felt the helicopter shudder and heard the rpm start to drop. I lowered collective and added forward cyclic, but the rpm continued to drop. I told the crew to hang on, that we were going in.

"I began looking for a place to land as the rpm continued to bleed rapidly. At about 25 feet, I pulled the remaining pitch to cushion the landing and the helicopter yawed sharply to the right. I applied full left pedal and at about 10 feet from the ground, I saw the rotor head and blades landing in front of the helicopter. . . ."

Investigation revealed that this $126,000 accident was caused by an attempt to take off with approximately 1,350 pounds in excess of maximum allow-

Additional hazard, concertina wire just off approach end of pad, caught UH-1 tail rotor



able gross weight. The report stated that supervision was not a factor, *but it recommended that wires around the helipad be buried to provide adequate emergency landing areas.* A description of corrective action taken included this statement: *"A new helipad is under construction. Until it is completed, only reduced loads will be lifted from the old pad."*

An analysis of the engine from this helicopter showed that the engine failed due to the failure of one or more N_2 turbine blades. The blades failed through high temperature intergranular creep and overstress mechanisms. This type of failure is the result of excessively high temperatures, time and stress. Once these blades have been subjected to excessively high temperatures, only time and normal operating stresses are required to bring about failure. Since the N_1 turbine blades, the N_1 nozzle assembly and the N_2 nozzle assembly did not indicate that an overtemperature condition had occurred in this engine, it is probable that the overtemperature condition of the N_2 turbine blades occurred prior to the installation of the N_2 turbine in this engine. This particular N_2 turbine assembly had 300 hours of operating time before it was installed in this engine.

Despite the overgross condition, this engine failure would have required an emergency landing. With wires covering all possible emergency landing sites, a successful forced landing could not have been made.

CROWDED LZ

The crews of a flight of five UH-1Hs were advised that their destination LZ would accommodate the five helicopters by a command and control aircraft. On final approach to the LZ, the AC of the lead helicopter informed the flight that the LZ did not appear large enough for five helicopters and the pilot of the fifth helicopter made a go-around.

The AC of the second helicopter elected to remain at a low hover because of the excessive slope of the terrain in the LZ. The No. 3 helicopter was landed as close as possible to No. 2 to leave enough landing room for the fourth helicopter. Nos. 2 and 3 were at an angle, facing a ridge, with No. 2 at a hover and No. 3 on the ground.

Because of turbulence and center of gravity changes caused by troops unloading at a hover, the AC of No. 2 allowed his tail to swing right, placing his tail rotor in the main rotor disc area of No. 3. A main rotor blade of No. 3 struck the tail rotor of No. 2, causing the 90-degree gearbox to separate. The helicopter then started an abrupt turn to the left and rolled on its left side.

One of the recommendations resulting from the investigation of this $54,000 accident was that better orientation be given to ground troops about boarding and exiting helicopters. *An additional recommendation might well have been better selection and preparation of LZs.*

HAZARDOUS PZ

A UH-1H was on a mission to extract soldiers

from a very small PZ. During the third pickup, the helicopter was hovering with one skid on the ground because of the sloping terrain and brush on the PZ. As the last of six soldiers boarded, it started a slow turn to the right, with full left pedal applied. Not recognizing this emergency as a failure, but assuming his problem was caused by wind, the AC pulled pitch and became airborne before the helicopter could strike other nearby troops. He was unable to regain control after becoming airborne and crashed in a heavy jungle approximately 60 feet from the PZ.

This $228,000 accident, which also resulted in three major injuries, was caused by a mechanical failure in the pitch change control system of the tail rotor. *Contributing to the accident was the fact that the PZ was not only not level, but it was covered with brush and stumps that prevented the pilot from putting the helicopter down. The presence of troops on the PZ also prevented him from making an autorotation when the emergency was first recognized.*

AREA SELECTION

A UH-1C gunship AC started a takeoff from a 2-foot hover with 6700 rpm from behind a dike and over a large dry rice paddy that was approximately 100 feet long. His flight path took him over four more rice paddies which were about 50 feet long and separated by 18-inch dikes. As forward movement started, the helicopter began to settle and when he reached the first dike, the AC had to pull in a little more pitch to get over it. He was already at maximum power and by pulling in more pitch, he bled rpm. This condition was aggravated as he continued to pull more pitch to get over each succeeding dike.

Wires (note poles) surrounding helipad at center of photo denied emergency landing areas. When helicopter lost

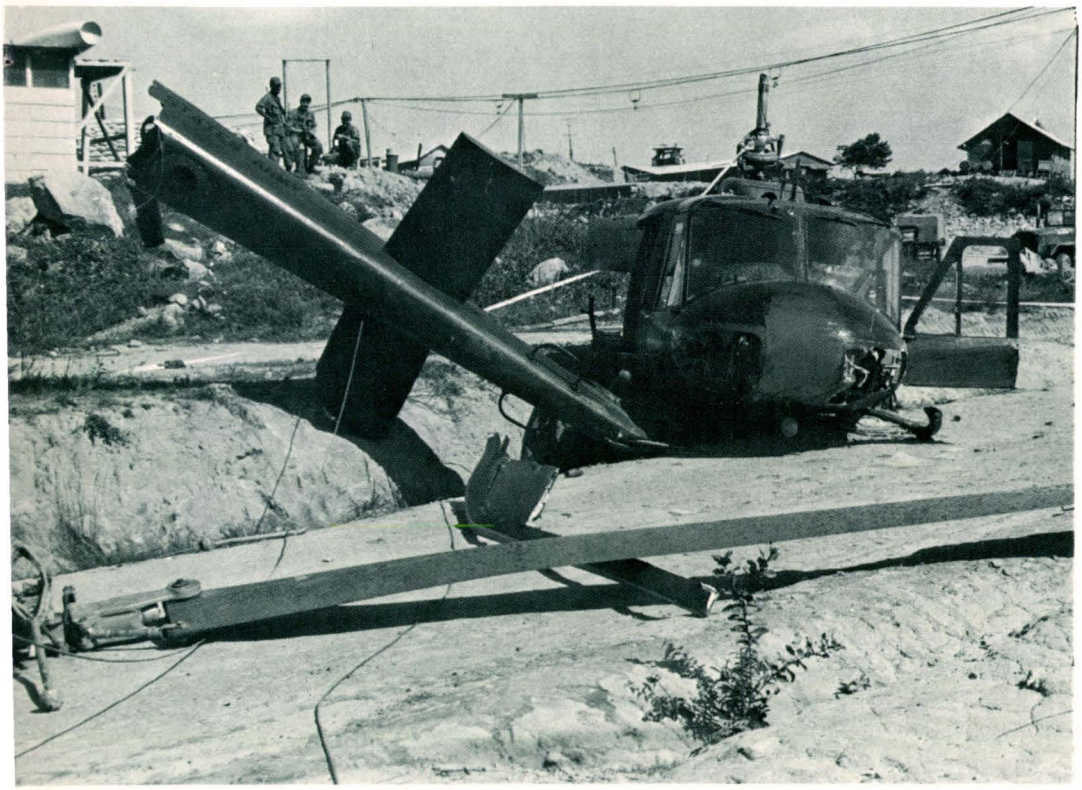
After crossing the first two dikes, the AC realized he was going to have to abort his takeoff, but he did not want to land in one of the smaller paddies because they were covered with water and he felt the helicopter would slide forward and hit a dike. He elected to try for a larger paddy which was partially dry, the fifth paddy from the point of takeoff, slightly to the right of his flight path and separated by a 2-foot dike. As he approached, his rpm was down to 5600 and he began to lose directional control. He pulled more pitch, attempting to clear the dike, and the helicopter yawed to the right and settled in. The skids hit the dike and the gunship came to rest on its left side.

This $217,000 accident was caused by the AC's failure to abort the takeoff while he was still in control of the helicopter. *A contributing cause was the selection of a heavily diked area as a landing and takeoff point for gunships.*

STUMPS, SLOPES AND OVERGROSS

A UH-1D and two UH-1Hs were each carrying six combat-equipped soldiers from a PZ at an approximate 100-foot elevation to an LZ at an approximate 2,000-foot elevation. The AC of the UH-1D made the necessary hover check in the PZ, but neglected to consider the altitude in the LZ, other than to assume that the fuel consumed in getting there would compensate for the difference in altitude. There was no warning given during the preflight briefing that the LZ contained many stumps and steep slopes. It was on a pinnacle which fell away sharply on three sides, with 12- to 15-inch grass covering the area.

rpm, aircraft commander had no place to land and helicopter hit wires



LZ containing many stumps and steep slopes fell away sharply on three sides

The AC made his approach to the LZ and came to a high hover with 6400 rpm. At this time, the passengers began to leave by stepping out on the skids and jumping to the ground. This was a slow process because the passengers were not only jumping to a steep slope, but had to pick their spots carefully to avoid landing on stumps. This momentary hesitation while they were on the skids caused the helicopter to sway laterally, contributing to a loss of lift. At this point, the helicopter had started to settle and was drifting backwards downhill. Due to the lack of reference points, the AC and pilot were unaware of this drift. As it drifted downslope, the main rotor blades got closer to the ground and the AC started a right pedal turn, then hesitated a moment while applying left cyclic. The helicopter turned 360 degrees, landed hard on the steep slope, rolled over and came to rest inverted. The two remaining passengers were thrown out and injured. One had a broken arm and the other had serious back and internal injuries.

This $228,000 accident involved many factors, among which were:

1. Failure to consider the difference in density altitudes between the PZ and LZ.

2. Failure to consider the lack of ground effect at the pinnacle LZ and the resultant power requirements to hover out of ground effect. The helicopter was 850 pounds overgross for hovering out of ground effect.

3. Lack of information about the LZ prior to flight.

4. The AC's inability to recognize a rapidly deteriorating situation and take timely corrective action.

5. The overwhelming desire of the AC to complete the mission, which overshadowed his judgment in flying the helicopter.

6. Supervisory factors, including pairing a UH-1D with two UH-1Hs and using the same load for all three helicopters. The AC of the UH-1D had limited experience and was assigned a pilot who was new to the UH-1D.

The accompanying photograph shows the helicopter after the accident and the steep slopes and many stumps.

OVERGROSS FOR FENCE

A UH-1B gunship with a crew of four, an XM-16, 900 pounds of fuel, 6,000 rounds of 7.62 ammunition, 13 rockets and approximately 375 pounds of miscellaneous equipment was taking off for a mis-

sion. It was hovered from the unit's rearming pad to an open rice paddy near the perimeter of the camp and a hovering takeoff was started. A barbed wire fence, 4 to 6 feet high, crossed the flight path approximately 100 feet from the point where the takeoff was started.

As the helicopter reached the fence, effective translational lift had not been achieved and the pilot flared to lift over the fence. As the helicopter crossed the fence, the rpm dropped to 5800 and the AC took control and made a running landing in a small rice paddy. The helicopter touched down level, slid through two rice paddies, hit a dike and rolled on its left side.

The cause of this $118,000 accident was listed as the attempt to take off at a high density altitude with approximately 700 pounds over the recommended takeoff weight. However, among the recommendations resulting from the accident investigation was *that an adequate takeoff area be cleared and used by all heavily loaded helicopters.*

OVERGROSS FOR TAKEOFF

A UH-1C completed its gunship mission, landed at a forward base, refueled with 800 pounds of fuel and the pilot prepared to take off for the flight to his home base. The helicopter was hovered laterally to the center of the takeoff lane. During this maneuver, the rpm bled to approximately 6000, but this was attributed to the fact that the AC had pushed left pedal during the sideward hover to look for another helicopter. The pilot landed on the takeoff lane, then began his takeoff. As the helicopter broke ground and started forward, the rpm dropped to approximately 6200 and the takeoff was continued with approximately 9 inches of ground clearance.

Approximately 100 feet from the takeoff point, a rutted muddy area, which was a ground vehicle traffic lane, crossed the takeoff path. As the helicopter reached this area, the AC abruptly applied additional collective to clear it and the rpm dropped to approximately 5800 after clearing the muddy area. At this point, the AC took control and continued the takeoff. Approximately 300 feet from the muddy area, another obstacle, a two-strand concertina fence, was encountered. The fence was cleared at the expense of an additional 200-rpm loss.

The helicopter hit the ground 40 feet past the fence, bounced and hit again 60 feet further on. It bounced again and started a spin to the right due to the lack of antitorque control from the low rpm. It hit the ground a third time after turning approximately 180 degrees and rolled on its left side.

This $217,000 accident was caused by failure to compute allowable gross load, failure to perform a hover check to insure the helicopter was within gross weight limitations for existing conditions, failure to abort the takeoff when the rpm became critically low and control applications by the AC while the pilot was in control of the helicopter.

A reviewing official said: "It is apparent that this accident occurred because the AC failed to abort the takeoff when the rpm continued to decrease below minimum safe operating limits. However, it should be pointed out that the present tactical mission is such that gunships are required to operate in an overloaded condition on a daily basis. If the UH-1C gunship is to continue to be employed and, unless we are willing to risk the high probability of recurring accidents, such as the one in this report, we must either accept a less effective performance on target by reducing the basic load of ammunition, or we must install a more powerful engine which is more compatible with the mission requirements.

"Although evidence was not found to clearly indicate that the takeoff was attempted with a quartering tailwind, *the fact that there was no wind indicator in the company's forward area should be included in the findings as supervisory error on the part of the company. It is noted that this situation was immediately corrected when brought to the company's attention. . . .*"

UNNECESSARY RISK

An OH-13S pilot was on a volunteer mission to go into an insecure area to pick up enemy weapons and documents. Infantry had swept through the area several times, but the pilot knew where there was a specific area that had been missed. Two OH-13S pilots volunteered and were allowed to undertake the mission.

After they reached the area, one pilot landed in a rice paddy adjacent to the area and was recovering weapons and equipment while the second pilot flew overhead cover. The second pilot then decided to go lower to see what he could spot from the air. He hovered over the area at about 6 to 8 feet. The area was bordered by palm trees, but was large enough to hover in and turn the helicopter. The ground was heavily cratered from artillery.

After hovering for approximately 10 minutes, the tail rotor struck an object, causing the tail rotor drive shaft to disengage. The pilot lost control, the helicopter yawed to the right, the main rotor struck a tree and the OH-13S crashed.

This $32,000 accident was caused by hovering too close to the bushes and shrubbery in the area, which resulted in a tail rotor strike. The findings of the investigation board also listed the pilot's strong desire to do a good job, which caused him to take unnecessary chances.

A reviewing official stated: "It is evident that in

the conduct of this mission the pilot took a greater risk than was necessary to accomplish his mission. He accepted an unnecessary risk by allowing his desire for mission accomplishment to crowd out his good judgment. This is another case of the acceptance of unnecessary risk by ignoring or ignorance of proven and established flight techniques and procedures. The trees and obstacles were there and visible to the pilot. The flying that followed should have been in accordance with known hazards and accomplished in such a way that the margin of safety was in favor of the pilot and helicopter.

"Supervisory error is considered to be involved in that there is a tendency for this type of approach to flying to be accepted as common practice. There is not enough emphasis placed on taking only that risk required to accomplish the mission. The end results are too often condoned when in fact the risks could not be justified by operational necessity. New and inexperienced aviators, confronted with ready acceptance of unnecessary risks, soon find themselves attempting the same and, due to their lack of experience, are often unable to cope with the situations in which they find themselves. They are in fact lulled by supervisors and experienced aviators into believing that these techniques are routine and common practice. This practice has to be stopped and positive command action is necessary to insure that pilots do not take chances they do not have to take and that the acceptance of high risks is not commonplace, but weighed carefully against the mission and situation. . . ."

WEATHER RISK

Two OH-6 pilots completed a resupply mission and were headed back to base at dusk.

Surviving pilot: "We left the base enroute to the resupply point at 1840. Along the way, we encountered numerous rainshowers and low ceilings. I arrived at the resupply point about 5 minutes ahead of the other pilot because he had to circumnavigate some bad weather along the way. I unloaded my cargo and headed back.

"A short time later, as I was crossing a highway, the other pilot called and asked me to turn on my running lights. I did and he said he had me in sight. At this point, he must have been about 1 minute behind me. As I continued, the weather looked worse so I turned 45 degrees left to a direction in which the weather looked better. I told the other pilot that I was slowing to 60 knots and he acknowledged. I told him I was going to try to get into our base from the west.

"Just after crossing a village, I called the other pilot, gave him my heading and told him I was going to try to get into the base. It was about a minute later when I ran into ground fog. I told the other pilot I was making a 180-degree turn and he acknowledged. This was the last communication I had with him.

"Part of the way through my 180-degree turn, I decided to climb and try and break out on top. I broke out at 3,500 feet indicated and headed west because the weather looked better in that direction. I was running low on fuel so when I found a hole to come down through, I put the aircraft down, spent the rest of the night at that location and headed for base in the morning when the weather cleared."

Questions asked this pilot:

"What did you think had happened to the other pilot?"

"I thought he had returned to another base and shut down."

"Do you know what his fuel status was?"

"He had plenty of fuel because he had refueled just before we started that last mission."

"About how far from the crash site were you when you went IFR?"

"In the same area."

"How long had the other pilot flown that day?"

"About 5 hours."

"What were the weather conditions around the base when you were returning?"

"It was getting dark and foggy."

Weather officer: "To summarize the type of weather conditions we experienced in this area during the day, we had nearly continuous scattered rainshowers with light drizzle and fog and generally varying ceilings, from 200 to 700 feet."

The OH-6 that crashed hit a tree which was the highest and most sparsely vegetated obstacle in the area. The main rotor hit the tree as the helicopter passed to the left of it and the OH-6 plunged to the ground from 15 feet. The skids embedded in the ground and it tumbled forward, breaking into pieces and killing the pilot who was the only occupant.

The cause of this $56,000 accident was found to be the pilot's attempt to maintain VFR under IFR conditions. Among corrective actions listed by a reviewing official was: *"Ground commanders are*

weighing the risks involved against mission priority (i.e., aviator experience, weather and aircraft limitations.)"

TIRED AND HUNGRY

After flying 3½ hours and completing a resupply mission, a UH-1D was enroute to a base for fuel. It reached the base and the AC was flying low level across the end of the base at 70 feet and 80 knots when the engine stopped. The AC selected a landing area that appeared to be level and touched down with an airspeed of approximately 30 knots.

After touching down, he saw that the terrain was extremely rough and there was a big depression about 35 feet ahead in his path. He successfully lifted the helicopter over the depression and the right skid hit a mound of dirt on the other side. Both chin bubbles were broken and mud filled the cockpit. The helicopter continued to slide through the mud approximately 30 feet, turning 65 degrees. The tail boom was broken off.

Investigation revealed that the cause of the emergency which resulted in this $104,000 accident was a loose coupling half of a fuel line quick disconnect which resulted in fuel starvation.

The day before the accident, fuel difficulties were corrected by a new fuel control box. The technical inspector, mechanic, crewchief, gunner, pilot and AC stated they had not removed the quick disconnect. The helicopter was given an intermediate inspection 4 days before the accident. The crewchief stated that the disconnect was checked at that time and was secure. Between the time of the intermediate inspection and the accident, the quick disconnect was removed and not properly secured.

The findings of this investigation included: ". . . *a successful autorotation could possibly have been made if the crew had been properly rested at the time of the accident. During the previous 24 hours, the pilot and AC had less than 3 hours sleep. They took off at 0600 on the day of the accident and neither had breakfast."*

Unfortunately, the report of this accident did not contain a flight surgeon's statement about physiological factors, though a command regulation required such a statement. The flight surgeon's analysis could have been especially enlightening about the effects of insufficient rest and food.

"INDICATIVE OF MENTAL AND PHYSICAL FATIGUE"

A UH-1D had been flying resupply missions, with a release time of 1500. The release time was extended to complete the mission and at 1640 the pilot was making an approach to an outpost. He made his approach into the wind to the outpost helipad and terminated at a 2- to 4-foot hover. As he did, the helicopter started to turn to the right. The pilot applied left pedal to stop the turn, but got no response and the turn continued.

Emergency was caused by loose fuel line quick disconnect. Aircraft commander and pilot had less than 3 hours sleep during previous 24 hours and took off at 0600 with no breakfast

The AC then took control and applied full left pedal, with no response. By this time, the helicopter had completed one to two complete 360-degree turns and the AC attempted a hovering autorotation. The terrain over which the helicopter had moved while spinning was eroded and it landed left skid low, rolling on its left side.

The emergency which resulted in this accident was caused by a failure which allowed a tail rotor control tube to come loose, causing loss of antitorque control. Other findings listed by the report included the pilot's delay in recognizing the loss of antitorque control; the lack of a suitable area for a successful hovering autorotation; and a possible contributing factor of fatigue on the part of the pilot, causing him to react slowly during the emergency.

Flight surgeon: ". . . The pilot had flown 17.5 hours in the previous 24 hours, with about 6 hours sleep. The AC had flown 7.5 hours in the previous 24. Both stated they were not fatigued and I could find no evidence of this on questioning. *However,*

the 8.5 hours of flying preceding the accident is most indicative of mental and physical fatigue, especially in the pilot's case, considering the 9-hour day preceding the day of the accident."

Reviewing official: ". . . Unit commanders are closely monitoring crew flying hours to equitably distribute the total flying hours of units among all unit aviators to assure the maximum amount of crew rest for each individual. In some cases, tactical necessity has caused the prescribed limit to be exceeded. These cases are weighed on an individual basis to preclude pilot fatigue. In addition, aviators have been instructed to advise their controlling agencies when they are approaching the 10- or 15-hour limitations established by parent unit regulation and to request a determination about whether or not they will continue with the mission. . . ."

FLASHLIGHT MAINTENANCE

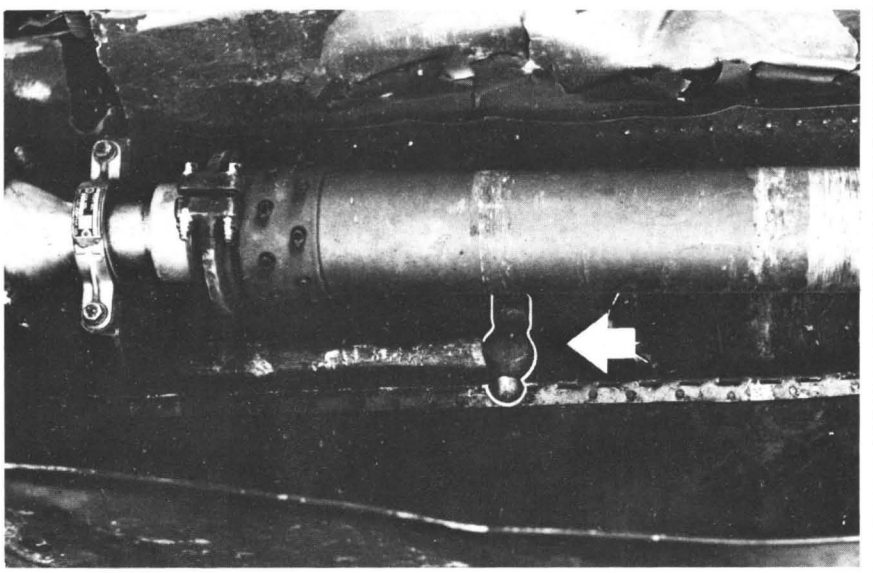
With a crew of four and two passengers aboard, a UH-1D entered a left 20-degree bank at 85 knots. While in the turn, the tail rotor failed, the airspeed dropped to 40 knots, and the helicopter spun to the right, impacted in level attitude, burst into flames and rolled on its left side. The two passengers and two crewmembers were killed. One crewmember escaped with a minor bruise and contusions. The other had serious burn injuries.

The emergency which resulted in this $228,000 accident was caused by a ball peen hammer which was left under the tail rotor drive shaft cover during maintenance and an inadequate daily inspection. The severity of the accident was caused by failure to follow the emergency procedures outlined in the dash 10 manual.

Corrective actions taken were:

1. Requirement for all aviators to read and understand proper corrective actions for all types of tail rotor malfunctions listed in appropriate dash 10s for type helicopter flown.
2. Demonstration and practice of simulated tail rotor malfunction procedures by each aviator upon assignment and during required standardization check rides.
3. Compiled list of crew duties to be performed during normal and emergency operations; duties to be discussed, studied and rehearsed by each crewmember.
4. Supervisory requirement for crewchiefs and mechanics to use appropriate checklists or manuals in performing required inspections or maintenance.
5. Requirement for preflight inspections to be accomplished with cowlings and drive shaft housing open.

Maintenance officer: "Maintenance and inspection error is obvious. Maintenance was performed at night, with no protection from the elements. The only lighting available was hand-held flashlights. Recommend lighting sets be made available for night maintenance."



Maintenance and inspection factors are evidenced by hammer left under tail rotor drive shaft cover. Maintenance was done at night without adequate lighting

WHERE'S LUCKY?

Ted Kontos

STARING OUT AT the heat waves rising from the hard baked ground, SFC Buck Stuart squirmed his 200-pound frame around on his sweat-stained canvas stool, raised a beefy hand and slapped viciously at a mosquito whining near his ear. He inhaled the musky, dank odor of the steaming hut and swallowed, thinking how good a cold beer would taste. Fair skinned and blonde, he suffered cruelly from the burning sun. He pulled a wet handkerchief from his fatigue pocket and mopped the streaming sweat from his broad face. The field telephone on the table before him tingled and he grasped the receiver. "Operations, Sergeant Stuart." He strained to hear. "Sorry, major. You'll have to speak louder. This phone's still giving us trouble. . . .

"Yes, sir, I can hear you now. No, they still haven't found a cause for the accident. Yes, it's hard to understand, especially with that crew. The AC had 5,000 hours and more than 1,700 in Hueys. He flew VIPs around in the States before he came here. The pilot had almost as much experience.

"Yes, sir, the weather was VFR, no other aircraft was involved and the investigators haven't found any indication of hostile fire.

"Maintenance? That'd be the last thing I'd suspect. John DeLoach was crewchief, you know, and they just don't come any better. He had more than 18 years experience and a fine record. Since he's been assigned here, maintenance downtime has been cut almost 30 percent. It must have been some kind of materiel failure, but the wreckage was so badly scattered, it's going to be hard to tell for sure.

"Yes, sir, eight passengers in addition to the crew. I'll let you know as soon as we find out anything."

Stuart replaced the receiver and glanced up as a sergeant in flight clothes entered. "Help you?"

"I'm looking for a friend of mine who's assigned to your unit. Sure will be glad to see him again. I got a letter from him 3 weeks ago, before I left the States. From what he said, you have a fine unit. I never knew Lucky to get so excited about an assignment. He's been here nearly 9 months. I guess he'll be leaving for home soon."

The sergeant walked closer to the table. "Wish I could have gotten over here sooner. I even tried to get assigned here, but it didn't work out. I would have liked working with Lucky again. I worked with him in Korea and he taught me more about maintenance than all the schools I ever attended. And I've been through a bunch.

"Anyway, I finally made it over here. Even if we can't work together, we can see each other and talk over old times. We were born and raised in the same town. You should have seen him in high school. He was a real go-getter and smart. He could always figure things out, like when he was playing football. He really worked at it. I guess that's why he was the best quarterback we ever had. I remember one time when we were up against the toughest team in the state. They had been state champions for 2 years in a row. They were big and fast and had a passing defense that wouldn't quit. The coach kept sending in plays and we were holding our own, hitting their weaker side. We had managed to pick up enough yards for a couple of first downs when the referee hit us with two 15-yard penalties. Then, you know what Lucky did? He ignored the coach's instructions and threw a bomb on a first and 40, mind you. You know, it worked. Those were the only points scored in that game. But, was the coach ever mad! He threatened to bench Lucky.

"Lucky was the same way in just about everything. There was always a better way, at least for him. Maybe part of it was pure dumb luck, but it always

worked out. It didn't matter what he did. Like the time he put fertilizer on his father's lawn in the middle of summer. We all laughed and told him he'd be up all night watering, or the grass would burn up. Know what? It clouded up and rained for 3 straight days. Everything he did always came out right. It didn't matter what it was.

"There was another time when he bought an old Cub that had been sitting in a farmer's pasture for no telling how long. The engine was gone and the fabric was shot, the little that was left after the cows had eaten what they wanted. It took $200, all the money he earned that summer, to buy that plane. We all kidded him when he towed it to his house. After he got to checking around and found out what he had to do to get it fixed up and how much it was going to cost, I think he figured maybe we were right this time. But he didn't let on. Every day he'd piddle with that plane, cleaning it until it was ready for covering. Call it what you like, but just about that time, a fellow was coming in for a landing at the airport in a stiff crosswind and lost control. He ground looped and tore both wings off his Cub. When he found that Lucky had that plane, he hurried over and paid him $350, just for the two wings. Then Lucky turned around and sold the fuselage to another guy for $100. How about that for luck? You can see how he got his nickname.

"That Cub is what gave Lucky his start in aviation. He went bugs over planes and flying after that. Couldn't wait to get in service."

The visiting sergeant drew a cigarette from his pocket. "Got a light?" He touched the cigarette to the flame and inhaled. "Thanks. Lucky's wife doesn't care much about flying. She just doesn't trust aircraft. I told her she never had to worry about him, not with his know-how and luck.

"You should meet his wife. She's a doll! And I've never seen two people more devoted to each other. Every time you see them together, it's like they just got back from their honeymoon. They have two kids, a girl and a boy. The girl will be 13 before he gets back and little Lucky is 10.

"I wonder what kind of surprise she'll have for him when he gets back this time. She's an artist, you know. She doesn't really work for anybody, she just does paintings for people she likes. And she oil colors photographs. She's real good, too. Her water colors used to win first prize every year in school. She earned enough money while he was in Korea to furnish the den like he always wanted, plush recliner and all. No telling what she'll have for him this time.

"Getting back to aircraft, this guy's a genius. He can troubleshoot an engine or system in his mind, like he was looking at a blueprint. Better than that, like he was inside the system. He never needed a TM. If all mechanics were like him, the Army could junk special tools like torque wrenches and air pressure gauges and save a bundle. Lucky never had any use for them.

"Just for kicks, two of us followed him with a torque wrench after he installed new plugs in a nine-cylinder radial. My buddy would set a dial type torque wrench on each plug and start tightening. I'd watch and yell when the plug started to turn so he could check the dial. And you know what? Every one of those plugs was torqued within limits. All 18 were turned above the minimum and not one was over-torqued. Try that sometime!

"You know how some people kick tires? Not Lucky. He can look at one and tell you just about how much air pressure it's got.

"He was a genius at figuring out hundreds of ways to save time. Take a simple job like installing a new set of spark plugs. You know how the schools teach you to clean them in solvent, inspect them, check the gap and all that? Well, Lucky just drains some gas in a bucket, sloshes those plugs around, takes them out and in no time the gas has evaporated while he's looking them over. Next thing you know, he's putting them in. Like he says, the factory has set the gap and if a packaged plug has been damaged enough for the gap to have changed, then you can bet the insulator is in bad shape. You're going to spot that. And what if a bad plug does get installed? You'll catch it when you pull a power check.

"I recall one time when Lucky had to get a Huey ready for a flight. This was out in the field, mind you, and they were really pushing him. The CO was on his way to pick it up and get out before a front moved in. It hadn't even been serviced yet, and all Lucky had were some barrels of fuel. He hooked up the handpump to a barrel and cranked like mad. He had that Huey serviced, preflighted and ready to go 5 minutes before the CO got there. Fuel contamination? No sweat. Like Lucky says, that's what filters are for. You've got them from start to finish in the fuel system, from course to fine. If they can't trap what little sediment might get in from one such servicing, then what's the use of having them? All you have to do is keep up with your inspections and make sure the filters are kept clean and serviceable.

SFC Stuart lifted his hand to interrupt the long tirade and asked, "Who is this guy?"

"Didn't I tell you? It's DeLoach, Lucky John DeLoach. I sure will be glad to see him."

PEARL'S

personal equipment and rescue / survival lowdown

Why Wear Nomex?

ACCIDENT ONE

FROM A FLIGHT surgeon's statement in an accident report: "All three occupants were seen to exit the aircraft with clothing afire, but under their own power, by the pilot of the second ship. After remaining in the air for several minutes making emergency calls, the pilot of the second ship landed. He stated that at the time none of the downed crew had their flight helmets on. However, he noted that none of them had burns in the areas covered by the helmet. The pilot of the downed aircraft remarked to the pilot of the second ship, 'If only I had worn my Nomex.'

"Both the pilot and crewchief succumbed as a result of severe burns. The severity of the burns sustained was directly attributable to the failure of all three crewmembers to wear Nomex protective clothing. Had the suits been worn, these needless deaths could have been avoided."

ACCIDENT TWO

A helicopter was on a resupply mission, carrying passengers and cargo. As it touched down on a mountain landing pad, the pilot lowered collective with the nose coming up. At this time, the aircraft commander took control. As the helicopter came off the pad it started spinning counterclockwise, rolled down the mountain and caught fire.

The crewchief, pilot and copilot got clear of the burning helicopter. The pilot's clothing was on fire as he exited the burning wreckage and he died several days later of burn injuries. He was not wearing a Nomex flight suit. The copilot who was wearing a Nomex suit suffered only minor burns.

From June 1969 USARV AVIATION PAMPHLET
FIREWATER AND FLYING
Major Anthony A. Bezreh, MC

Pete climbed out of the sack slowly, very slowly. When his upper torso reached the vertical position, he grabbed his head with both hands to make sure that it wouldn't fall off. There was a sort of dried out feeling in his innards; his eyeballs looked like a Rand-McNally road map; and his mouth felt like the bottom of a birdcage. Pete mustered up enough determination to make it to his feet and carefully navigated his way out of the hooch. "Guess I really hung me one on," he muttered to himself. "No matter how I look at it, this is going to be one miserable day."

Poor Pete! What a condition to fly in. Of course, he's flown in this condition before and, so far, he is

PLEASE CUT ALONG LINE AND DISPLAY IN PROMINENT PLACE

If you have a question about personal equipment or rescue and survival gear, write Pearl, U. S. Army Board for Aviation Accident Research, Ft. Rucker, Ala. 36360

still alive to make the same mistake again. And, if he gets away with it this time, he'll probably get away with it the next time . . . probably, that is.

Pete is the willing victim of a delightful beverage called ETHYL ALCOHOL, which comes in a variety of forms to please every taste. Obviously, Pete is suffering from the aftermath of his overindulgence the evening before, affectionately known as the HANGOVER. Unfortunately, Pete thinks that his hangover is just a sort of reprisal for all the good spirits he shared last night, a necessary evil, but nothing serious, you know. That is, it couldn't affect his performance in the cockpit . . .or could it? Maybe it would be worthwhile to look at some of the facts. You know, no matter what subject it is you want to talk about, there's always some joker who will look at it scientifically; and until we find some way to eliminate these people, we probably will have to listen to them.

If you drink 2 ounces of WHISKEY or two bottles of beer, you will get a blood alcohol level of 0.05 percent and you are legally not under the influence. If you drink 6 to 7 ounces of WHISKEY or six to seven bottles of BEER, you will have a blood alcohol of 0.15 percent above, which is considered as prima-facie evidence (whatever that means) that you are legally DRUNK, that is that your behavior is significantly influenced by alcohol. Blood alcohol levels from 0.05 to 0.15 percent are considered as relevant to prosecution, especially if you ACT LOOPED. If you have a blood alcohol level increasing from 0.15 to 0.50 percent, you will pass through stages characterized as DIZZY and DELIRIOUS, DAZED and DEJECTED, DEAD DRUNK and finally just plain DEAD.

Now, if you take an average Army aviator like Pete and give him a normal highball to drink every half hour for 4 hours, at the end of his 4 hours and eight drinks he will have a blood alcohol level of about 0.22 percent. That puts him in the dizzy and delirious category. Then let's suppose Pete has finally had enough and decides to hit the sack and sleep it off. If he sleeps for 8 hours (and who does these days), he will wake up with a blood alcohol of 0.15 percent, and, if he jumps into an aircraft within the next 2 hours, he is now boring holes through the blue with the glorious blood alcohol level of only 0.13 percent, a full 0.08 percent above the level at which he is legally safe and sane. Pete has more than just a hangover. Good old Pete is still drunk! In fact, it won't be until about 24 hours after the start of his last night's spree that Pete will be down to the 0.05 percent level and by that time he is starting the same thing all over again. Pretty discouraging, isn't it?

Add to this the fact that it really doesn't take much booze to cause significant amounts of motor, sensory and mental impairment. For example, let's look at motor impairment. A moderate drinker suffers a 20 percent impairment of his steadiness in standing at a blood alcohol level of 0.02 percent, 60 percent impairment at 0.05 percent and 120 percent impairment at only 0.10 percent.

As for mental impairment, memory, judgment and reasoning are affected. For example, an experiment was done on telegraph operators receiving coded messages. Those who had drunk only two bottles of beer were 22 percent less efficient than before; and their efficiency had dropped 72 percent after two bottles more.

With respect to sensory impairment, alcohol causes a constriction of the visual fields and, for example, would impair a pilot in watching for planes in the periphery of his field of view. Night vision and vision at low levels of illumination are impaired by alcohol, and even the sense of touch is decreased.

Of course, when Pete is flying his chopper, hopefully at least, he is using all three—motor, sensory and mental functions. Pete can figure that three or four beers will knock his overall performance by about 35 percent, when his blood alcohol level reaches its peak of 0.05 percent.

As a rule of thumb, you can count on your body getting rid of about 1 ounce of whiskey per hour. But remember that the metabolism of alcohol is handled by the body at a fixed rate and there is very little you can do to speed it up. All of the ice cold showers, walks around the block and black coffee in the world won't help your body get rid of that alcohol any faster.

IF YOU ARE DRINKING TOO MUCH TO FLY, WISE UP AND STAY ALIVE. WE NEED ALL THE PILOTS WE CAN GET.

USAASO Sez

The U. S. Army Aeronautical Service Office discusses

TM change on radar approaches

New FAR distribution method

On Radar Approaches: A Precision Approach (PAR) provides pilots with highly accurate approach guidance in the azimuth, elevation and range parameters. Rate of descent necessary to maintain glide path is affected by speed in the approach and the angle of glide slope (G.S.) flown. A rate of descent can be reasonably forecast by evaluating reported wind for its effect on ground speed and consulting the Rate of Descent Tables published in the Terminal Instrument Approach Procedure booklet. The G.S. angle for each PAR runway is provided in the IFR-Supplement along with the Decision Height (DH) and visibility minima.

A Surveillance Approach (ASR) differs from the PAR in that it provides positive information only in azimuth and range parameters. This information may be less accurate than that provided by the PAR because of different type radar sets used. Altitude information, when provided, is recommended altitudes for specified range points along the final segment of the approach. It is not mandatory that an aviator abide by these altitudes. He may descend to authorized Minimum Descent Altitude (MDA), subject to interceding step-down fixes, should he so elect. The recommended altitudes are provided only as a guide, to enable the aviator to establish a reasonable rate of descent for the final approach and to assist in arriving at the MDA at or before reaching the missed approach point (MAP).

Due to Change 8 of TM 2557-29 effective 1 July 1969, altitude information on the ASR final is no longer automatically provided. Aviators must initiate a request prior to reaching final to receive this information at Army, Navy and FAA facilities. Air Force facilities will not provide altitude information for an ASR final approach.

Federal Air Regulations: Due to a recent change in the method of distributing the FARs (Federal Air Regulations) it will now be necessary for each Army unit to order these publications from the Government Printing Office with local funds. All the FARs are being incorporated into 11 volumes. Each volume will contain several associated FARs. (FAR 91 will continue to be issued along with the FLIP Planning Sections.) As these volumes become available, notices will be published in the Army Aviation Fight Information Bulletin (TB AVN1 series) and in this column. You should direct your order to: Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. Revision service to the FAR volumes will be automatic.

Facility chiefs and controllers—do you remember the August issue? That new tool of the trade, TM 95-200 (Air Traffic Control Facility Operations Manual) dated April 1969, has been published and distributed. Better get your copy!

SANFORD ARMY AIRFIELD

MAJOR JACK W. SANFORD

THE INSCRIPTION on the monument reads: "Sanford Army Airfield, in memory of Major Jack W. Sanford, Senior Army Aviator, Co 'A,' 502d Aviation Battalion, killed by hostile action on 16 June 1965"; however, there is much more that can be said about this man who became a legend in Army aviation circles.

That fateful day in June could have been just another day for Jack Sanford, flying over what appeared to be a peaceful Mekong Delta in search of the enemy. However, on this particular afternoon he received a call to scramble his heavy fire team of Huey gunships to search for an American advisor who had been captured. Minutes later he was leading his team in a low reconnaissance to investigate a sampan thought to be carrying an American. While making a pass, and without warning, his aircraft crashed and exploded.

Members of the team made desperate attempts to get into the area where Sanford's ship went down, but the enemy had placed 60 mm mortar fire on approaching aircraft, making it almost impossible to land. Finally, one aircraft managed to land under cover of suppressive fires. Sanford and the two members of his crew were picked up and quickly evacuated; however, Jack Sanford had been hit three times and died on the way to Saigon.

Major Sanford was a man of the highest ideals and never gave up on any project he attempted. His aspirations and dedication to his country were uniquely high and without exception he achieved whatever he aspired to. He epitomized the spirit of Army aviators worldwide and particularly the Army aviator flying the skies over the Republic of Vietnam.

During his illustrious career Jack Sanford was awarded the Silver Star, the Distinguished Flying Cross with the 1st Oak Leaf Cluster, the Bronze Star Medal with "V" device and more than a score more, which are indicative of his contribution to a free people. It is hoped that everyone stopping at Sanford Army Airfield at Long Binh, near Saigon, will recognize the true importance of the memorial that has been erected. They will understand that Jack Sanford and the thousands of men responsible for the excellence of Army aviation will be remembered.

BG Allen M. Burdett Jr. (left), commanding general, 1st Aviation Brigade, and LTG Frank T. Mildren, deputy commanding general, U. S. Army, Vietnam, view the monument to the late Major Jack W. Sanford during the official dedication of Sanford Army Airfield at Long Binh Post

Hi fellas,
meet us on page 14