UNITED STATES ARMY

MAY 1968

AVIATION DIGEST

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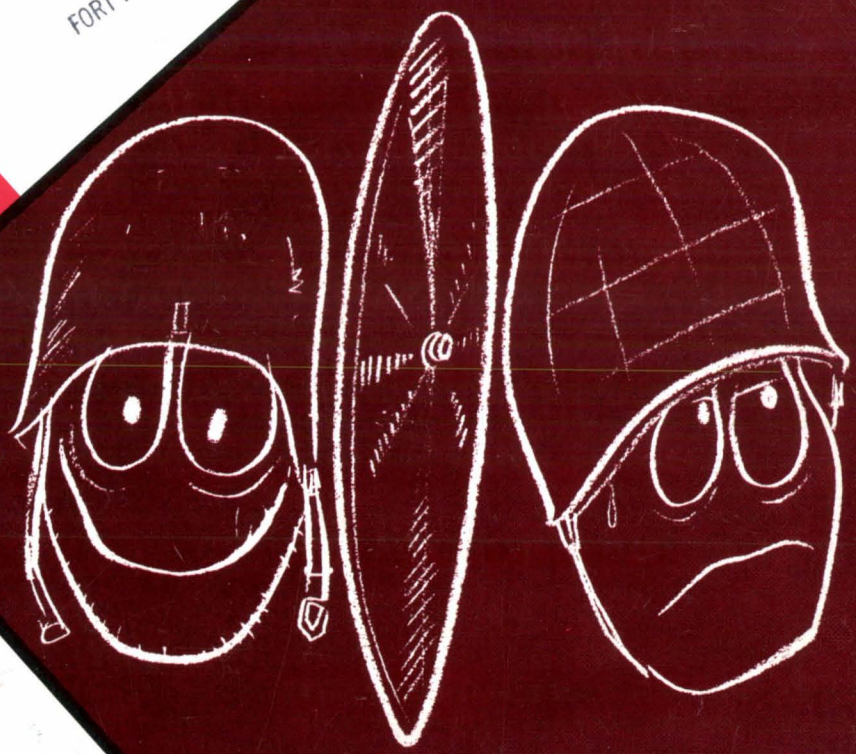

ROTOR SENSE
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UNITED STATES ARMY AVIATION DIGEST

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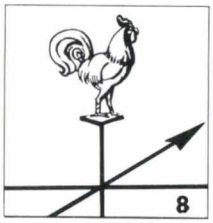
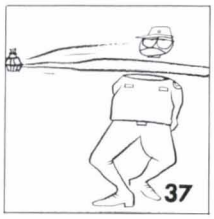
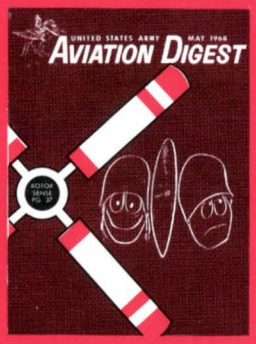




VIEWS FROM READERS 1
THE VOLCANO, MAJ Glenn E. Morgan 2
FOR IPs ONLY, CPT Samuel G. Firman 4
IF YOU ARE GOING TO BE A PRO, MAJ Edward J. Andres 7
NEW WEATHER CODE, SSG Billy A. Woolley 8
AVIATION COMMUNICATIONS SECURITY, CPT Dennis K. Whitmer 10
AIR-SEA RESCUE NO. 1, MAJ Daniel R. Bauer 14
THE ARMY MAINTENANCE MANAGEMENT SYSTEM, MAJ Joe W. Saunders 16
ANIMAL, VEGETABLE OR MINERAL, CPT Anthony Clemente and CPT John B. Frazee 20
NIGHT AIRMOBILE ASSAULTS, MAJ Vernon C. Grigg, Jr. 26
SUMMER — FUN OR DRAG, LTC William H. Hark 32
STANDARDIZATION CPT Peter H. Otersen 36
ROTOR SENSE, MAJ Chester Goolrick 37
KNOW YOUR ENEMY — METAL FATIGUE, H. E. Roland, Jr. 48
PEARL'S 54
ONE HOUR TO SUNRISE 60
AAAA AWARDS Inside Back



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

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

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VIEWS FROM READERS

Sir:

The Aviation Maintenance Training Department of the U. S. Army Transportation School is presently engaged in relocating its Aviation Maintenance Management Branch to building 2730, a modern building originally erected for the Officer Candidate School. With the phase-out of OCS this building has been made available to the department.

It is planned to decorate the building with appropriate items depicting an aviation maintenance motif. The plan includes a display of patch emblems of all aviation and maintenance units within the Army and their locations.

The display will be viewed by thousands of officer and enlisted aircraft maintenance students here at the Transportation School, and will be inspiring to all.

It will be greatly appreciated if you would forward your unit patch to the department to be displayed with those of all the other aircraft maintenance units.

COL ORMAN E. HICKS
Avn Maintenance Tng Dept
US Army Transportation School
Fort Eustis, Virginia 23604

Sir:

Reference "The Old Comes Down the New Way" on page 31 of the January 1968 issue of Aviation Digest.

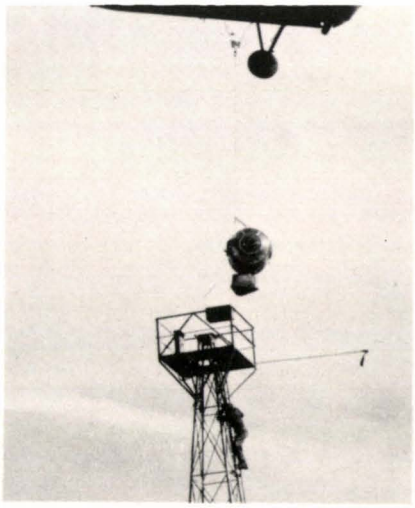
I was pilot of the CH-34 involved in the mission and had considered writing an article concerning the operation because I had "invented" a handy device during accomplishment of our task. The lower photo of the two used in the article clearly shows the device in action. Having previously been involved in several tower jobs (see "An Interesting Mission," September 1962 Aviation Digest), I had found that making small corrective movements at any considerable height above the ground was very difficult due to the lack of having a good reference point available.

My handy-dandy device consists of a rod or pipe which is anchored to the tower and which protrudes horizontally from the tower far enough and in the right direction to be visible to the pilot from his cockpit window. I further found that a cloth tied to the end of the rod provides help in solution of the depth perception problem.

The critical time is when the pilot is hovering close to the tower for hookup by ground crewmen. Small corrections are required for positioning the helicopter and the difficulty in making these corrections increases in approximately direct proportion to the height of the tower involved. I don't plan to patent my invention (as a matter of fact, it may already have been invented by someone else), so it's available for use by anyone who'd like to employ it!

MAJ PAUL J. BUCHANAN
138th Avn Co (RR)
224th Avn Bn (RR)
APO San Francisco 96337

• MAJ Buchanan's invention is shown in the close-up photo below. —The Editors



Sir:

May the following notice be published in your column?

TO ALL MOHAWK EJECTEES IN ARMY AVIATION—FROM THE MARTIN-BAKER AIRCRAFT COMPANY, ENGLAND.

On the 10th of May 1968, a dinner and dance is to be held at the London Hilton Hotel, Park Lane, London, to celebrate 2,000 lives saved in the Martin-Baker ejection seats.

Invitations to attend with their ladies are being sent to all ejectees whose names and addresses are known to our company. Invitations are also being sent to Heads of Services, foreign Air and Naval Attaches in London and other persons distinguished in aviation. Marshal of the Royal Air Force, Sir Dermot A. Boyle, G.C.B., K.C.V.O., K.B.E., A.F.C., is to be the guest of honour.

Rear Admiral L. J. Kirn, U. S. Navy, Senior Defence Attache in London will attend and is to speak for the American Forces.

We are likely, in our invitations, to miss a small percentage of Army aviation ejectees due to the difficulty in maintaining an up-to-date address list. Therefore, any ejectee who has NOT received an invitation and who would like to attend the dinner, write to:

Secretary
Martin-Baker Aircraft Company, Ltd.
Higher Denham, Near Uxbridge
Middlesex, England

and an invitation will be sent.

It is appreciated that it will not be possible for some ejectees to come to London. However, it is hoped that Army aviation will be well represented at the dinner.

DAVID D. BARBER
Martin-Baker Technical Representative
Fort Eustis, Va. 23604

The Volcano

It would not have taken much over a baby step for the OH-13 to go over the side of the volcano or into the crater

Major Glenn E. Morgan

THIS IS NOT an accident story or even a war story. It is merely one small page from a chapter in the successful accomplishment of a very large task. The setting for the story is the country of Costa Rica in Central America. The Inter-American Geodetic Survey, working in conjunction with the local government, is making accurate and up-to-date maps of the country. This is but a brief account of one mission in that large task.

In 1962 the project moved to and established a base camp at the town of Quesada, approximately 55 kilometers, as the crow flies, northwest of the capital of San Jose. The mission was supported by two OH-13s, one U-6 Beaver, and aviation personnel assigned from the 937th Engineer Company (Avn). The aircraft and aviation personnel were assigned to the country on a permanent basis at that time. The aviators had been in the country for some time and were quite familiar with its terrain and peculiar weather conditions, as well as flying the OH-13 at high density altitudes.

So much for background setting. Now let's get to the villain of this tale—one extinct volcano named Volcan Arenal. (The word "Arenal" in Spanish means "sandy ground.") Arenal was quite strategically located from a mapping/survey standpoint, since it stood out from the main mountain range and commanded a view of a very large area.

Arenal was a beautiful sight to look at. She rose to a height of 5,100 feet above sea level and was shaped almost like a perfect ice cream cone turned upside down. The sides were steep and covered by a growth of scrub type brush, varying from 3 to 6 feet in height. The dead crater in the top was about 200 feet deep and contained much of the same type growth plus a few large trees. The lip or edge around the crater was very rugged and uneven with no one place over 6 to 8 feet wide.

The civilian project engineer was a Costa Rican National named Claudio Vieto who, after considerable thought and study, determined the need for a survey station atop Arenal with a helicopter landing pad. Plans were made and a station preparation party of two men were flown by Beaver into a small airstrip located right at the base of Arenal.

In the village of Fortuna laborers were hired to make the trek up the steep side of Arenal and the work began. Approximately five days after departing the village, the party radioed that they needed supplies. They had made a temporary campsite about halfway up the side and had been up to the top and back. Preparations were underway to build a helicopter pad on the side of Arenal near the campsite to bring in supplies. At this time it was doubtful that a helicopter pad could be made on top of the volcano due to the rugged terrain.

In another two days they reported that the helicopter pad on the side of Arenal was ready for use and would we please get supplies to them. Supplies were flown by Beaver to the airstrip at Fortuna and a shuttle run began with one OH-13.

At this point the weather became a very strong "persuader" or deciding factor. Unusual weather is common throughout Costa Rica, but even our awareness did not seem to help us as far as Arenal was concerned. It had a weather phenomenon all its own. It seemed that even on odd days when the entire mountain range running from Nicaragua to Panama was as clear as could be, Arenal had its own personal cumulus cloud that hung nearby. Only on rare occasions and for short periods of time was it completely clear during daylight hours. Of course it also had its own made-to-order wind currents, which seemed to be ever changing.

With these conditions prevailing and the cloud base about halfway down the side of Arenal, I made my first landing, after two tries, on what was probably the most makeshift helipad I had ever

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MAJ Morgan selected his topic to offer enlightenment on one of the lesser publicized missions of Army aviation. "The Volcano" is based on an actual mission in which he took part. His current assignment is at Ft Sill, Okla.

seen. It was built with one side on the mountain and the other propped up by logs. The surface was a combination of twigs, branches, brush and a few good-sized saplings—all lashed together with wire, rope, string and even a few vines.

While I held the pitch rather light, expecting it all to fall in, the workmen hurriedly unloaded the welcomed supplies. The chief of the party assured me his helipad was good and secure, but he would continue work on it if I would bring him some heavy wire and large spike nails. This I did on my second and last trip for that day.

In the days to follow more re-supply trips were made and water was taken in at every chance. The only available water was at the base of the mountain, and it took one man a full day to walk down and back to carry one 5-gallon can. There were a few small pools of water in the crater; however, they were difficult to reach and proved to be stagnant.

The station marker was placed on top of Arenal and a small helipad was literally hewn from the rocks. A radio report from the party advised that a campsite had now been made atop Arenal and the helipad was ready. We were advised to use caution while landing because when we set down on the pad the OH-13 tail rotor would be approximately 10 to 15 feet above their tent. This was the only available location and all loose equipment would be well secured.

The next morning we hoped for clear weather, especially on Arenal. One look revealed the old reliable cumulus cloud near the top, but now and then an opening appeared and we decided to go have a look at it.

With Señor Vieto on board the

OH-13 a 15 minute flight from the base camp at Quesada found us at 5,500 feet indicated, poking around that cumulus cloud. A few passes were made to have a good look at the helipad and check on the winds, and an approach made. It gave the sensation of landing on one little 10 foot square pad suspending in space. The surrounding references were nil and the swirling puffs of cloud didn't help much at all.

A successful landing was made —the first time for a helicopter atop Volcan Arenal. The view from her top was breathtaking, as was the look straight down the side at all that empty space. Tightening down all the controls we ventured out of the helicopter, leaving it at idle, just to look. There was just enough room for a man to stand on either side or at the front of the OH-13. It would not have taken much over a baby step to go over the side of the volcano or down into the crater. Directly below us lay the town and airstrip of Fortuna. It would require only sufficient power to lift off and clear the pad and one would have to make circling turns in autorotation to make the strip at Fortuna.

A combination of smashed rock and dirt had been used to make the small helipad. Logs had been cut from the center of the crater and used to crib up the outside edges of the pad and then filled with rock crushed by hammer. The making of the helipad had truly taken ingenuity and hard work on the part of the station crew.

In the weeks and months to follow many OH-13 trips were made onto that small helipad atop Arenal. The station was used extensively in the survey operations in that area. It was a real challenge to the work party to build the helipad on Arenal, as well as a challenge to the skill of the aviators to land on it. Both were successful, and it was a very gratifying experience for everyone involved.

Since most of us find ourselves in the role of an instructor pilot occasionally, it would be well to keep in mind at least the five simpler teaching techniques used by professional instructor pilots

Captain Samuel G. Firman

AS ARMY AVIATORS we are all instructor pilots. This is true regardless of whether we are authorized the designation of a —13 or have attended a methods of instruction course. We become instructor pilots every time we fly with a fellow aviator. Every flight with two or more aviators aboard gives each of them the opportunity to impart or receive instruction. It may be instruction on the use of a single switch, a complex navaid, or a pilot technique that has served an individual well and that he wishes to relay to others.

Most Army aviators have not attended a formal course in methods of instruction, yet many aviators are very effective in imparting their knowledge to others. This is evidenced daily in the steady progress of proficiency in units and among aviators in general. Much of this progress is due to the outstanding efforts of authentic instructor pilots, and I don't mean to detract from the value of their unique abilities. However, the rest of us do our share of instructing, and at times the instructional load placed on ordinary aviators has been very great due to shortages of qualified instructor pilots.

Because we all find ourselves in the role of an instructor pilot from time to time, we should be aware of at least the simpler techniques used by professional instructors. Knowing these techniques will also aid when we are trying to learn. With these thoughts in mind I would like to bring to the attention of all aviators the five basic steps of instruction. I have found that by conscientiously following these steps I have been able to give effective instruction with the least effort on my part. We have all come across these steps in our training, but many of us may have failed to recognize them or have forgotten them.

CPT Firman was serving his second tour of duty in Vietnam when he was inspired to write "For IPs Only." His article is a reflection of his personal outlook of Army aviation. Currently he is stationed at Ft Rucker, Ala.

EXPLANATION

When a particular procedure is to be taught, it should be fully explained to the student—not just the physical and mechanical steps, but the why, when, and how. If a switch is to be flipped, tell him which switch, why, when, and how it is flipped and what happens after the flipping. The explanation should be as brief as possible, yet cover all details. It should also motivate the student to proceed to the remaining steps of instruction.

Make the student aware of how the procedure affects his personal safety. Often an appeal to professional pride can be used as motivation, such as "Performing this operation correctly is an indication that an aviator has a lot of experience in this aircraft." A proper explanation will entice the student to be very attentive during the second step of instruction.

DEMONSTRATION

No procedure is too simple to be demonstrated. It might seem silly to demonstrate flipping a switch or pushing a button. Yet some switches in our more sophisticated aircraft require particular techniques. Sometimes a switch on the left side of the cockpit is more readily and safely flipped with the right hand. For example, in the CH-47 Chinook there are several ways to manipulate the engine start button, start fuel switch, and ignition switch, but there are only a couple of convenient ways to do so. Demonstration also prevents most misconceptions made during the explanation step from carrying over into the final three steps.

The demonstration of any procedure should be carried out in a normal manner. It may at times be necessary to exaggerate a movement not detectable otherwise, but it is best if the student sees, feels, and hears the demonstrated procedure under normal circumstances.

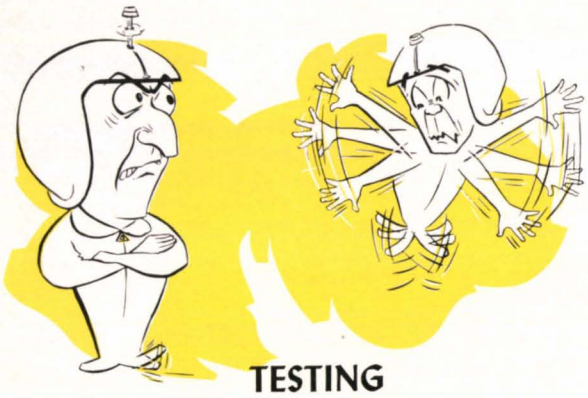
Don't exaggerate your own proficiency. How many times have you seen a grandstanding instructor pilot elaborate a demonstration to the point that it caused him to goof? With the completion of a good demonstration step the instructor can say, "I did it, you saw it, now you try it a few times and see how you do."

PRACTICAL EXERCISE

Learning by doing is an old saw that still works. The student will gain more proficiency in a procedure by going through it himself than during all other steps of instruction combined. During this step minor corrections can be made, or it may become apparent that the first two steps were improperly handled. If a student becomes completely befuddled, the first and second steps must be redone and possibly modified. Most likely the explanation was not detailed enough and the demonstration was too rushed. Go back to the beginning and start anew.

If a definite amount of instruction time is allotted, a greater portion of that time should be devoted to practical exercise. Don't bore the student with con-

tinued practice after he has become well acquainted with the procedure. He will have plenty of time to practice once he has learned the operation through the five steps of instruction. He should be allowed to proceed to the next step.



TESTING

When the first three steps are completed, and while they are still fresh in the student's mind, he should be tested to see how much he has retained. Many instructors, using the term loosely, tend to use this step as a complete method of instruction. We have all heard them say, "See if you can do that. No, that's wrong. Practice a while and I'll be back to see if you can do it then."

Tests do not indicate what a student has learned, only what he has knowledge of. Until a student has completed the fifth and final step of instruction, he has not learned. Testing helps the student by giving him confidence in his ability to perform a procedure. It helps the instructor evaluate the effectiveness of his instructional techniques and gives him guidance in applying the fifth step to the particular student.

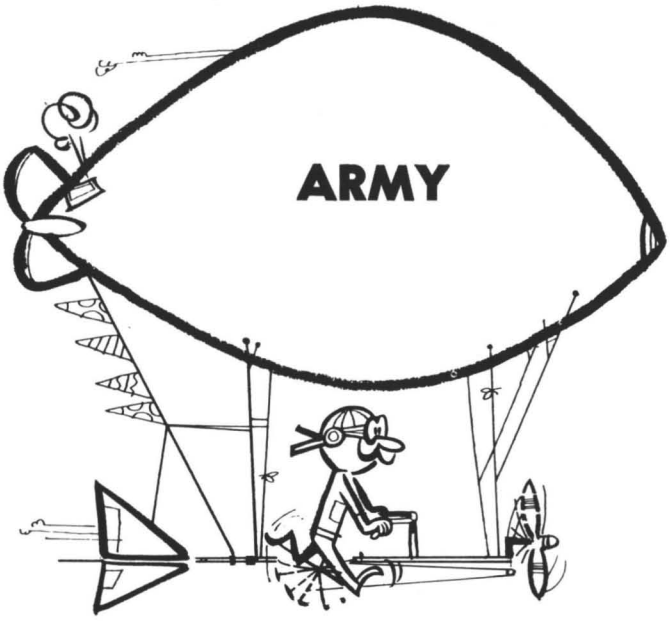
CRITIQUE

The student is now ready to learn. He gained knowledge from the explanation. The demonstration gave him technique. Practical exercise gave him proficiency. Testing gave him confidence and evaluated his proficiency. He will learn from the critique. A student may do poorly during testing but become highly proficient and knowledgeable immediately after an effective critique. On the other hand the time spent on the first four steps can be completely wasted by a poor critique.

The critique should give the student the instructor's evaluation of his progress. It should point out minor deficiencies that can be corrected by practice. A tactful critique will contain motivation for the student to continue practice on his own until he has perfected the procedure. This can be in the form of praise, safety talk, or an appeal to a particular character trait of the student. A student has either passed at the end of the critique or the instructor has failed.

These are the five steps of instruction. If they are used in the order given with no step left out, the student will learn. No step should be given any more weight than the others. They are equally important and each step should be completed satisfactorily before proceeding to the next. Used properly, they make most instruction and learning almost effortless. Poorly used, they still get instruction across more effectively than a helter-skelter method of instruction.

I have used the words instructor and student interchangeably with you and your buddy. I hope these five steps of instruction will help you in those classrooms in the sky—every Army aircraft with two or more aviators aboard.



If You Are Going To Be A Pro

Major Edward J. Andres

HAVE YOU EVER considered what the word "professional" means? Webster defines it as "participating for gain or livelihood in an activity or field of endeavor often engaged in by amateurs; a calling requiring specialized knowledge and often long and intensive academic preparation, characterized by or conforming to the technical or ethical standards of a profession."

Let's apply the word to aviation and arrive at the term "professional pilot." What do these words mean to you? Are you a professional pilot? The questions which follow should help you determine whether or not you are a professional.

Do you know what the terms Vmc, Vne, etc. mean? When asked about your aircraft, how many times have you said, "I don't know, but I'll find out"? Could you find this answer in the cockpit while experiencing an actual emergency? Can you handle any emergency in any aircraft you are qualified in? Do you know how every system operates, and why? Do you continually attempt to learn more about your aircraft?

Do you have a thorough knowledge of cloud forms, pressure patterns, airflow, etc., which will enable you to analyze and recognize hazard - producing phenomena, which in turn will influence your decision to go or no-go? Do you arrive at operations in sufficient time to thoroughly plan an exacting and safe flight, or are you hurried throughout your planning phase and later find you've forgotten a few important items?

Are you familiar with all regulations and ATC procedures pertaining to you as an Army aviator flying an Army aircraft? Do you fly within your capabilities, or do you let pride influence your decision to undertake a mission?

Above all, the most important item in being a professional is attitude. Do you accept less than perfection from your coworkers? Do you sincerely want to be a professional pilot, or do you fly just for the thrill or excitement of adventure? Do you want to become minimum qualified in as many aircraft as possible, or do you want to become extremely well qualified in a few?

The points raised by these questions are by no means all that could be mentioned, for many need to be touched upon. Periodically, every aviator who considers himself a professional should review his qualifications in this manner—and he need only answer to himself.

If you have not scored 100 percent on this self-administered examination, then gentlemen, there is work to be done—**if you are going to be a Pro.**

MAJ Andres offers his definition of a professional aviator in order that Army aviators will have a clearer opinion of what their professional goals should be.

NEW WEATHER CODE

INTERNATIONAL FORECASTING CODE REVAMPING AFFECTS ALL AVIATORS

Staff Sergeant Billy A. Woolley

IF LEARNING the weather codes is one of those unpleasant chores you've been intending to do for the past several years, but somehow just never found the time, it may be just as well. They have been changed.

SSG Woolley is an Air Force meteorologist assigned to Detachment 9 16th Weather Squadron at Cairns AAF, Ft Rucker, Ala. He wrote his article so that U. S. Army aviators may familiarize themselves with the new forecasting codes.

TAFOR, AERO, and PLATF are words that will seldom be heard around weather stations in future days, unless recalled by weathermen in a moment of fond remembrance or in answer to such comments as, "What happened to the old code? I liked it better." METAR, SPECI, and TAF will become familiar terms to military pilots the world over. These are the names given to the new observation and forecast codes that became effective 1 January 1968.

What are TAF, METAR, and SPECI? TAF is the weather term meaning "Terminal Aerodrome Forecasts." METAR is a term for "Meteorological Termination Aviation Report" and SPECI is the term for "Selected Special Weather Report." The TAF code will be used worldwide by all Air Weather Service (AWS) units, and METAR and SPECI codes will be used by all AWS units outside of continental North America.

You say you're surprised? Here it is May already and you haven't heard anything about new codes?

Give your local weather station a call and ask for the nearest location reporting CAVOK (pronounced KAV OH KAY). Undoubtedly, this will surprise and please your local weather wizard.

One reason you may not have heard much about the new code could depend on your duty location since 1 January. If you have been in the United States or Canada, briefing terminology has continued in plain language. Likewise, observations are continuing in airways code.

Where then should one expect to receive the new codes? In North America if you've been communicating with RAPCON, TOWER, or PFSV (Pilot to Forecaster Service), you may already have received information in the TAF format. It became official after 1 April 1968 and all agencies will be using the new code. The 175-1 reflects the TAF code with a few slight variations. (Visibilities will still be entered in statute miles and cloud base heights in the present Airways system. At all times outside the continental United States you will receive the weather observation reports in METAR or SPECI, depending on location, and the forecasts will be in TAF code.

The general format changes significantly from the old to the new codes, but there is little difference between the three new codes (the addition or deletion of an extra group here or there). This similarity will be a definite advantage to you, the pilot. Special optional groups have been included to forecast such items of interest as turbulence and icing.

A new and different set of weather symbols will be used to encode the weather in the new codes. Probably the item of most significant change is in reporting visibility (VSBY) in meters (1,600m = 1mi). Clouds will be reported in eights (octaves) and in feet above the ground. (Note: The number 9 is used to indicate a total obscuration of the sky.) One may occasionally receive an altimeter in millibars from certain overseas stations.

Let's take a look at these code formats and site some examples. Remember, TAF is the forecast code and will be used world-wide. METAR and SPECI are observation codes and will be used primarily outside of continental North America.

The various codes and abbreviations have been grouped categorically in order that the reader may clip and retain all, or any portion, for future reference

ABBREVIATIONS

WEATHER

04	FU	Smoke
06	HZ	Dust Haze
08	PO	Dust devils
11	MIFG	
12	MIFG	Shallow fog
17	TS	Thunderstorm
18	SQ	Squall
19	FL	Funnel Cloud
20	REDZ	Recent drizzle*
21	RERA	Recent rain*
22	RESN	Recent snow*
23	RESN	Recent rain and snow*
24	RERA	Recent freezing rain*
25	RESH	Recent showers*
26	RESH	Recent snow showers*
27	REGR	Recent hail*
29	RETS	Recent thunderstorms*
30	SA	
31	SA	Duststorm or sandstorm
32	SA	
33	XXSA	
34	XXSA	Heavy duststorm or sandstorm
35	XXSA	
38	BLSN	
39	BLSN	Blowing snow
40	BCFG	
41	BCFG	Fog patches
42	FG	
43	FG	
44	FG	
45	FG	Fog
46	FG	
47	FG	
48	FZFG	
49	FZFG	Freezing fog
50	DZ	
51	DZ	
52	DZ	Drizzle
53	DZ	
54	XXDZ	
55	XXDZ	Heavy drizzle
56	FZDZ	
57	FZDZ	Freezing drizzle
58	RA	
59	RA	
60	RA	
61	RA	Rain
62	RA	
63	RA	
64	XXRA	
65	XXRA	Heavy rain
66	FZRA	Freezing rain
67	FZRA	Heavy freezing rain
68	RASN	Rain and snow
69	RASN	Heavy rain and snow
70	SN	
71	SN	
72	SN	Snow
73	SN	
74	XXSN	
75	XXSN	Heavy snow
77	SN	Snow
79	PE	Ice pellets
80	RASH	Showers
81	XXSH	
82	XXSH	Heavy showers
83	RASN	Showers of rain and snow
84	RASN	Heavy showers of rain and snow
85	SNSH	Snow showers
86	XXSN	Heavy snow showers
87	GR	Soft hail
88	GR	
89	GR	Hail
90	XXGR	Heavy hail
91	RA	Rain
92	XXRA	Heavy rain
93	GR	Hail
94	XXGR	Heavy hail
95	TS	Thunderstorm
96	TSGR	Thunderstorms with hail
97	XXTS	Heavy thunderstorm
98	TSSA	Thunderstorm with duststorm or sandstorm
99	XXTS	Heavy thunderstorm with hail

*"Recent" applies if the phenomenon was observed during the hour preceding the time of observation.

CLOUDS

CI	Cirrus
CC	Cirrocumulus
CS	Cirrostatus
AC	Altocumulus
AS	Altostratus
NS	Nimbostratus
SC	Stratocumulus
ST	Stratus
CU	Cumulus
CB	Cumulonimbus

Continued on page 25

ANNUAL AWARD
Monthly Winner
CONTEST

Aviation Communications Security

Captain Dennis K. Whitmer

WITH THE INCREASED role that Army aviation plays in the movement of men and supplies in Vietnam has come the need for an increased emphasis among aviation units on communications security. Suspected compromise of friendly operations has led to the belief that Charlie's capacity to monitor tactical radio conversation and to interpolate meanings and disseminate information derived is greater than previously anticipated. Since aviation units are almost entirely dependent on radio communications for command and control, it is especially important for Army aviators to adhere to established procedures of communications security.

Newly arrived aviators, unless rigorously indoctrinated, are often unaware of the reasons behind these procedures. Depending on the type unit assigned, the in-country checkout on communications security varies from considerable emphasis by those units which normally participate in combat assault missions to little more than "keep the talk down" by those units participating in a support role. The information in this article is designed to present the new Army aviator with some of the communication security problems and procedures used by aviation units in Vietnam.

The necessity for securing mission information begins with the conception of the operation and continues until the last gunship departs the landing zone. Those personnel directly concerned are usually prone to be very security conscious, particularly in transmitting operational information to subordinate tactical headquarters. Frequently, information concerning logistical support for planned or existing operations is not treated with such care. This is especially true when information of a support nature is passed from battalion to company or platoon level.

A number of factors must be considered when discussing the value of mission security leaks at this level. Since the information is of a logistical support nature and usually occurs after the operation is in progress, Charlie could gain little from monitoring such information. The distance between the logistical support center and the

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CPT Whitmer, realizing the need for security of aviation communications, wrote his article with the hope it might make Army aviators more keenly aware of this need. He currently is assigned at Ft Rucker.

Army aviators, such as those in the HueyCobra at upper left, depend heavily on radio communications with units ranging from isolated patrols to large organizations such as the 1st Signal Brigade, which employs complex equipment such as the tower above. Whether communications are with the isolated patrol or the 1st Signal Brigade, care should be taken to follow prescribed radio procedures — for Charlie is listening!

area of operation often precludes rapid transmission of gathered information.

Companies and isolated platoons do not have the sophisticated equipment required for the secure transmission of mission information and, therefore, have to rely on standard communication security measures. Radio, being the least secure means of transmission, is still used to transmit mission information; however, prearranged codes are becoming SOP within most units. Inexperienced operators often compromise such codes, and a program of continual education and frequent change of codes is necessary to maintain the desired results.

Improved telephone service has led to an increased use of the telephone as a means of transmitting logistical missions. An extensive security education program on the use of the telephone is being conducted. However, discussion of aircraft missions over the telephone continues to provide Charlie with a wealth of information.

The most secure means of passing missions at lower levels is by messenger. Many commanders have established an extensive system of motor and air messengers within their command for disseminating and receiving mission information. Routine reports and mission statistics are adequately safeguarded and conveyed in this manner.

Having successfully received a support mission, it becomes the individual Army aviator's responsibility to complete the mission without jeopardizing the supported unit. The need for communication security still exists and a number of factors must be taken into account: departing, en route, and arriving at the landing zone or airfield.

Consideration must be given to the amount of traffic in and around the field which serves as the base for logistical support. Numbers and types of aircraft involved could fur-

Radio nets can make aviators prime sources of information

nish some information, particularly on a wholesale resupply operation. This information would be insignificant in that it would tell only when and not where an operation was being conducted. Routine supply actions are insignificant since most base airfields handle a considerable volume of traffic. Radio traffic associated with coordinating the loading and unloading of troops and supplies often provides useful information. Generally done on the ground but often attempted via radio before the aircraft actually arrives, this method can provide Charlie with valuable information.

Unless prearranged codes are used, unsuspecting aviators often use unit names or numbers and types of supplies in their attempt to obtain desired parking or loading information. When an aviator is unfamiliar with the base of operation, the most satisfactory method is to land and coordinate personally with those concerned. Where wholesale resupply is involved, many aviation units send personnel specifically trained for this purpose to the base of operation in advance of the aircraft. These personnel coordinate all ground activities before the aircraft arrive.

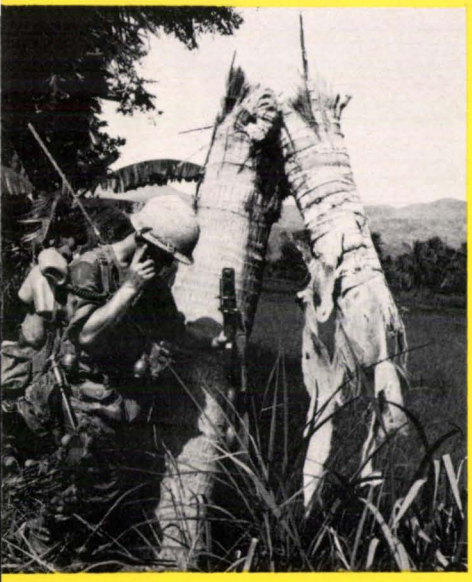
En route considerations are generally limited to minimizing the amount of radio traffic between aircraft. Mission changes are often passed via radio, and unit operations officers and individual aviators must be aware of the mission information that can be obtained by monitoring such transmissions. Artillery advisory service and radar controlled flight following are broadcast in such a manner as to minimize the amount of mission information presented.

One practice followed by some aviation units is using unit nicknames as radio call signs for aircraft. This practice is harmful to communications security because after these unit nicknames become known to Charlie, any radio call made by the aircraft readily identifies the unit involved in the operation. With knowledge of the aviation unit involved also comes such information as base of operation, lift capability, fuel endurance, etc.

When unit call signs remain fixed, the security measure normally employed is to change frequencies often. This proves to be an almost impossible task in some areas of Vietnam because the distance between units which reduces mutual interference does not apply where an aviation unit operates in all of one or more corps area. The use of several types of radio equipment by both aviation and ground units also limits the number of frequencies available and further complicates any plan to rotate frequencies among units. Until such time as more compatible types of radio equipment are used and more frequencies made available, it will be impossible to provide communications security by frequent changes of unit frequencies.

Several considerations of mission security are to be made upon arrival at the landing zone or base of operations. The first of these concerns identification of the landing zone. It was established fairly early in the Vietnam conflict that use of colored smoke would have to either be coordinated in advance or that smoke would be thrown and the arriving aircraft would identify the color. Several near disaster situations have arisen when the arriving assault force or strike aircraft has called for a specific color of smoke for identification and Charlie has monitored the call and thrown the same color smoke. Established procedures when requesting smoke for identification are that the ground unit will throw smoke and the air-

If an aviator is uncertain about a base of operations, it is best to land and coordinate personally



Charlie is listening for information concerning logistical support (above), specific troop locations (left), and volume of traffic (below)

craft commander will reply with the color.

Another consideration is establishing initial radio contact with the ground unit when the arriving aircraft does not have the frequencies and call signs of the supported unit. Such information is usually included in the mission, but oftentimes the aviator flying a logistical support mission is given only when and where and not whom to contact to deliver his supplies. The experienced aviator soon learns that frequencies and call signs are an important part of every mission. To facilitate traffic control at unestablished airfields, a system of common traffic control frequencies and call signs has been implemented over most of Vietnam. An aviator who knows these frequencies and call signs can usually obtain the traffic control he needs.

A third consideration is when the frequency of a specific unit or outpost remains the same over a long period of time and communications security is provided by rotating call signs among outposts. In this case the aviator arrives over a known location and has the proper radio frequency but is unaware of the change in unit call sign. Many times in an attempt to establish contact and identity, the unsuspecting aviator will compromise locations and call signs. In this case, also, the aviator will soon learn that radio frequencies and call signs are an important part of every mission.

Communications security is important for all personnel; however, the large extent of aircraft use and the amount of radio communications necessary to control these aircraft make the Army aviator a prime source of vital mission information. While communications security is essentially common sense, every aviator must realize that each radio transmission is a potential source of information for the enemy.

Air-Sea Rescue No. 1

Major Daniel R. Bauer

An actual account of how an allied aviator, during ceremonies dedicating his country's first helicopter, lifted it into the girders of a hangar filled with top government and military officials. Fortunately, no one was injured as a result of the accident

WAY BACK IN 1920 one of the hard and fast rules in Army aviation was that no one was to take off closer than 50 feet to a hangar. As a result of an accident there, which I witnessed, I'm sure that this rule is now in force in a certain European country.

Having a few days of leave coming, I managed to catch a ride on an administrative flight en route to Europe. As the plane was taxiing to our tiedown spot on the ramp, the crew started shifting toward the door those items necessary for survival at this two-day stop — golf clubs, motorscooters, and the much needed bags of civilian clothes.

As we were shutting down, a very official looking sedan pulled up alongside and an officer got out. He was dressed in a splendid dress uniform of his country's military service. He identified himself as Major Rapoza (not his real name) and asked to speak to the aircraft commander. The major in charge went aft, spoke for a short while, then returned and informed us that we were invited to participate as guests in a ceremony inaugurating the country's new air-sea rescue service.

After quickly changing from flight suits to uniforms more appropriate for the occasion, the five of us were driven to a larger hangar at the edge of the airfield.

Outside the hangar several sedans with little flags on the fenders were parked in one row. Inside out of the sun, various flags were in their stands, and a table with snacks and drinks was set up against one wall. A military band played, entertaining a large group of military and civilian dignitaries who were sitting on chairs facing a CH-34 in the middle of the hangar.

We were introduced to several persons and shown to our seats. The major explained to us that the CH-34 was one of three recently received from the United States and that it was the first one reassembled. Even in the shade you could see that the helicopter was a well cared for aircraft, shining as the result of a very recent paint job and a complete waxing. A short while later the band stopped playing and everyone returned to their seats.

In a few minutes three military men in full dress uniforms, tall black boots, what appeared to be riding trousers, short jackets with wide colorful lapels covered with decorations, and small black hats that appeared to be on sideways marched from a corner of the hangar toward the aircraft. Arriving abreast of the CH-34 they did a fancy left face, saluted the assembly and were introduced by an announcer.

With the formalities over the three turned to the business at hand. The crewchief (very few decorations and last in the line) handed the pilot (many, many decorations) what appeared to be a log book of sorts. He leafed quickly through it and signed one page. Handing the book back to the crewchief, the pilot and copilot (four or five decorations) conducted a march-around preflight and climbed into their seats.

The copilot called off what I presumed was the checklist while the pilot's hands and eyes flew around the cockpit. The engine was started and the copilot's voice could still be heard over the engine noise calling off the checklist. Partially through the runup, the pilot extended his right hand out of the cockpit and twirled his index finger. The crewchief, standing outside the helicopter, followed suit by twirling his finger. The rotor blades were now engaged.

As the runup was completed the crewchief boarded and put the safety strap across the open cargo door and stood by the rescue hoist facing the audience. A little bell rang, the rotating beacon came on, and the pilot turned toward the crowd, saluted quickly, turned back to the controls and lifted the inaugural flight up into the steel cross members supporting the roof of the hangar. Air-sea rescue service flight number 1 settled abruptly back to the hangar floor with pieces of rotor blades still flying about.

Quietly excusing ourselves we adjourned to our hotel for a laugh that would have been in poor taste near the hangar.

No one in the hangar was hurt but the fate of the pilot and his trusty copilot is unknown.

Although MAJ Bauer's article may sound like a fictitious event, it actually happened and he witnessed the event. MAJ Bauer is currently serving overseas.

Men plus equipment — well maintained equipment — are required to give our troops the edge in battle. This has been proved time and again in combat by men like the soldier at right, a member of the 118th Assault Helicopter Company, who checks his Huey

The Army Maintenance Management System

Major Joe W. Saunders

SOME COMMANDERS think of themselves as commanders of troops only. With the Army's increasing dependency on larger quantities of more complex equipment to cope with modern day warfare, many commanders have come to realize that their primary task is as manager of men and materiel. Men alone are not enough to turn the tide of battle; men plus equipment — well maintained equipment — are required to give our troops the edge in battle.

In Vietnam new textbooks are being written daily on the employment of sophisticated equipment while fighting a jungle war. Regardless of the success of guerrilla campaigns in the past and the recommendations of some of our allies to eliminate the artillery, armor, and other frills and let the infantrymen literally chase Charlie until he no longer has the will to fight, the most successful battles have resulted from superior equipment in the hands of our troops. Without this superior mobility, firepower, and communications in the hands of our troops, all of Vietnam might well be in the hands of the communists today.

The wise commander soon realizes the necessity for combat ready equipment and takes action to ensure that sufficient time is devoted to its care and maintenance. The problem often faced by many commanders is a basic knowledge of the maintenance management system itself.

Planners and managers in Department of the Army have realized the need for a better and more simplified system of maintenance management for many years. The Berlin crisis in 1961 provided the emphasis to start the ball rolling in the right direction. As a result of this emergency sufficient emphasis

was focused on the multitech service maintenance reporting system to hasten the action of personnel in responsible positions. The first positive action to more accurately determine materiel readiness was the establishment of a board to study the Department of Army's maintenance management system.

The board began its investigation at the brigade level, since it wanted to emphasize the forms used at first and second echelon maintenance. An analysis of all existing forms, records, and directives at brigade level flushed out some 84 forms and records, 20 directives, and 4 technical manuals that provided the instructions for filling out the forms and records. Over the years as new equipment was introduced into the system, the Army had simply superimposed new forms and directives upon the old ones already in existence. Standardization between tech services was not established.

It soon became apparent that the equipment records system must be standardized, streamlined, and simplified if significant progress was to be made in the equipment records field. With this objective the board recommended elimination of 15 directives and 51 forms and records from the brigade equipment records system alone.

After the intial study was completed at brigade level the board members sharpened their pencils and made a detailed and comprehensive study of the entire system. The result was a completely new system with standard procedures for all Army equipment. No longer would the tech services design and implement separate forms, records, and directives for their equipment as they deemed necessary. Instead a new system known as TAERS (The Army Equipment Record System) was developed that provides:

- Standard equipment record procedures that produce essential maintenance information for commanders at each level of command — starting with the equipment operator and his unit.
- Information gathering and reporting procedures that make maximum use of automatic data processing techniques in handling maintenance data generated at the operating levels.
- Commanders and maintenance managers with information for evaluating materiel readiness, to include the status of equipment, the sufficiency of resources, the effectiveness of maintenance operations, and the adequacy of maintenance supply support.
- National agencies with maintenane data for formulating management decisions related to materiel readiness, product improvement, equipment reliability, equipment maintainability, equipment serviceability, and many other equally important decisions.

Devising a system capable of collecting the data necessary for the maintenance management decisions of a $15 billion equipment inventory was an astronomical task which required the latest techniques in data processing and management. To further complicate the job certain basic objectives were set forth for the new system. The basic requirements called for a records setup that was simple enough to be used by an operational unit in the field and yet provide feedback data usable at higher management levels.

Basically the new records system must be standardized, streamlined, and simplified. Reducing the number of forms would go a long way toward accomplishing this goal; however, there was also a need for additional standardization in the system. The new records must be designed to apply to the same equipment and follow the same system the world over. To meet the initial objectives and accomplish a task of this magnitude, the planners developed TAERS.

There are eight basic elements to TAERS.

Equipment Log Book,
Standardized Forms and Records,
Materiel Readiness Reports,
Satndardized Card Format,
Mandatory Data Reduction,
Consolidated Machine Listing,
Data Collection and Processing,
Transmission of Maintenance Data.

These basic elements are interrelated. Each action is basically simple in its concept and application; yet all contribute and benefit from a master system that was designed to provide Army Ready Materiel (ARM).

Each selected item of equipment has its own log book. Each log book is tailored to the specific type of equipment and contains only those maintenance forms applicable to it. The log book begins at a time of delivery by the manufacturer and is permanently identified with that item of equipment until it is washed out of the system.

The records contained in the log books are designed for management purposes. They provide a means for compilation of maintenance information on Department of the Army forms and must be controlled and safeguarded against loss or damage. The most important use of the equipment log is to provide commanders with up-to-date information concerning the readiness of his equipment. Few commanders realize the wealth of

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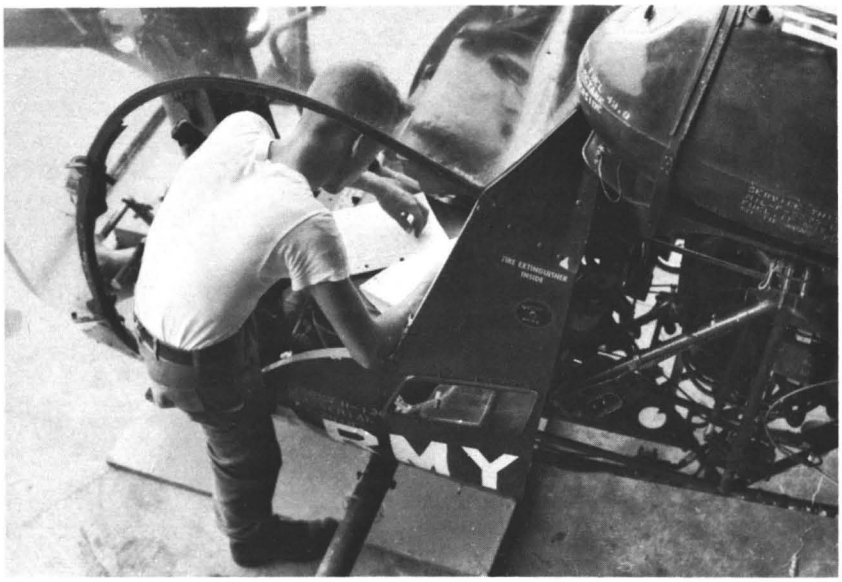
MAJ Saunders based his article, "Army Maintenance Management System," on knowledge and experience gained during his career and while serving with the Aviation School's Department of Maintenance Training.



It is important to keep log books current

information these gold mines (log books) contain.

It is significant to mention that the reduction in forms and records from 106 to 45 is a by-product of the initial objective of the board, which sought standardization and more efficiency in the maintenance management and readiness reporting system.

The Materiel Readiness Report (DA Form 2406) provides Department of Army staff and commanders at all levels with information as to the readiness status of selected items of maintenance-significant, mission-essential equipment in the hands of the using organizations. Information contained in this report is designed to provide:

- Commanders at lower levels with equipment status information for planning day-to-day operations.
- Installation and organization commanders with information as to maintenance backlogs, serviceability of equipment, density of equipment, and availability of equipment for operations.
- Major commanders and intermediate commanders the materiel readiness status of equipment in the hands of using activities.
- Department of the Army the materiel readiness status of designated items of equipment.

Materiel readiness is defined as the condition of materiel in every Army organization which permits the prompt and economical fulfillment of assigned tasks. Materiel readiness indicators encompass quality, quantity, and serviceability. The materiel readiness system provides commanders at all levels with a uniform method of evaluating serviceability of equipment authorized and issued to their units.

The concept of evaluating equipment serviceability is based upon the capability of materiel to perform immediately the intended combat function for a stated period of time. The lack of universal and practical standards for use as a yardstick to measure materiel and operational readiness led to the establishment of item standards on selected maintenance - significant, mission-essential equipment. These standards, now better known as equipment serviceability criteria (ESC), provide a uniform method of evaluating the serviceability of equipment authorized and issued to units.

After these item standards have been applied to each selected item of equipment in the form of ESC, the equipment is categorized as green, amber or red. Green signifies that the equipment is in the "go" category and can sustain normal operation for a stated (90-day) period. Amber signifies caution. Although the equipment can perform the mission for which it was designed, a certain amount of reliability has been lost and the odds are against the equipment performing its mission for a 90-day period without requiring some maintenance. Red signifies that the equipment is sick and on quarters, or the equipment is not there.

An outstanding urgent MWO will also cause an item of equipment to be rated as red. To operate an item of equipment that has been categorized as red in many cases will constitute a hazard to the crew and/or other personnel and cause excessive damage to the equipment itself. The green, amber, and red equipment serviceability criteria (ESC) have probably created more interest than any other item in the maintenance manager's toolbox.

TAERS is the keystone to the Army Maintenance Management System. It is the means by which the Army Maintenance Management System documents all maintenance activities performed upon any given item of equipment. TAERS provides the necessary information for commanders and maintenance managers to manage the total resources. The TAERS system is the one tool of the Army Maintenance Management System that every commander must become familiar with if he is to obtain the maximum combat ready equipment.

The validity of the whole system depends upon the individual's post-

ing the TAERS records. Should the driver, mechanic or crewchief not complete the forms accurately, all maintenance statistics concerning the end item are greatly distorted. The accuracy of the TAERS system can be assured only through positive action by the unit commander in the area of improved record maintenance.

With the increased emphasis on maintenance management and materiel readiness, unit commanders at all levels have begun to recognize the need for placing maintenance management on a par with operational management. At the unit level the commanders are interested in 100 percent of the equipment 100 percent of the time. At division level this interest must be selective due to the volume of equipment. At the installation level where funds are programmed for support, again there is intense interest in detail. However, the intensity diminishes at higher level and only selected items are monitored as required.

Equipment improvement recommendations (EIR) are submitted for equipment failures that result from faulty design or defective materials. EIRs are submitted to the appropriate National Maintenance Point (NMP) where they are screened by engineers for trends in equipment failures. Once the failure trend has been established a fix is engineered and published in the form of a MWO (modification work order). The MWO will list the parts and the level of maintenance required to accomplish the work. A detailed drawing of the work to be accomplished is also contained in each MWO. Through the EIR and MWO programs the Army gathers information necessary for engineering changes to enhance the product improvement of Army equipment.

TM 38-750, TM 38-750-1, and TM 38-750-2 provide the procedures for implementing the Army Maintenance Management System. TM 38-750 applies to the user/operational level. The procedures contained in TM 38-750 outline the use, preparation, and disposition of all TAERS forms and records. Thus a common maintenance langauge for all organizations and activities is provided. TM 38-750-1 provides the procedures applicable to installation and field command. The primary function of the field level is to collect, process, and pass on to the national level information collected from the using units.

TM 38-750-2 establishes the procedures for the national level. The national agencies are responsible for collection, processing, storage, distribution and application of the maintenance data generated by TAERS to provide interested Department of Army personnel and managers with the information necessary for more effective maintenance management.

To collect data necessary for maintenance management decisions, designated TAERS forms in the current inventory have been selected to provide feedback data to the system. The designated feedback forms are processed through the system arriving at the Logistic Data Center (LDC) from all over the world. Here the data on the feedback forms are transferred to punch cards, if not already on cards, and stored in the data bank on magnetic tapes for subsequent analysis and report purposes as directed.

From this information the managers project requirements for parts, procurement of new equipment, TOE changes, design changes, and many other decisions that will have a direct bearing on the user's materiel readiness posture.

The Army Maintenance Management System was designed with a specific objective: to provide the tools necessary to maintain Army Ready Materiel. The tools are available within the current system to accomplish this task. With a program of continuous updating, prudent use and education of all concerned, the system will provide the best use of man, materiel, money, minutes and machines.

The system provides common maintenance language for all

Animal Vegetable or Mineral

The pilots while flying
Are a bold, brawny lot,
And of things that whiz past
They care not a jot.

Oft' times they hit them
These objects they smash,
And their flying machines
Go down in a crash.

So here are some notes,
Some thoughts, and some rules.
Read them and study them,
Don't pass them like fools.

Our stories are truth,
Not fictitious play.
Just pore through the pages
And see what we say —

Of wires, of birds,
Of little green trees,
Of pilots so bold
And why they hit these.

Birds Trees or Wires

Captain Anthony Clemente

and

Captain John B. Frazee

CPTs Clemente and Frazee selected their topic of foreign object accidents since there continue to be too many of this type. It is hoped the poems will help in remembering these hazards.

Look out for the . . . ! ! !

This statement, or one similar, has probably been uttered in sheer terror or surprise by many aviators a split second before impact with a foreign object that has popped into their field of vision.

A proper continuation of the statement can usually be punctuated with a variety of sound effects. For a few moments thereafter confusion will surely reign. The cockpit may be showered with plexiglass fragments, a slightly disfigured and unrecognizable bird with the accompanying feather storm, or perhaps a piece of wire or a tree limb, and the occupants blessed with a new source of aircraft ventilation. Until the flight is terminated, one way or another, the occupants are also treated to a good case of jangled nerves.

Incidents such as the above can and do happen, and regrettably are increasing in frequency. The fact that Army aviation predominantly operates at low level, or that the proportion of new aviators is higher than ever, or even that the inventory of aircraft is increasing, is not where the problem lies. The individual Army aviator is the basic variable and on him alone rests the solution. It is therefore necessary that all of us make up our minds to alleviate the primary problems by being cognizant of the dangers involved in low level and contour flight, and further to act accordingly.

It is a well accepted premise that aside from other aircraft, many other objects constitute hazards to low level flight. A listing of all these objects can range from the obvious to the ridiculous. Significantly, the majority of strike incidents and accidents occur with three classes of objects, namely birds, wires, and trees. We are going to examine the problems as well as some of the solutions in each area.

BIRDS

Throughout aviation history, man has recorded many meetings of flying machines and birds. These inadvertent mid-air collisions range from the humorous to the tragic; all too often the results being in the latter category. Most aviators can recall some instance when an aircraft has struck a bird, or vice versa, and the outcome of the chance meeting.

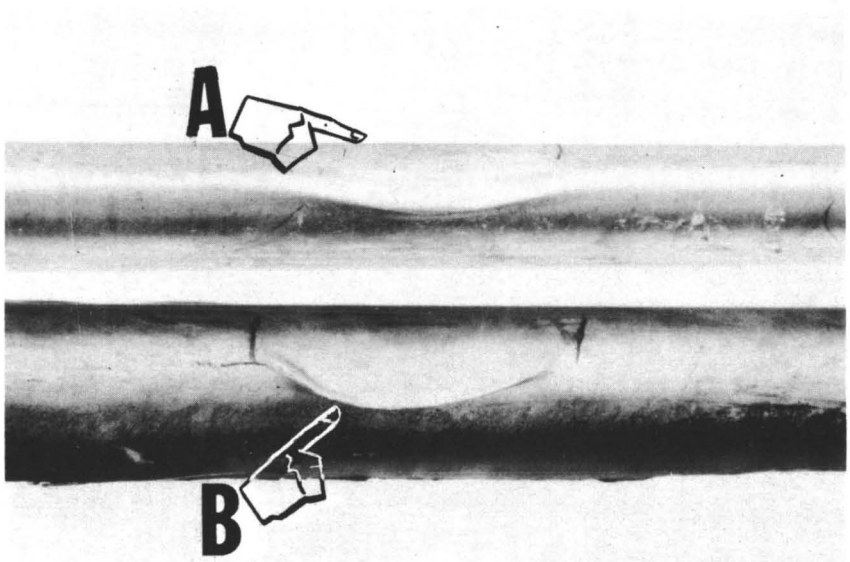
Volumes of data have been compiled by many countries in an effort to find a means to eliminate or minimize birds strikes, but very little progress has been realized in spite of the intensive studies. However, the research has pointed out more clearly some basic information that aviators tend to disregard. Many people will properly label these items as "horse sense," but read and analyze them. How many did you ever think of, overlook or, worse yet, forget?

First of all, birds were flapping blissfully around our earth for thousands of years before man mastered the art of getting himself off the ground. These birds are not suddenly going to stop flying, therefore, man is going to have to coexist with them if he is to continue moving from place to place in aerial conveyances.

The most prominent example of this is the much talked about but unsolved "Gooney Bird" problem on Wake Island. Man has not been able to evict the birds even from the aircraft runways of this island which they rightfully consider their private airdrome. In this case man has come out of the conflict a very poor second, and in addition, he has been placed on the defense. As there is a distinct lack of communication with our feathered companions of the airways, defensive tactics are sensibly the best policy to adopt in our everyday flying practices. More plainly stated, our first rule in dealing with the problem is "Watch the birdie."

Our second consideration is with regard to types of birds. Any aviator should have a working knowledge of the variety of birds he is likely to encounter in his area of operations. An awareness of this can help him plan to stay away

"A" is a known bird strike; "B" is suspected



Animal, Vegetable or Mineral

from suspected roosting or nesting areas, avoid flocks, especially during migratory seasons, and where he is liable to encounter large soaring types.

Take for instance the California pilot whose light fixed wing aircraft had its right wing sheared during a rather rare meeting with a condor. The resulting crash killed both pilot and bird. We can only surmise the probable cause, but it is not likely that the pilot failed to see this bird, whose wingspan ran slightly over 9 feet. Some say his glaring error was in not avoiding the bird, as any intelligent aviator will shy away from all soaring birds and give them the right - of - way and maneuvering room as he would a sailplane. Rule number two is therefore, "Know what types of birds to expect in your area; and given the opportunity most birds will avoid an aircraft."

This foregoing rule immediately gives rise to the question, "Where and when can I expect to encounter birds?" Due to the many variables, there are no precise answers to this rather complex question, but a study of past statistics can shed some light on the subject. Naturally, there is the chance of a bird strike anywhere an Army aircraft can physically operate and under almost any conceivable condition throughout a given period of time. However, certain trends can be identified, and in the data compiled the following items have been noticed.

Where in blue blazes did the wires come from?

Encounters with small birds such as blackbirds, starlings, and sparrows are most numerous. This is probably due to pilot detection; they are too small to be readily seen. What is significant is that the next grouping in frequency of strikes consists of large birds such as buzzards and hawks, the ones most easily seen and identified. Seagulls, ducks, and unknowns finish out the list predominantly lower. It could therefore be concluded that aviators are not alert to the presence of large birds or are expecting them to give way. But this statement is far from being all inclusive and cannot hope to cover the entire spectrum of variables. Let's go two steps further.

Bird strikes with regard to altitude fall roughly in these groupings: one-third occur in the 0 to 100 foot level, an additional one-third at 101 to 1,000 feet and the final one-third from 1,001 feet on up. Low level and contour flights fall in the high percentage zone, so if you participate in a large number of these types of flights, expect to see a proportionately higher number of the flapping variety of flying objects.

The season of the year is unimportant, as birds and aircraft fly throughout the year. But as can be expected, the months of peak bird migrations are those when the majority of bird strikes occur. September and October hold the record highs with March and April running a close second.

Now that we have the statistics broken down to almost over-simplification, what can we glean from them? This brings us to our third and final rule, "Fly low level only when the mission requires it, being especially watchful during migratory seasons."

It can be readily seen that this short treatise on bird strikes is not in itself a solution to the problem. Each individual who takes an aircraft aloft must apply his

knowledge and common sense in practice.

WIRES

Inflight wire strikes continue to be a significant factor in Army aircraft accidents. Yet, how many aviators have read accounts describing wire strikes (or noticed a similar statistical statement) and dismissed it with the thought, "This doesn't apply to me. I'm never going to have a wire strike"? Before any of you are tempted to close this page for the same reason, remember this: wire strikes are occurring all the time. Very few of these strikes involve an aviator who has already had one. Most are first time incidents involving those who said they would **never** have a wire strike.

Our first consideration in this problem area is the realization that wire strikes do not just happen; they are made to occur through carelessness and inattention. This is one type of accident which is avoidable, mainly because wires are relatively stationary. A perfect example is the pilot who made repeated trips in and out of the same battalion command post. He had been operating in this area for some time, and was familiar with the best approach and departure routes as well as location of nearby trees and forced landing fields.

A woods full of trees can play havoc with an aircraft, such as the case of the OH-23 above. But a single tree can add up to just as much trouble — witness the Huey below

Animal, Vegetable or Mineral

On the day in question, he was approaching the pad to pick up the battalion CO when he noticed that his helicopter was intangled in a spider web of wires. The helicopter made a violent half roll and came to rest in an inverted position, miraculously not burning. After the pilot hastily exited the aircraft with minor cuts and bruises he was noted to say, "Where in the blue blazes did those wires come from? They weren't there yesterday." Rule number one is rather obvious: "Stay alert and be prepared for the presence of wires everywhere when landing or taking off."

En route most wire strikes occur during low level and contour flights, although several have taken place as a result of hitting a radio tower guy wire. The latter we'll dismiss in this discussion. As anyone who has flown contour flights will tell you, wires can grow in strange places. They also abound in obvious locations. To avoid wires you must do one of two things: fly high or know the precise location of wires on your route.

Take for instance the two aviators flying low level on a familiar route from point A to point B late one afternoon. While flying westward into the sun, they were so blinded that they didn't see the new high tension wires in their path. The aircraft exploded 85 feet above the river they were flying along. Both aviators should have known of the existence of these wires as they had remarked to others about the construction of the towers. A further check with their operations officer verified that the stringing of the wires had been posted on the NOTAMs board for 2 days before the accident. Rule number two stems from this accident, "If flying low level, know where wires cross or parallel your flight path and perform a high reconnaissance first whenever possible."

The two rules given will cover most situations, but those who work directly with ground type units have the additional responsibility of educating personnel at all levels on sensible wire stringing techniques. The pilot at the battalion command post certainly wouldn't have had his accident if someone had thought about the danger of installing wires a mere 20 feet from the helipad. A few people are still around who think helicopters only go straight up or down during landing and takeoff maneuvers.

Once again we can say, "It's up to you to use a little common sense and your personal knowledge to stay out of trouble."

TREES

Of little green trees . . .

No, not all trees are little, but they are relatively stationary and you can fly around or over them. Tree strikes, like those with wires, are avoidable. Carelessness and inattention are the biggest factors involved.

How about the guy who took the top 10 feet out of a sweet gum tree with an O-1E while making a message drop? He watched the packet as it fell to the ground instead of paying attention to the trees at the far end of the field.

Here's another: A helicopter pilot in Vietnam is scheduled in his OH-13S to pick up a staff officer and return him to division headquarters for a staff conference. Pilot unties blade, jumps in and buckles up, starts engine, makes runup, and during clearing turns off his pad and runs the tail rotor through a tree. A blatant case of being in a hurry, resulting in carelessness.

In many cases, a tree strike results because of an aviator's mistake or miscalculation. A failure to compensate for length of takeoff run in high density altitude conditions or nonrealization of gusty crosswinds will put you into a tree just as readily as not seeing one.

Generally speaking, the avoidance of strikes of any type is in the pilot's hands. We the aviators have control of the situation and can alleviate or worsen the problems according to our own desires or ambitions. Only one question remains: What are YOU going to do about the problem? Is your strike going to be animal, vegetable or mineral?

Let's see if we can't change the little poem at the beginning of the article to read something like this:

The pilots while flying
Are a careful, cautious lot,
And of things that whiz past
They hit them not.

Oft' times they fly wide
These objects they pass,
And their aircraft are whole
Not a tangled mass.

They have studied and read
And formulated rules.
They are sharp as tacks,
Not stupid fools.

All realize it's dangerous
When they're flying low,
But now they're cautious
Because they know

Of wires, of birds,
Of little green trees,
Of pilots so careful
And why they miss these.

Continued from page 9

FORMAT

TAF

TIME LOCATION WINDS VSBY WEATHER CLOUDS ALTIMETER

(Example)

OZR TAF 1212 KOZR 23015/25 9000 4CU30 6CI75 QNH 2996ins
GRADU 1618 2520/30 5000 80RASH 5CB20 4CS75 65625 53208 QNH 2993ins
INTER 2023 29030/40 1600 99XXTS 8CB10 68619 59109
GRADU 0002 30010 CAVOK QNH 2998ins
RAPID 1112 99905 800 47FG 50DZ 9//03 QNH 2995ins

The above code covers about all significant groups that would normally be included in a TAF. Learning the format and a few weather symbols is the key to having an adequate knowledge of the weather at hand when you need it. The following breakdown will aid you in decoding the above forecast.

TAF—Terminal Aerodrome Forecast.

TIME—Valid period of forecast in GMT (1200Z to 1200Z).

LOCATION—International four-letter location identifier for aerodrome for which the forecast applies.

WIND—Forecast surface wind. Direction in three digits. Mean true direction rounded to nearest 10 degrees (variable direction indicated as 999). Mean wind speed in knots. Gusts (reported only when they exceed the mean wind by 10 knots) follows mean wind and separated by a (/) slash.

VSBY—Forecast horizontal visibility in hundreds of meters, up to 5,000 meters, and the nearest 1,000 meters between 5,000 and 9,000 meters. A restriction to VSBY must be included when VSBY is forecast to be less than 9,000 meters (5.6 miles).

WEATHER—Forecast weather encoded in both numbers and letters code (see code table). The numbers permit a full description of forecast weather, whereas the letter abbreviations give only a categorical description.

CLOUDS—Cloud forecast group. Amount in eighths, type cloud, and forecast height of the base above ground of each layer. (Exception: 9//03: 9// denotes total obscuration and 03 is vertical visibility in hundreds of feet up into the obscuring phenomena). Cloud group will be repeated as necessary to indicate the cloud distribution. The groups will be arranged in the ascending order of the height of cloud layer bases. When clear skies are forecast, the group is not used. The ceiling is the height at which the summation of cloud layers amount at and below the height exceeds 4/8. Cloud bases are entered above ground as two digits. Heights from 100 feet to 5,000 feet are encoded 01-50 respectively. For cloud bases above 5,000 feet, the figure 50 must be subtracted from the code figure to obtain the correct cloud base. (Example: 56 = 6,000 feet; 60 = 10,000 feet, etc. Note figures 51-55 are not used.)

CAVOK—Will be used in place of VSBY and Clouds when the following conditions are forecast to exist simultaneously:

a. VSBY 10 KM or more.
b. Lowest cloud layer is 4/8 coverage or less and height of bases is 10,000 feet or above, and no CB are expected.
c. No precipitation or thunderstorms.

ICING & TURBC—Optional groups. (Icing has "6" as indicator and turbc has "5" as indicator.)

ALTIMETER—Forecast lowest altimeter setting in inches.

REMARKS—If any.

NOTE: GRADU—INTER—RAPID. Terms used to note changes in the forecast either gradually, intermittently or rapidly.

Let's take a line or two from the TAF example given above and decode it.

OZR TAF 1212—Terminal Aerodrome Forecast valid (12Z to 12Z).

KOZR—Forecast is for Cairns Army Air Field, Fort Rucker, Alabama.
23015/25—Surface winds 230° at 15 knots, gusts to 25 knots.
9000—Visibility 9,000 meters.
4CU30—4/8 cumulus cloud, bases 3,000 feet.
6CI75—6/8 cirrus clouds, bases 25,000 feet.
QNH 2996ins.—Minimum altimeter setting 29.96 inches.
GRADU 1618—Conditions begin a gradual change at 1600Z and by 1800Z become 2520/30—Surface wind 250° at 20 knots gusts to 30 knots.
5000—VSBY 5,000 meters.
80RASH—Slight rainshowers.
5CB20—5/8 cumulonimbus clouds, base 2,000 feet.
4CS75—4/8 cirrostatus clouds, base 25,000 feet.
65625—Icing group: moderate icing in clouds between 12,000 feet and 17,000 feet; (62=12,000 feet; 5=5,000 ft thick).
53208—Turbulence group. Moderate turbulence in clear air, frequent (between 2,000 feet and 10,000 feet).
QNH 2993ins—Minimum altimeter setting 29.93 inches.

METAR and SPECI are in essence the same code. The main difference is location of use, and the exclusion of the temperature groups from the SPECI code.

METAR AND SPECI

(Observation Report)

TIME LOCATION WIND VSBY RVR WEA CLOUDS TEMP (METAR ONLY) ALTI CIG

The only exceptions of note in comparing the observed format to the forecast format are the RVR, temperature group, and altimeter.

RVR—Ten minute mean runway visual range in tens, hundreds and thousands of meters. At USAF bases the one minute mean RVR is reported locally in hundreds of feet. Runway number reported only when RVR is being reported for two or more runways.

TEMP—Air temp in whole degrees celsius, followed by slash. Dewpoint temp in whole degrees celsius.

ALTIMETER—May be in millibars or inches.

Now let's examine a METAR observation compared with the same weather report at a station in the United States. A typical U.S. airways observation might look something like this:

OZR 501003/8F 64/63 2705 984/RVRM 24

An overseas station with the same weather would look like this:

PHIK 27005 0600 RO720 44FG 3ST05 5SC10 18/17 2984ins CIG10

Decoded:

PHIK—Station location, Hickam AFB, Hawaii.
27005—Surface wind 270° at 5 knots.
0600—VSBY 600 meters.
RO720—Runway Visual Range (RVR) is 720 meters.
44FG—present weather, fog.
3ST05—3/8 stratus clouds, base 500 feet.
5SC10—5/8 stratocumulus clouds, base 1,000 feet.
18/17—Temperature 18° centigrade, dewpoint 17° centigrade.
2984 ins—Altimeter setting 29.84 inches.
CIG10—Ceiling at 1,000 feet.

TURBULENCE CODE

0 None
1 Light turbulence
2 Moderate turbulence in clear air, infrequent
3 Moderate turbulence in clear air, frequent
4 Moderate turbulence in cloud, infrequent
5 Moderate turbulence in cloud, frequent
6 Severe turblulence in clear air, infrequent
7 Severe turbulence in clear air, frequent
8 Severe turbulence in cloud, infrequent
9 Severe turbulence in cloud, frequent

AWS units will encode extreme turbulence by use of code figure 6, 7, 8, or 9 and adding "EXTRM TURB hBhB-hBhB" in REMARKS.

ICING CODE

*0 None or trace
1 Light icing
2 Light icing in cloud
3 Light icing in precipitation
4 Moderate icing
5 Moderate icing in cloud
6 Moderate icing in precipitation
**7 Heavy icing
**8 Heavy icing in cloud
**9 Heavy icing in precipitation

*WMO code figure 0 is no icing
AWS units will use 0 to indicate either a trace or no icing.
**AWS uses heavy in place of the WMO term severe.

Problems and possible solutions in —

Night Airmobile Assaults

Major Vernon C. Grigg, Jr.

WITH THE increased emphasis being put on airmobile operations today, it is imperative that units be capable of conducting airmobile operations during daylight and darkness.

The enemy force in Vietnam attempts to maintain superior mobility through a superior knowledge of the terrain, the use of hit and run tactics, and fragmenting of forces in depth. Extensive and sustained use of airmobile forces offers the most effective challenge available today to this mobility differential which the enemy enjoys. The Army presently has very effective daylight airmobile techniques; however, airmobile techniques for night counterinsurgency operations appear to need more study and development.

Many facts have a bearing on the problem of night airmobile assaults:

- The enemy force in Vietnam moves and conducts the majority of its operations at night.
- During any airmobile operation, helicopters and troops are most vulnerable to enemy fire during the landing phase.
- An airmobile force usually lands where there are few fixed defenses and relatively few well organized enemy troops.
- Navigation to the operational area is more difficult during the hours of darkness.
- Weather is a deciding factor in determining whether a night airmobile operation is feasible.

Certain conditions should exist before planning the night airmobile assault. First, the forces to be employed should be trained in basic airmobile operations. Second, air superiority should be assured. Third, the operation should be staged from an area close enough to the landing zone to enable the aircraft to make one or more round trips without refueling. Fourth, the landing zone should be relatively open, without obstructions such as dense jungle growth, wires, and other obstacles that might make helicopter landing hazardous. Finally, the friendly force must be capable of neutralizing, suppressing, or destroying any antiaircraft weapons available to the enemy force.

The night airmobile assault is planned so that troops can be assembled and reorganized after landing with minimum or no enemy interference. After organization, the force assaults the initial objective. To achieve these goals the airmobile force commander must select landing zones with emphasis on their suitability for landing, assembling, and reorganizing the unit without enemy interference.

Advantages to be gained by this type of night assault are as follows:

Loading, movement, and landing are simplified by movement of units to the landing zone intact.

Landing in an undefended or lightly defended area reduces the possibility of losing aircraft and personnel as a result of enemy fire.

Coordinated action is facilitated because control of units can be established before engaging the enemy.

Night fire support from outside the landing zone is difficult but can be coordinated with the ground maneuver elements.

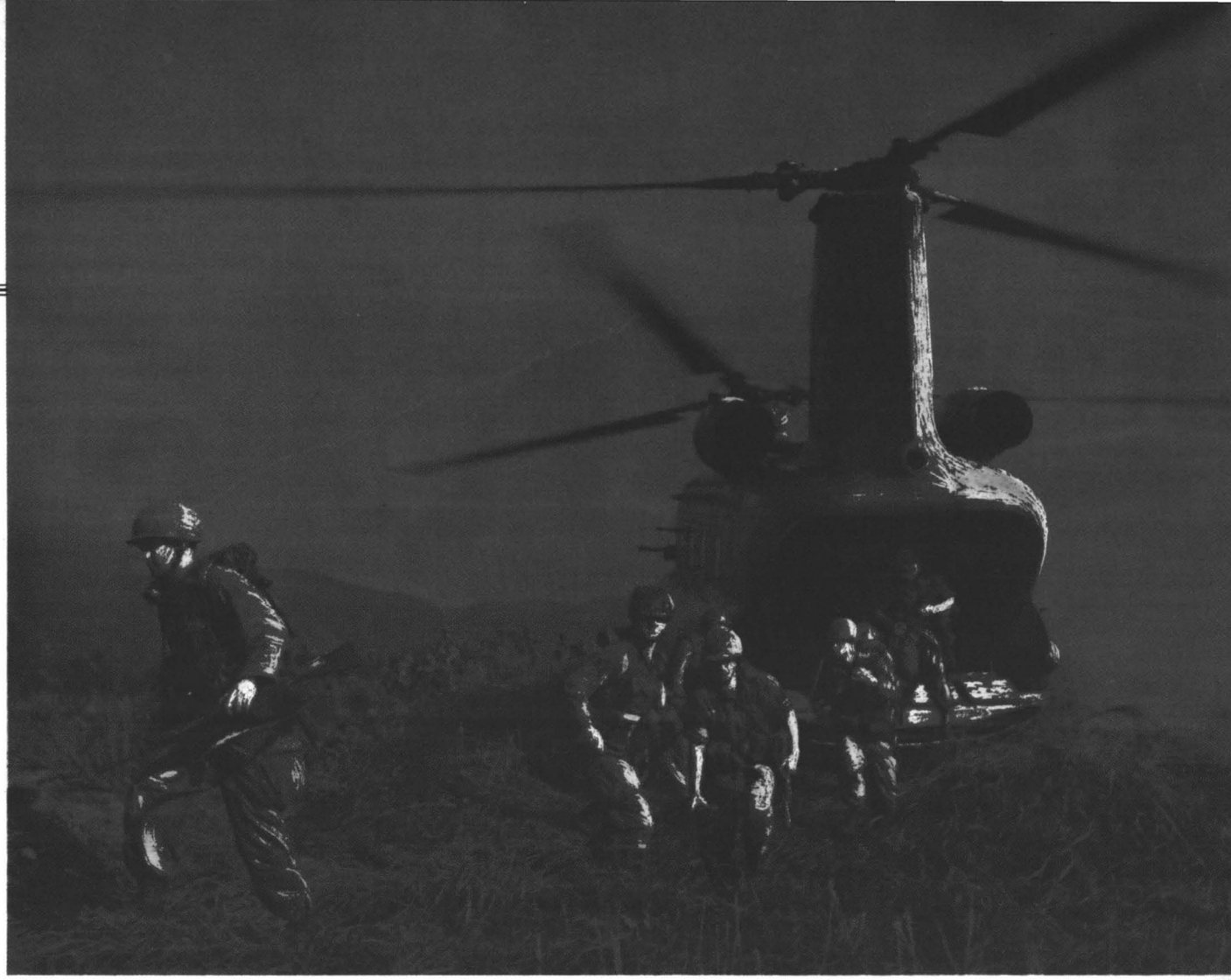
The element of surprise is usually retained.

It is important that the many disadvantages be considered. The most important are these:

The apparent necessity for more elaborate controls.

Caution on the part of the aviation elements and the ground

MAJ Grigg based his article on knowledge and experience gained while he was a member of the TAC-X phase of rotary wing training at the Aviation School.



forces may tend to slow the operation.

Night formation flying is more difficult for aviation units, and additional training in night formation flying may be required.

The present lack of adequate guidance systems and prepositioning of those available complicates navigation and may restrict the selection of certain landing zones.

Weather must be, and forecasted to remain, much better than that required for day operations.

Personnel require more training and experience. It is often difficult to find areas suitable and safe to rehearse for a specific operation.

Planning for the night airmobile assault should be detailed and comprehensive. A detailed map reconnaissance is necessary before any airmobile operation. This is even more important before night operations. The map reconnaissance is used in conjunction with aerial reconnaissance. Normal aerial reconnaissance should be conducted so that information, including photographs, can be obtained with a minimum number of passes over the area. Positive steps should be taken to avoid revealing the purpose of the flight(s). Photographs taken at high and low altitudes may be used to determine whether obstacles are present that may not have been detected visually.

Intelligence reports from the area can be invaluable if the reports are reliable and timely. Reports from Vietnam indicate that it is very difficult to obtain current, reliable information from agents. Sufficient intelligence data can be obtained through the use of photographs, infrared devices, and visual means.

Weather can be the most decisive factor in any operation involving aircraft. Airmobile operations at night are unfeasible if marginal weather conditions exist, since navigation is difficult and landings may be hazardous. Even though one or two helicopters can navigate and land with reasonable safety during adverse weather conditions, this is not safe and practical for a greater number of aircraft.

Selection of landing zones should be based on the aviation commander's recommendation. If the objective is defended, landing directly on it should be avoided. The flight

should be able to land into the wind if possible. If not the load of each aircraft must be greatly reduced.

The landing zone should be relatively smooth and firm. When dry vegetation is present, caution is necessary to prevent fires in the landing zone. If the landing zone is in a rice paddy such as those in Vietnam, steps should be taken to determine the depth of the water. If the water is more than a foot deep, it may be necessary to terminate the landing at a hover. In such cases, the landing gross weight of all aircraft must be carefully considered. Trying to hover an overloaded helicopter over water at night in formation can be a nightmare.

It is recommended that all landing zones be cataloged and designated for possible future operations. These landing zones should be given a number or name so that once an objective area has been identified, a corresponding landing zone is readily apparent.

Possible landing zones such as the one above should be cataloged and designated for possible future night operations. Also, it is important that personnel be thoroughly trained and briefed on night assaults techniques (below) before the operation commences

If possible, the primary landing zones should be committed to memory by all crewmembers, commanders, and staff members involved with the airmobile operations.

Orientation of the troops is a major problem once the helicopters have landed. Techniques that will overcome this problem are limited only by one's imagination. The important point is that all personnel involved must be thoroughly trained and briefed on the technique to be used. Some practical techniques are as follows:

The commander may simply tell his personnel where the objective is in relationship to where they intend to land. For example, "The objective is 1,000 meters to the right of the landing zone. Move out in line formation."

The leader in each helicopter may ride between the pilot and copilot. After getting final orientation instructions from the aircraft commander, he informs the remainder of the group the direction to the assembly point for reorganization.

A compass board may be mounted in the cargo compartment where it can be easily seen by all passengers. The compass is simply pointed in the direction of the attack.

Pathfinders can be a valuable asset in counterinsurgency operations. They have been successfully used in Vietnam and other areas. When pathfinders are employed they should function generally as outlined in FM 57-38, with modifications to suit the particular situation. These major questions need to be answered when considering the employment of pathfinders: Will they be detected? If so, can the mission be accomplished before

the enemy can react?

One of the major problems confronting a commander who anticipates the use of an airmobile force landing at night is how to effectively illuminate the landing zone. Assuming that normal pathfinder lighting and marking techniques are not practical, there are several other workable methods of lighting and marking areas for landing helicopters. Methods to be considered here employ either aircraft flares or types of searchlights.

C-47 aircraft can provide flare illumination for an extended period. The only factors that limit their illumination time are weather and the number of aircraft available. With two aircraft, it is possible for one to return to an airfield and reload while the other remains on station. The illumination time for landing a helicopter-borne force is relatively short, so normally one C-47 aircraft will suffice.

Employment of aircraft flares presents several problems. Drifting may cause them to be totally ineffective if winds are not accurately measured and compensation made. The trajectory and point of flare burnout must be given careful consideration. They can impair the pilot's night vision if they pass in front of the helicopters, and they may cause fires if allowed to burn out on the ground.

Helicopters are capable of illuminating an area with flares for a limited time. An aircraft with a greater payload capacity than the UH-1 helicopter is desirable. Weather and aircraft availability are the prime limitations on helicopters providing flare illumination. Flares dropped from helicopters have the same disadvantages as those with the C-47 aircraft.

The C-47 can provide direct light or "artificial moonlight" by use of a searchlight. The artificial moonlight technique will at the same time offer some degree of

Pathfinders, such as those parachuting into an LZ below, have been extremely effective in conjunction with night airmobile operations

A searchlight can be mounted in the cargo door of the Huey

deception to the enemy.

Using direct light from the C-47 would have the same, if not more, advantages than most direct light searchlights. Obviously, the problem of positioning and security are not as great as with the other lighting methods mentioned. However, for airmobile landings, direct light may present some problems. If the light is directed from the front or sides of an approaching flight, the problem of the pilot's night vision becomes acute. At the same time the flight may be lighted or silhouetted, making a good target for antiaircraft fire. If the light is directed from the rear of the flight, the aircraft are silhouetted; however, the problem of night vision is significantly reduced.

A searchlight system for the helicopter has been tested and used in Vietnam and shows great promise. (See DIGEST Jan 66, "Searchlight for Helicopters"; Jan 67, "Playboys and the 'Lightning Bug'"; Nov 67 "Firefly.") The flight characteristics of the helicopter make it obviously more versatile and flexible than the C-47 aircraft. The helicopter searchlight system mentioned consists of seven C-123 landing lights mounted on a framework of tubing. When the system is mounted in the cargo door of a UH-1 helicopter, the beam can be aimed through an arc of about 40° longitudinally and 35° laterally. Excellent ground illumination has been obtained from altitudes up to 3,500 feet MSL. This system has some of the same disadvantages as direct light from the C-47 aircraft.

A landing zone can be illuminated with artillery flares. Problems of coordination and safety, as well as those problems inherent with the use of any flares, may make this technique impractical.

It has been demonstrated that a successful airmobile landing can be made with only natural moonlight.

Once preliminary plans have been completed and a method of illuminating the landing zone has been selected, other major considerations are the flight to the objective area, landing, departure, and supporting fire.

The flight to the objective area must be closely coordinated and regulated. A thorough and accurate movement order will eliminate many problems. Each flight must take off on schedule and assemble in formation before departing on course to the release point. Flights can be accurately vectored by other aircraft or by radar to the landing zone. When available, radar should be used as a back up or primary means of vectoring aircraft to the operations area.

For night movement V-formations of three (or five) aircraft in trail are best. This type of formation offers better control of the flight and a closer formation. Navigation lights on the helicopter should be modified with paint or tape to direct all lighting up toward the center of the helicopter. Modifications of navigation lights have been used in Vietnam.

A control aircraft should be used to coordinate and possibly provide navigational assistance to the flight as it approaches the landing zone. The control ship can also direct other aircraft in operational areas, such as flare or searchlight aircraft, tactical fighter aircraft (through the forward air controller), and helicopter gunships. In addition, the control aircraft should be capable of: remaining in the objective area for the duration of the airmobile phase of the operation, marking the landing zone if required, and communicating with the ground forces, to include supporting artillery.

Employment of armed helicopter support helps to reduce attacks of airlift helicopters by delivering intense supporting fire. Armed helicopters offer excellent cover and fire support during the critical phases of approach, landing, and takeoff from the landing zone.

Tactical fighter aircraft may be used to prestrike suspected and

known enemy locations. At the conclusion of the prestrike, a reconnaissance by fire should be made by armed helicopters.

Just before the airlift helicopters enter on final approach, armed helicopters should make a final search of the landing zone to determine if it is safe for landing. If the armed helicopters receive fire from the landing zone, they should continue to reconnoiter the area by fire. At this time a go or no-go decision can be made.

As soon as it is determined that the landing zone appears safe for landing, the landing area should be marked if this has not already been done. When the airlift helicopters start their final approach (or just before this time), illumination should be placed on the landing zone. Once the final approach is initiated, all supporting fire should be shifted out in front of and to the sides of the landing zone.

Deception technique should be considered for use with the landing. The Israeli army employs a novel technique in this regrd. By using an aircraft with speakers mounted outboard, a tape recorded helicopter flight (in formation) is broadcast to deceive the enemy as to the true direction or location of the airlift helicopters. The UH-1 and other helicopters have a characteristic sound which makes them audibly detectable from a considerable distance.

After troops and cargo have been offloaded, the airlift helicopters should take off as rapidly as safety permits. It is important for the flight(s) to take off in formation if possible. If a formation takeoff is impractical, then they should form up as soon as possible after takeoff to facilitate a smooth departure and flight from the landing zone.

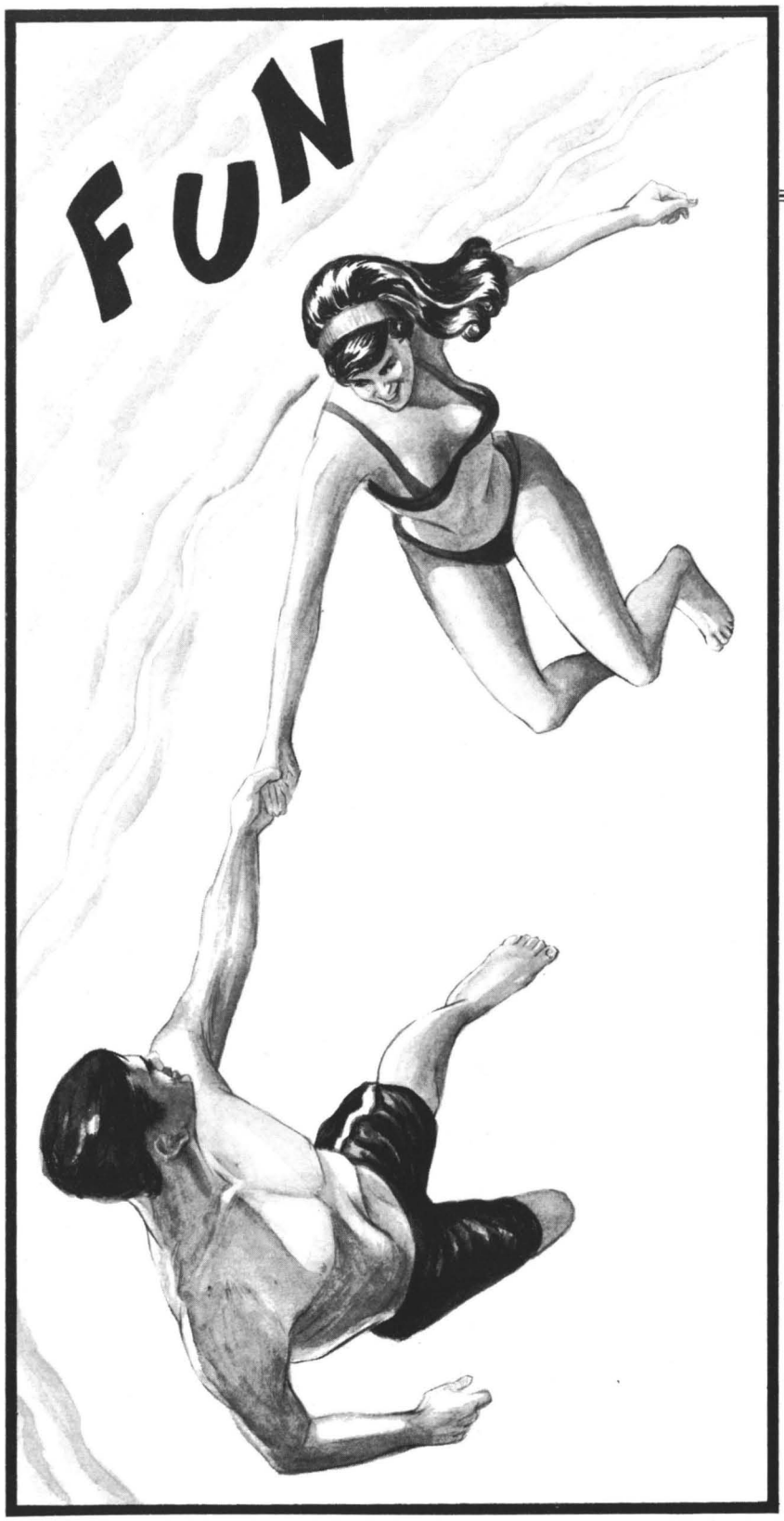
Helicopters normally have the advantage of surprise during the first landing in an area. However, subsequent landings in the same area have little or no surprise effect. Moreover, subsequent lifts may become more susceptible to ground fire unless the area is secured by the initial landing forces. Therefore, a complete combat force should be landed on the first airlift, and the commander should alter approach and landing patterns on subsequent lifts if the situation permits. Sometimes it may be even better to use alternate landing zones that have been selected beforehand.

The night airmobile assault is feasible and can be effectively used in counterinsurgency operations. This type of assault offers an effective means by which a force can reduce the mobility differential of the enemy as well as increase the element of surprise.

CH-54 Shoots for Record

LAST WINTER, the 273d Assault Support Helicopter Company (Heavy), 222d Combat Support Aviation Battalion, accomplished what it believes is a world record for tonnage transported in a limited time with a single free world helicopter.

The accomplishment was the direct result of a tactical operation to offload the *HMAS Sydney,* an Australian aircraft carrier anchored in Vung Tau Harbor. Working continuously, the mighty CH - 54A transported 608,799 pounds in 4 hours and 34 minutes. This time element included three pressure refuelings. Loads ranged from an 18,600 pound prime mover to a 10,500 pound lift of three ¾-ton land rovers rigged together in a single load.



SUM
O

Summer means high tempe heat upon individuals shoul injuries such as cramps, exh properly treated — but mo

Lieutenant Colonel

SWIMMING, FISHING, blue skies, picnics. Summer, glorious summer, is fast approaching with all its fun and games. Heat, turbulence, poison ivy, and thunderstorms. Summer is also approaching with all its troubles.

What will it be for you this year? Heat rash, broken bones, and all the other problems associated with outdoor living? Or will you follow a few simple rules and make your summer a pleasant one?

Summer means high temperatures, and the effects of heat upon the individual must be considered in all your activities. Heat injury such as heat cramps, heat exhaustion, or the deadly heat stroke must be recognized and adequately treated but, more important, prevented in the first place. Proper-

MER-
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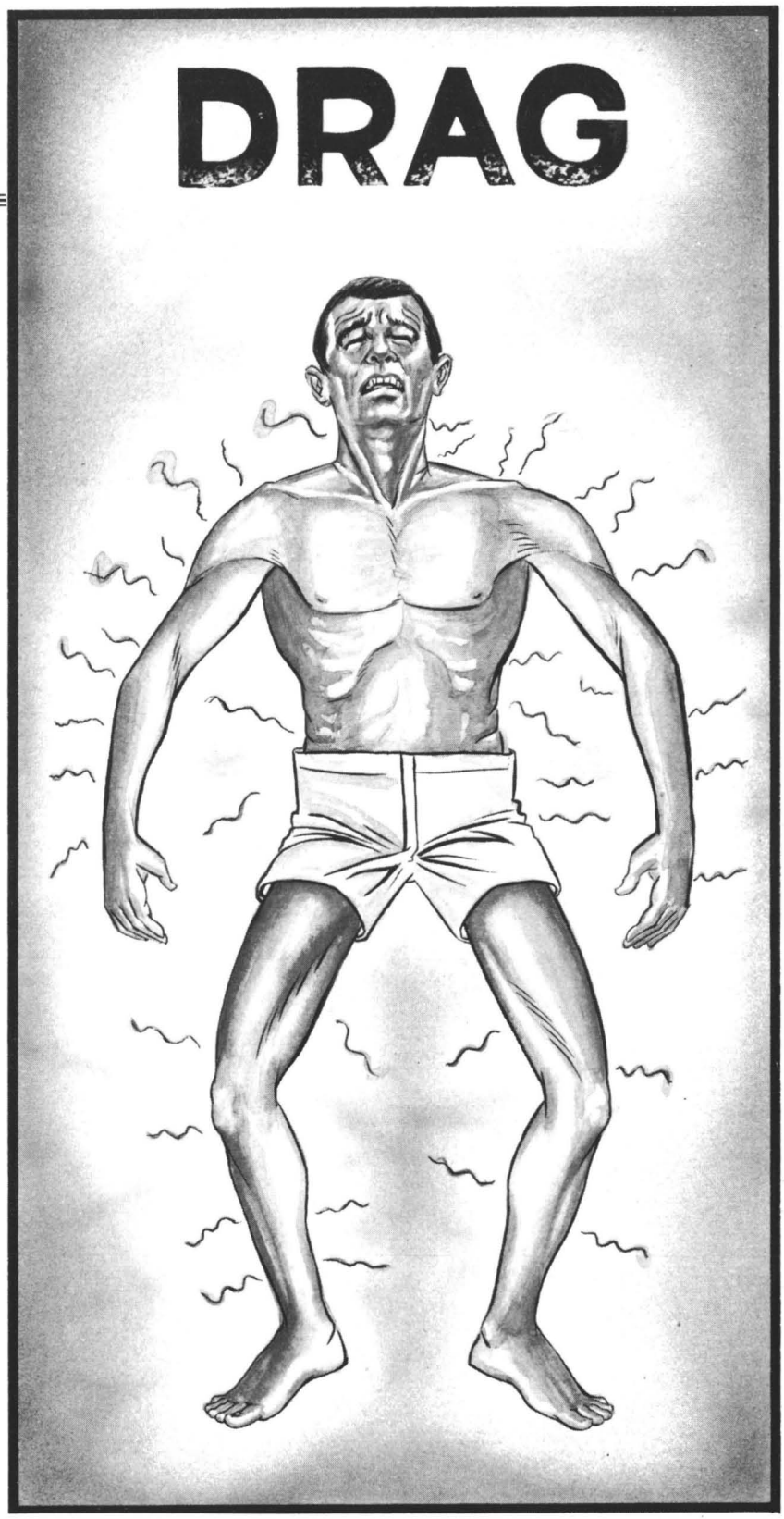


tures, and the effect of be taken seriously. Heat stion, and stroke must be important, prevented

illiam H. Hark

acclimatization by gradually increasing work periods in hot weather over a two week interval should prevent most heat injury problems.

Fluids and salt must be replaced when lost by the body, but the overuse of cold drinks is dangerous and the casual swallowing of salt tablets may bring on a very upset stomach. Adequate quantities of cool water along with the salting of regular meals will be all that is necessary in most cases. Aviators engaged in extremely heavy work under very poor conditions of heat and humidity should consult their flight surgeon on the proper measures to be taken. The wearing of proper dress and scheduling of work periods to coincide with the less stressful times of day remain very important.

Summer - Fun or Drag

A short break for relaxation will work wonders in fighting heat problems. It's also a good idea to take a short break at the nearby civilian airfields while catching up on your proficiency flying. But remember to avoid the cream and custard pies at the Greasy Spoon. They may be a quick source of energy but frequently are a good source of food poisoning. Also remember a snack of hot dog, soft drink, and candy bar is not really the ideal lunch. More and better food than that is needed to help push those big birds through the sky.

Summer holds dangers for the family man spending the weekend working around the house. By midmorning Saturday, the parade of lawn-care experts minus part of their extremities, or with various protruding foreign objects, begins to arrive at the local emergency room. Power lawnmowers are an extremely frequent cause of severe injuries and must always be used with great caution.

When you bring the mower out of the shed be real mean to your children and pets and chase them out of the yard. If they are not there they can't be hit by flying objects. Make a quick survey of the area to be cut, removing all stones and other objects that might be thrown by the rotor blade.

Always push the mower; don't pull it. Mow slopes sideways, not up or down. If you push the mower up the slope it can back down on you. Pushing down may allow the mower to run away from you.

Whenever your mower needs adjustments or fuel, cut the power. To make sure it won't start accidentally, disconnect the spark plug, especially if you must touch the blade for some reason.

The healthy-appearing tan obtainable in the summer is much admired. The red, blistered aviator, home in bed with his sunburn ointment is not admired. He is only a liability to the commander who has missions to accomplish. Again prevention is the only acceptable course. Be particularly careful between the hours of 1000 and 1400 because this is when the sun is at its worst. Also remember that some of the worst burns occur on cloudy days.

It's a good idea to wear sunglasses in the bright sunshine, particularly if you plan to do night flying. They will make it a little bit easier to adapt to night vision. But don't use them at night. They allow only 15 percent transmission of the available light, and 15 percent of very little isn't much.

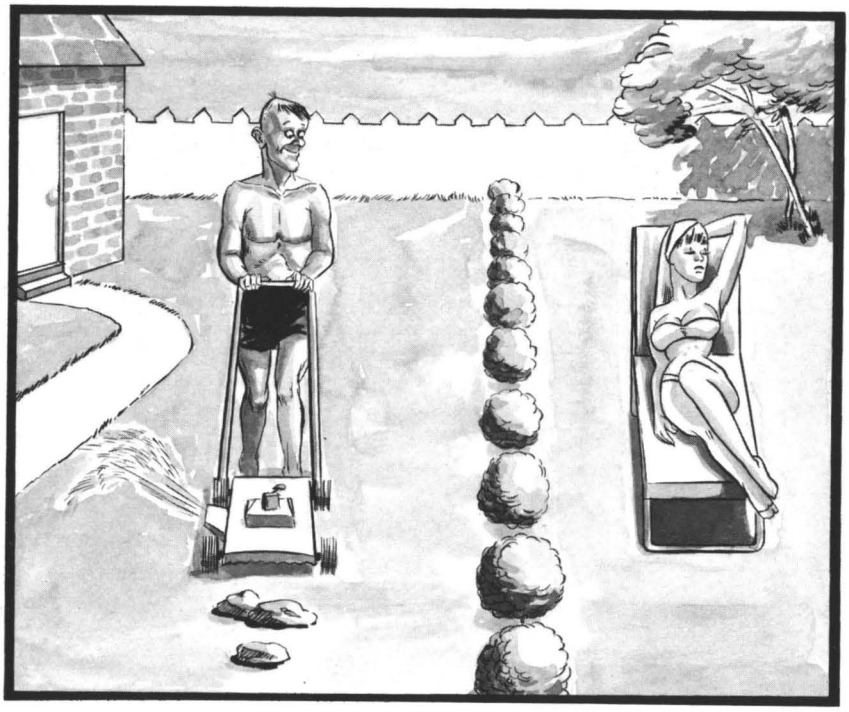
Sunglasses, regardless of the color, don't prevent glare from bright lights around airfields or automobile headlights; they do prevent you from seeing objects in the shadows.

Issue glasses should be worn rather than oddball types. They are designed with a natural-grey lense that prevents changes in your color perception.

Insects are a continuing nuisance. Their bites are irritating and are occasionally serious. Serious bites should be shown to your flight surgeon. Insect spotting of the windshield of low flying aircraft can be a serious problem. Many an aviator has found himself in trouble because he thought an approaching aircraft was only a smashed bug on his windshield.

How about insects getting in the ear? Sounds like a doctor's pipe dream but it happens more often than you think. The bug makes a great uproar inside your head as he tries to get out, but don't let it panic you. He can, of course, do some damage but in most cases it's the victim who usually does the damage by digging in the ear with objects not made for that purpose.

Power lawnmowers demand your FULL attention

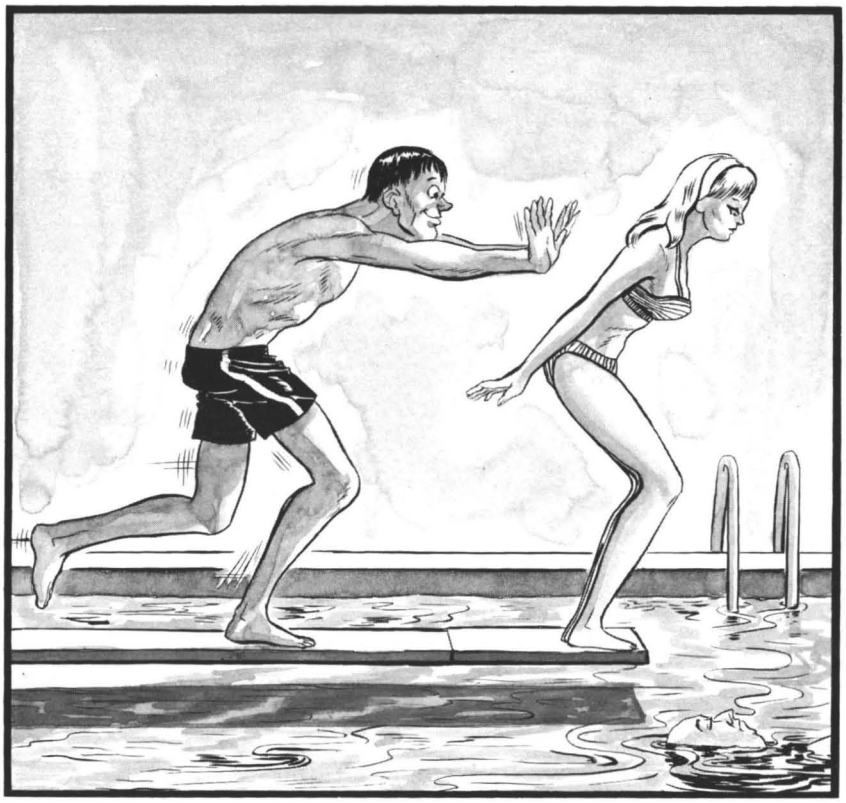


Of course, the first thing to do in a situation like this is to get to your friendly flight surgeon. But if no doctor is available it may be necessary to act on your own to kill the insect. If you have no perforation in your eardrum you can silence the bug with drops of 70 percent alcohol. You then can leisurely wash the insect out. It may be of value to remember that insects frequently are attracted to light, and a small flashlight at the ear canal may cause it to leave.

Be careful with the use of bug sprays in your garden. Many of the chemicals used have a wide range of side effects with a very narrow margin of safety. Always dilute them as directed on the label and avoid as much contact or inhalation as is possible. Always note whether the chemical used is recommended for use in private homes and gardens. Sprays designed for aerial application to crops may be exceedingly hazardous if used under other circumstances. If in doubt, check with your flight surgeon or preventive medicine officer.

Summer is the time of water sports, which in turn means lots of external otitis, the so-called "fungus" of the ear. Again prevention is the thing. After swimming, be sure your ears are dried well. There are some eardrops that can aid in this if you are having trouble.

Watch for "horseplay" in swimming pools. A frequent result of these activities is the painful rupture of an eardrum from a light blow while underwater. This requires a long period to heal and may jeopardize your flying status.



Beware of "horseplayers" around swimming pools

And there's that adult scouting activity known in the Army as field exercises. The use of foliage and leaves for camouflage is good. However, poison ivy dermatitis is a major problem during the summer and those individuals who cannot identify it may find themselves with a major skin eruption over sensitive areas of the body.

Watch your equipment in the field. Do not lay things down where insects and other small creatures may crawl in and hide. One aircraft was almost lost a while back because a snake crawled out of a pilot's helmet while in flight. The investigators of the accident thought the pilot had hallucinations until they searched the plane at his insistence and found the hitchhiker.

Scuba diving is a source of considerable fun and relaxation for the active types. This activity however can be an extremely dangerous one for people who are not well trained in the techniques of the sport and the use of the equipment. Oxygen should not be used in the compressed air tanks of the scuba rig. Know the area in which you are diving and never do it alone.

Aviators should know the dangers of flying an aircraft, even at low altitudes, after diving. An absolute minimum of 12 hours must elapse before flying and a period of 24 hours would be even better to eliminate the possibility of the bends. See your flight surgeon immediately if any unusual symptoms should occur in the 24-hour period after diving.

And lastly, remember you can follow all of these safety rules, and it won't help one bit unless you drive and fly carefully.

LTC Hark was assigned to the Department of Aeromedical Education and Training when he wrote of the perils of summer. He based the article on professional knowledge with the hope it would remind readers that summer months aren't necessarily fun months.

STAnDArDizaTIOn

Captain Peter H. Otersen

ONCE UPON a time there was a young second lieutenant called Brighty. This young man, who as a child had watched the eagles soar over his native mountain ranges, decided upon receiving his commission to apply for flight training in the U. S. Army.

After his initial dollar ride in the O-1 Bird Dog, Lieutenant Brighty was convinced that man was not created to fly and that he would have to overcome this deficiency by studying conscientiously and memorizing his checklists.

Brighty progressed better than expected — his checkrides were passed with high scores and his instructors were delighted in his flying ability. In ground school he excelled by nearly memorizing the -10 and being able to compute density altitude in his head with the given factors. He performed in the same manner when he subsequently transitioned into the U-6A.

After graduation from flight school Lieutenant Brighty, wearing his shiny wings proudly over his left breast pocket, was assigned to Korea to fly the aircraft he had just become so expertly qualified in.

The first frown appeared on Lieutenant Brighty's forehead when the unit standardization instructor pilot began his initial checkout with, "Son, forget everything you learned in flight school. This is Korea—we fly our birds differently over here." He then proceeded to give young Brighty a complete set of new rules and standards together with a mimeographed "revised" checklist.

Make no mistake, honorable reader, Lieutenant Brighty quickly adjusted to his new environment of taking off with carburetor heat on cruising at different power settings. It was only when he returned to a unit in the ZI that his newly acquired procedures caused his local IP to break out in cold sweat. Brighty was again handed a new checklist and after several hours of standardization flights he could once again soar with the eagles which were flying over Texas complying with local regulations (the eagles, that is!). Let us not forget to mention that his valid Army standard instrument card was not honored here until after a checkride with a member of the instrument examining board.

Lieutenant Brighty returned to the home of aviation for a few weeks to transition into another aircraft before his assignment to Vietnam to demonstrate in combat his superior flying ability. "There is no better aviator than one who just graduated from flight school," said the IP as he provided Lieutenant Brighty with a new checklist and the local SOP.

Brighty scanned the pages of the list, found little similarity to the -10, and quickly discarded his Aviation School instructions in a sudden moment of despair. By now he was convinced that this was an exercise for the purpose of better training and to teach him to be flexible. "Woe to an aviator," he said to himself, "who lets procedures become routine."

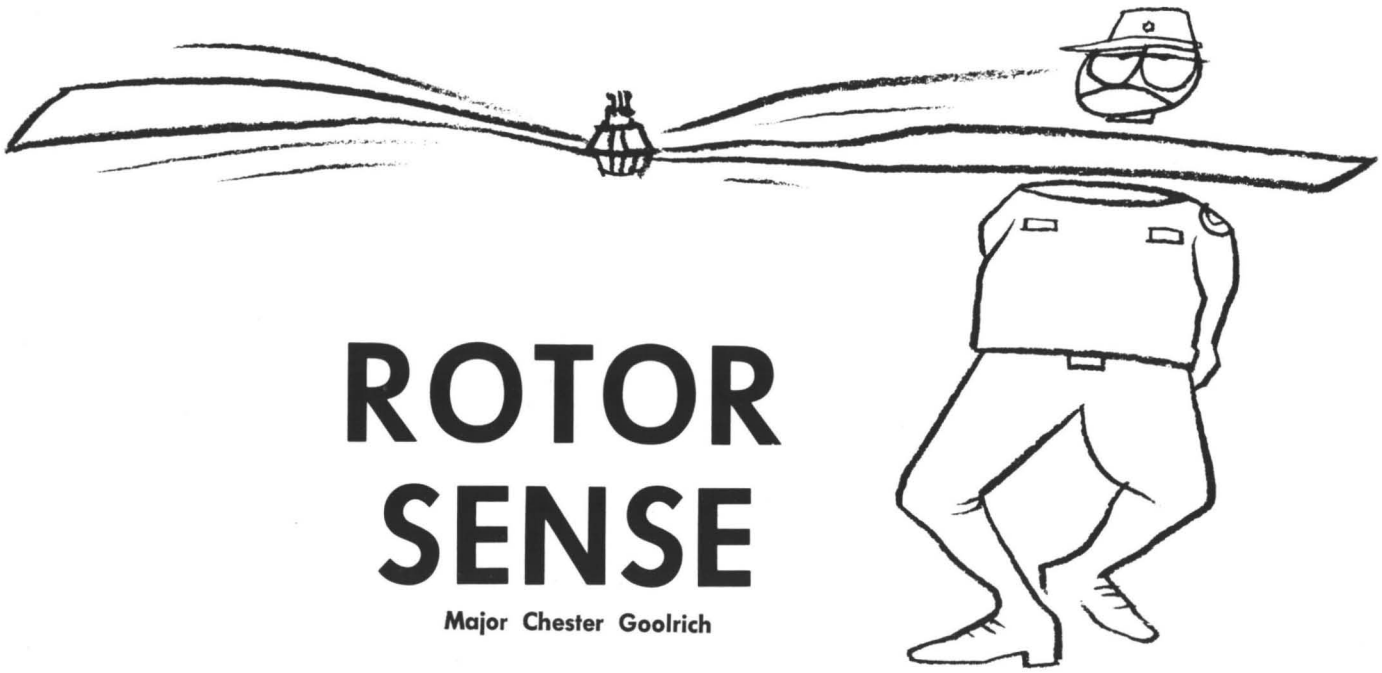
Newly promoted Captain Brighty served his tour in Vietnam without an accident or incident and proceeded directly to Germany. "Could there be a better aviator than one who has flown many hours in Vietnam under combat conditions?" he asked himself. "Could there be better procedures than those tested in combat?" The local Safety and Standardization Division felt there were and they prescribed a new checklist for flying in USAREUR. So for the first time in his flying career Captain Brighty revolted. He discussed the new rules with several other Vietnam veterans and they decided to modify the checklist, relying closely upon the -10 and the instruction of the Aviation School.

Now Captain Brighty is wondering what will happen should he be assigned to another command. Will someone hand him a new checklist? Will someone tell him to forget everything he learned before?

Besides being unbelievable a fairy tale must have a happy ending, so we will just say that if Captain Brighty has not become a victim of standardization, or the lack thereof, in the meantime he is still flying and will live happily ever hereafter.

CPT Otersen chose a fictitious approach to stressing the need for standardization. Although his article may be an overdramatization of the lack of standardization, it does point out the bewilderment it can cause.

the following 28 pages prepared by the United States Army Board for Aviation Accident Research



ROTOR SENSE

Major Chester Goolrich

NEXT TO AIR CONDITIONING or a personal iceberg, the best thing to have on hand on a day when the thermometer is about to blow its safety valve is a jumbo-sized electric fan, one large enough to get a Bird Dog off the ground.

Not counting, its goes without saying, a frosty mint julep personally prepared by a Kentucky colonel who got his know-how from a family tradition of beating the heat going back to the good old days before the Civil War.

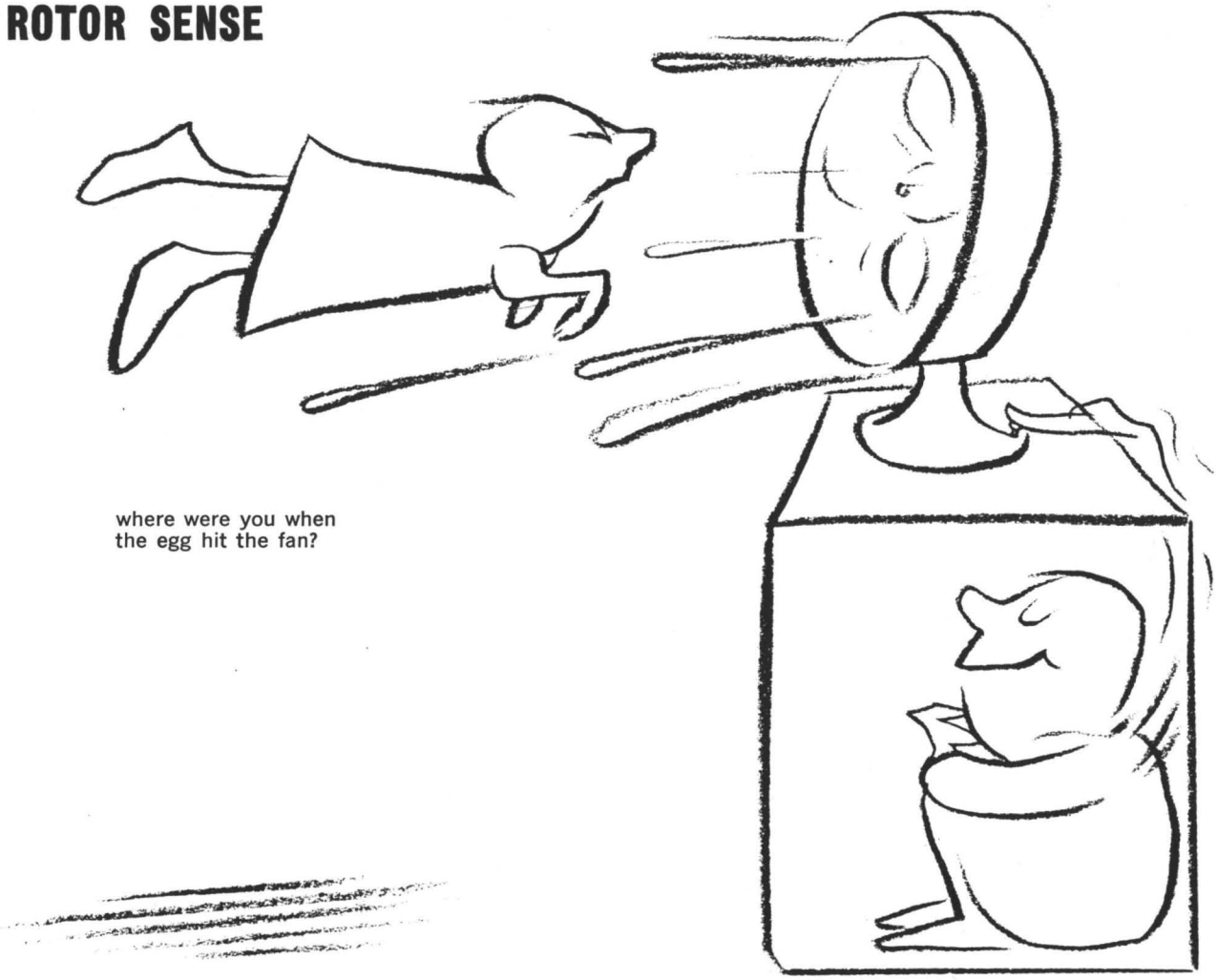
But every blessing in this world is likely to come equipped with a built-in drawback. If the colonel pours the julep with a heavy hand you wind up with ringing in the ears and double vision. Too much air conditioning brings on a stiff neck. Sit on an iceberg long enough and you develop chilblains and frosted toes.

And anybody who has ever been rash enough to stick a finger in an electric fan when it was revved up to full rpm's—or has tried the interesting, if messy, experiment of throwing an egg or a custard pie in one—knows that it can be fairly unpleasant if you get too familiar with it.

There are a number of other modern blessings in the electric fan category which exact penalties from a chap rash or careless enough to interfere with them when they are minding their own business. Every small town doctor knows that as soon as June rolls around his waiting room will be clogged with suburbanites whose toes have got in the way of the blades of rotary mowers. A sure sign of an inefficient sawmill operator is a missing fingertip or two. The next time you go to a carnival, if you spot a chap with a hoofprint on the side of his head, chances are he was struck by one of the horses on the merry-go-round.

In short, if you interfere with **anything** when it is traveling around fast enough, something has to give.

ROTOR SENSE



where were you when
the egg hit the fan?

Throw an egg at a fan and you wind up with instant omelet on your face. Try a pool ball and you are in the market for (a) another pool ball, (b) a new fan, and (c) a plastic surgery job.

What goes for electric fans and merry-go-rounds, gents, goes double for helicopter rotors.

Even their built-in penalties carry penalties.

FAMILIAR TUNE

When you start pondering the reasons behind the incidence of rotor-inspired accidents among men who have a clear idea of what can happen when a blade hits a tree, another blade, or somebody's head, you almost always run into the same old sad song that provides the sound track for about every other area of aviation accidents.

ACCIDENTS TAKE PLACE WHEN A MAN TRAINED TO DO A THING THE RIGHT WAY FORGETS HIS TRAINING.

An airman who gets into trouble by mishandling a rotor blade aircraft in any one of a couple of hundred different ways usually is no different from the power company lineman who is knocked silly when he touches a live wire. The lineman has been told plenty of times that contact with a couple of thousand volts is not the healthiest way of getting a charge out of life. What happens is that he gets preoccupied with some tricky aspect of his repair job, is fatigued, or allows his skill to operate as an automatic reflex instead of as a thinking man's tool. Scratch another lineman.

A helicopter airman's job is even more complicated than a lineman's. In the first place, he's saddled with the task of operating one of the orneriest means of transportation invented since the Romans gave up eight-horse chariot racing. In the second place, he is usually performing under conditions hairy enough to cause anyone's attention to wander off in

all directions. And in the **third** place, he is almost always surrounded by other rotor airmen, like crows in a cornfield, milling around in the same crowded area. It is enough to make any sane airman sometimes feel he would just as soon trade places with the back kicking into a 30-knot breeze from behind his own goal line.

It's a fact that the odds under such circumstances are tough. There are at least eight basic types of rotor accidents, and if you put your mind to it you probably wouldn't have too much trouble uncovering a few more. Eight will do for a start. They are—

- Rotors striking personnel
- Rotors meshing
- Rotors picking up ground items—debris, tarps, ponchos, and the like
- Rotorwash-caused accidents and incidents
- Rotors hitting revetments
- Vehicles with antennas driving under rotors
- Formation rotor strikes
- Attempted starts with tied-down rotors

Everybody in the helicopter end of Army aviation knows this as well as he is aware of the fact that arsenic is no substitute for sugar on the morning's bowl of cereal. Anybody who has been in Army aviation for a fair length of time has seen the results of one or more kinds of instances of poor rotor management.

Yet the accidents keep happening just the same.

A familiar tune?

It's a sad song, all right.

HEAD-ON COLLISION

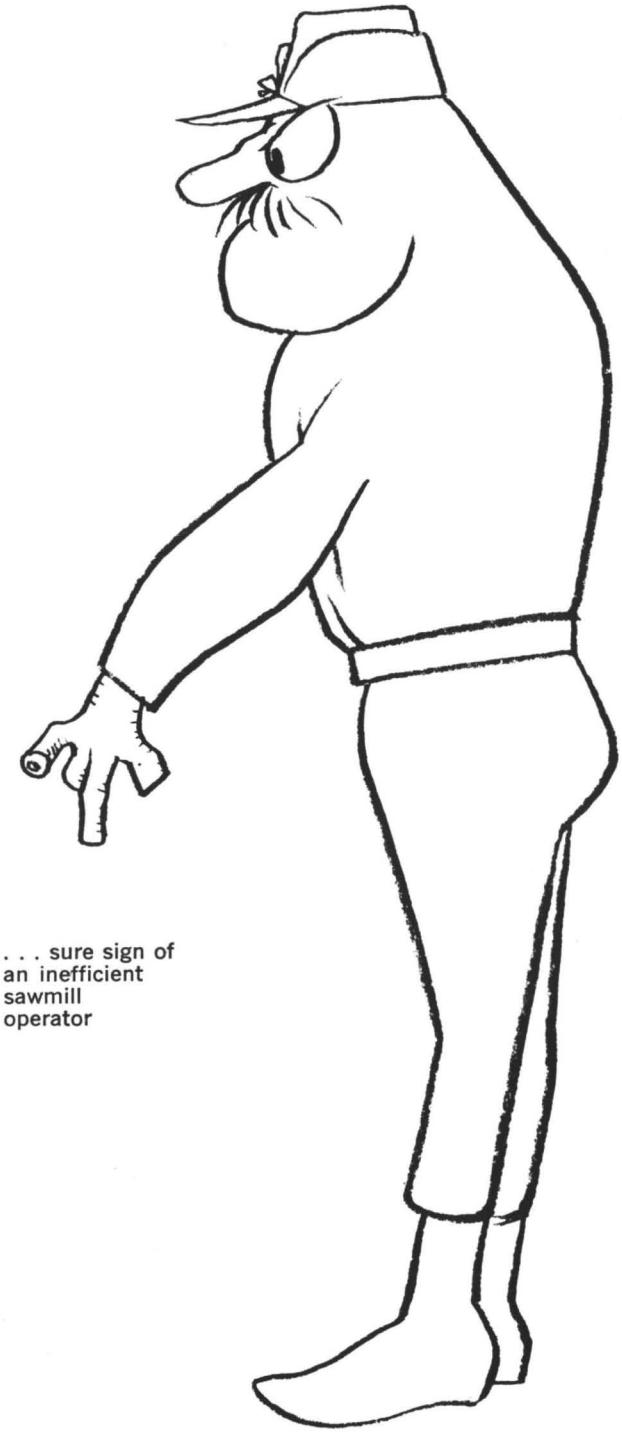
It's being only fair to hard-working Army airmen to say at this point that there is one area of rotor accidents in which training doesn't play a complete part. You'd have to be pretty simple-minded to walk into a whirling rotor blad under normal circumstances. The percentage of simple-minded Army aviators is roughly the same as that of cross-eyed quarterbacks in the National Football League.

The fact is that it's a rare day when anyone in Army aviation is hit by a blade. Sometimes, yes. But not often.

However—and it is a big however:

JUST ABOUT EVERYBODY IN THE ARMY SOONER OR LATER COMES INTO CLOSE CONTACT WITH HELICOPTERS — BUT NOT EVERYBODY IN THE ARMY IS IN AVIATION.

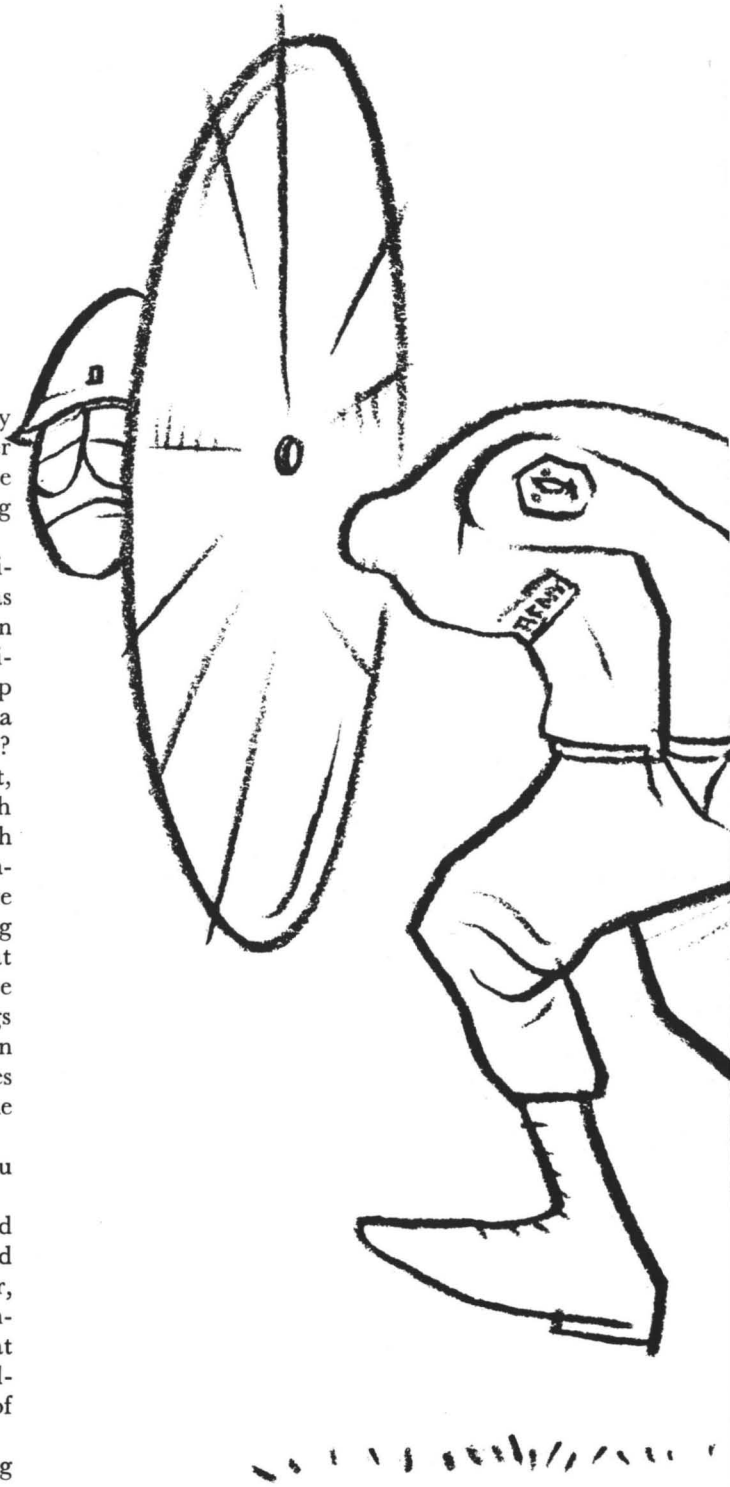
Here the light should begin to dawn. A footslogger being hauled into and out of combat, or being ferried from point A to point B on any of a thousand-and-one different kinds of missions the helicopter yellow cab service is called on to perform



. . . sure sign of an inefficient sawmill operator

ROTOR SENSE

. . . if you interfere with ANYTHING when it is traveling around fast enough, something has to give



daily can't be expected to concentrate on the deadly possibilities of a rotor. He has his mind on other things—like what Charlie may be planning if he is going in, or a steak and a shower if he is coming out.

To be sure, any helicopter passenger can appreciate the fact that a blade can remove his head as neatly as Henry the Eight's axman if he gets in its way. But does he stop to think that when a helicopter lands on a slope, the uphill rotor can sweep the ground close enough to mow the grass like a golf green being prepared for the National Open? Hell-bent for election to get clear of the aircraft, can he forget that helicopters come equipped with blades fore and aft and that you don't approach one from the rear any more than you would a temperamental race horse or a Missouri mule? There have been instances of uninstructed men being knocked for a loop because they didn't realize that a lazily revolving power-off blade packs a lot more wallop than it looks as if it does. These are the things you don't have to overlook more than once when you're dealing with rotors. Encounters with blades have a nasty way of being once - in - a - lifetime experiences.

They happen, too, all too often, and don't you forget it.

Only a short while back a passenger loading aboard a UH-1D at night and during a snowfall approached it from the right rear, was struck by the tail rotor, and that's all she wrote. There have been more instances than anybody likes to think about of combat infantrymen who have been struck, sometimes fatally, in head-on collisions with the uphill sides of blades.

You couldn't blame these poor chaps for blundering into something they didn't know about, any more than you could find fault with a 2-year-old for stick-

ing his finger on a hot stove. Sure, sometimes a man who is excited, apprehensive, or concentrating on his own particular job can overlook a warning even if it is dinned into his ear by a bull horn or tattooed on his chest in inch-high letters.

BUT NORMALLY A WARNING DOES THE TRICK AND IT IS THE ARMY AVIATOR'S RESPONSIBILITY TO SEE THAT HIS PASSENGERS ARE FULLY WARNED.

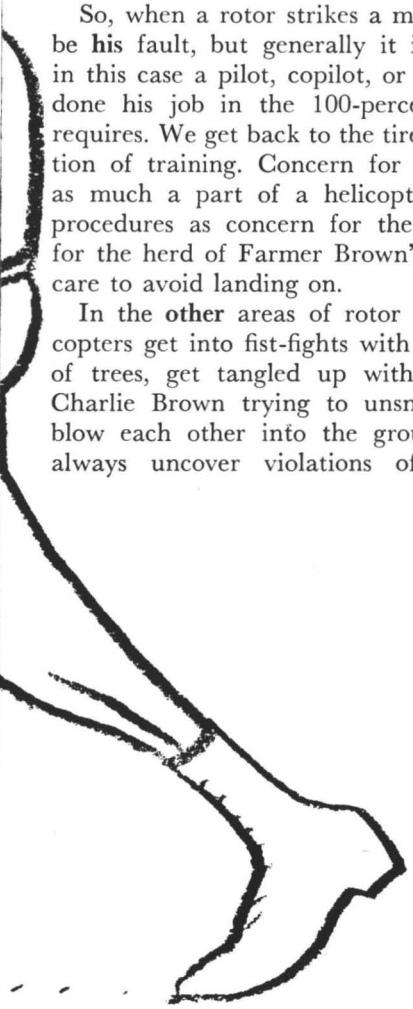
Even a Boy Scout who has never got past the tenderfoot stage remembers to do his daily good turn. Army aviators, in the Eagle Scout class to a man, take extra care to see that their passengers get the word that the main rotor is something to avoid and that that little dinkus whirling around at the back isn't in the toy category either.

It's so much less messy that way.

CLOSE ORDER DRILL

So, when a rotor strikes a man it may not always be **his** fault, but generally it is **somebody's** fault—in this case a pilot, copilot, or crewchief who hasn't done his job in the 100-percent, 24-carat style it requires. We get back to the tired old bit about violation of training. Concern for passengers should be as much a part of a helicopter airman's standard procedures as concern for the aircraft, or concern for the herd of Farmer Brown's prize cows he takes care to avoid landing on.

In the **other** areas of rotor accidents, when helicopters get into fist-fights with each other or groves of trees, get tangled up with foreign objects like Charlie Brown trying to unsnarl a kite string, or blow each other into the ground, you can almost always uncover violations of sound procedures.



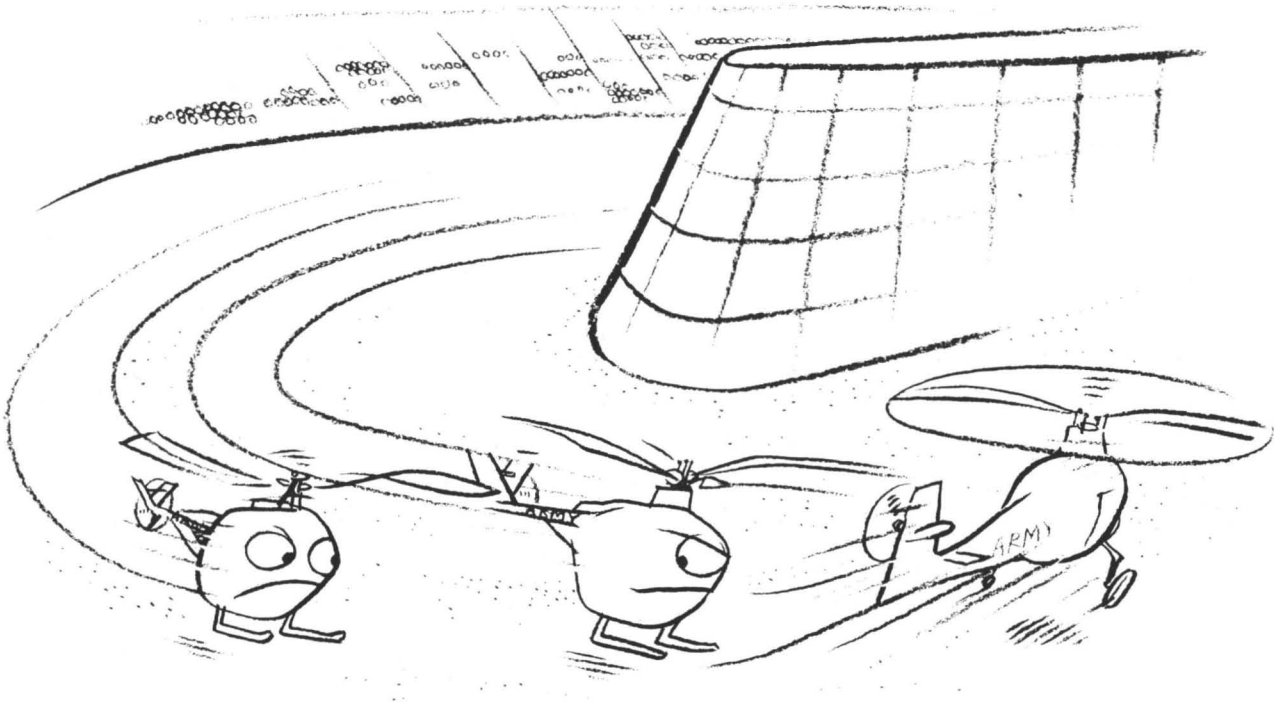
. . . contact with a couple thousand volts is not the healthiest way to get a charge out of life

Somebody has forgotten what he knows, has ignored what he knows, or has sailed cheerfully ahead in the face of what he doesn't know. The result is just about always the same.

Let's look, for instance, at the business of foreign objects. No aviator has yet reported hitting a flying saucer with his rotor, but just about everything else you can name has been encountered from time to time. We'll leave birds out of it. Nobody yet has figured out a way to give orders to a Canada goose or a giant condor. Anyway, most geese and condors have sense enough to stay clear, though a turkey buzzard recently lost a head-on battle with a HueyCobra.

The real trouble comes when a hovering helicopter picks up assorted bric-a-brac off the ground in its rotorwash and throws it into the blades like the original kook who tried the egg-in-the-fan or custard pie experiment. The pull is terrific. Anything loose which weighs much less than Bloombelly McSuet, the fat man in the circus, is likely to get the full treatment. It has been demonstrated a number of times that a well-bred helicopter can't, and won't, fly when its blades are festooned with enough underbrush to keep a beach picnic fire going for 2 days—tarpaulins, empty mail bags, ponchos, and the original pair of overalls which somebody put in Mrs.

ROTOR SENSE



. . . operating one of the orneriest means of transportation since the Romans gave up chariot racing

Murphy's chowder. If you were to assemble under one roof all the various odds and ends which rotors have blown up from time to time, you'd have a fair start on a lumberyard and could hold a rummage sale which would keep you in spending money for the next decade.

The cure, like most cures, is as simple as putting a band-aid on a blister. You don't have to be a combination of Sherlock Holmes and Perry Mason to reach the conclusion that if there are no loose objects lying around for the rotor to get its wash on, no damage can be done. The best way to keep Junior from eating between meals is to hide the cookie jar.

It hasn't been too long ago, as an example, that an OH-13 attempting a takeoff after landing in a confined area, picked up enough loose brush and kindling wood to bring an end to the day's proceedings. A personal trash removal program by a thoughtful pilot or groundcrew could have prevented the trouble. Again, a panel on a field location was sucked into the blades because somebody had failed to consider that a pin will hold in muddy ground without about the same faithfulness it will in hot butter.

It has been human experience going back to the days of Oog the Caveman that if you look after the details, the big things will take care of themselves. Remove temptation in the way of ponchos and mailbags from its path and a helicopter can huff and puff like the Big Wind from Winnetka without ever coming to grief because of rotorwash.

GALE WARNING

Big wind is right. At cruise speed, a rotor at its center is traveling around at about 360 rpm, give or take a few, fast enough to suit even a five-time winner at Indianapolis. **The blade's tips are revolving at just about the speed of sound.**

This means that air—a lot of it—is being hurled down at what amounts to hurricane force. We've all seen what a hurricane can do to a beach resort when it really gets down to brass tacks. The pocket-sized hurricane a helicopter kicks up below, in addition to picking up loose material and causing helicopter suicide, can raise sand with anything else which gets in its way. You might say in this respect that helicopters are their own worse enemies.

A typical example of what this can bring on was the UH-1D hovering for takeoff which got such a severe buffeting from a descending CH-47A that it was nearly thrown to the mat like an outweighted

wrestler. A quick autorotation by an alert pilot saved the day in this case. A similar incident caused severe damage to another Huey's skids and underside.

Still another CH-37, taking the part of the villain in the act, caused the main blades of a hovering OH-13 to flex down and strike the tail boom. No one was killed or even severely hurt, but the Army was without the services of one OH-13 for quite awhile.

It all stems from the fact that helicopters, unlike fixed wing aircraft which need a lot of running room, tend to operate in flocks like coveys of quail, bringing on the kind of problems you always encounter when you get a lot of people jammed into two small an area. Unless you look out for the other fellow, somebody is likely to wind up with an elbow in his eye. Every sensible helicopter man keeps in mind that everywhere he goes he is taking along his own homemade, pocket-sized typhoon and that, unless he keeps a sharp eye, he can bring on a mess of trouble for some poor soul who is trying to deal with the hurricane his own machine is kicking up.

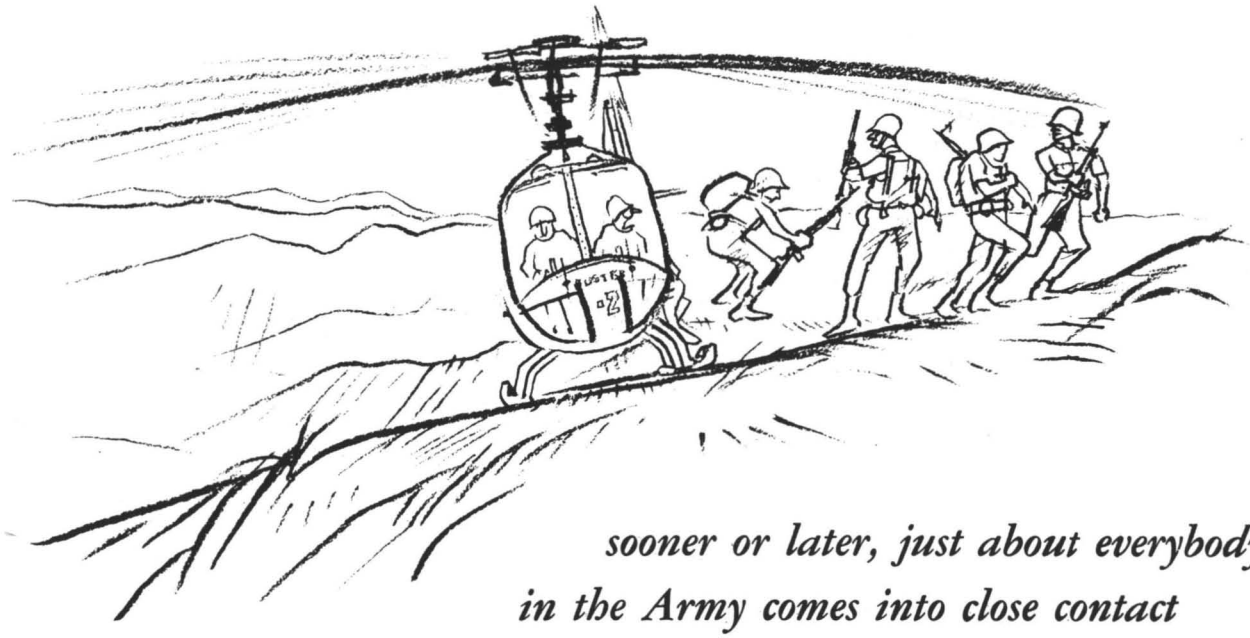
DUKE'S MIXTURE

The kindest thing to be said about most of the other categories of rotor-induced accidents is that the people involved as a rule weren't having one of their better days. Or, if you were George Washington and a stickler for the bald truth, you would have to admit that somebody goofed.

We'll grant that other factors can come into the picture. A pilot trying to land in the miniature sand or duststorm his or somebody else's personal hurricane raises at the last moment may be excused for thinking his guardian angel was falling down on the job if he damages a skid on touchdown. It's a rough world, and the arrival of the rotor blade on the scene didn't make things any easier. Wilbur and Orville didn't know how well off they were.

But if you dig down into most rotor accidents, you'll usually find that somebody inadvertently went out of his way to make it even tougher. There are as many kinds of such accidents as there are pickles in a barrel, but they all share one factor, the human one.

ROTOR SENSE

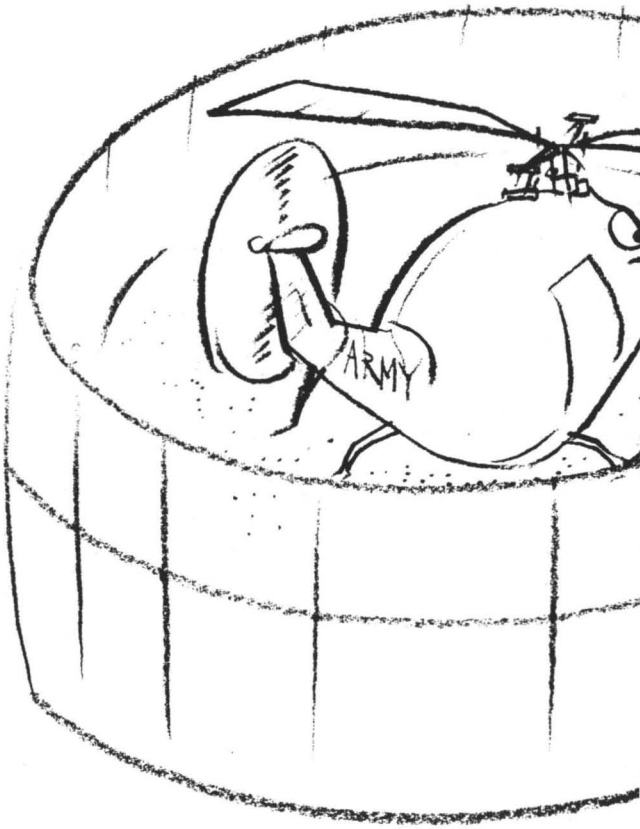


sooner or later, just about everybody in the Army comes into close contact with helicopters . . .

When a man behind the wheel of a jeep sporting an antenna longer than a bamboo fishing pole blithely drives under a helicopter with its rotor turning, you can offer long odds that his mind was dwelling on an upcoming date with a blonde blockbuster rather than on the job at hand. The same goes for the unknown hero who left a pair of needle nose pliers on a tail boom, right where they could fall into the rotor when it started fanning around. This incident wouldn't have happened, at that, if the pilot had made an adequate preflight. And there has been more than one occasion when engines have been started with the rotor blades still tied down as securely as a bunch of palefaces captured by Sitting Bull.

Simple carelessness? High density fogmindedness? You can say it again, and you can also make a note of the fact that where helicopters are concerned it doesn't take much of a blooper to bring on a major disaster.

Aside from the occasional goof-off which brings on the crash, too many helicopter accidents and incidents involving rotors come from a lack of intelligent foresight—the failure to look ahead to the possible consequences of a minor error. This is what the people back in Oog's day were talking about



when they started going around telling each other that an ounce of prevention was worth a pound of cure.

Take the case of loose objects in the aircraft itself. Even a paper cup or a hot pastrami sandwich on rye can cause trouble if it blows out the door and into the rotor at the wrong moment. Also, more than once a door has come loose and hit the rotor when it became accidentally unlocked, or somebody failed to install the safety lock pin. Anything unsecured in a helicopter is raw meat for rotor appetites.

One classic example of failure to assess the possibilities—one which cost four lives—took place when a UH-1D pilot attempted to sling load a main rotor blade for another aircraft. He attached one end to the external cargo hook but failed to secure the tip. At 200 feet and 60 knots the blade began fluttering like a caged bird and flew up into the main rotor. We will spare you the details of what happened next, as if you couldn't guess.

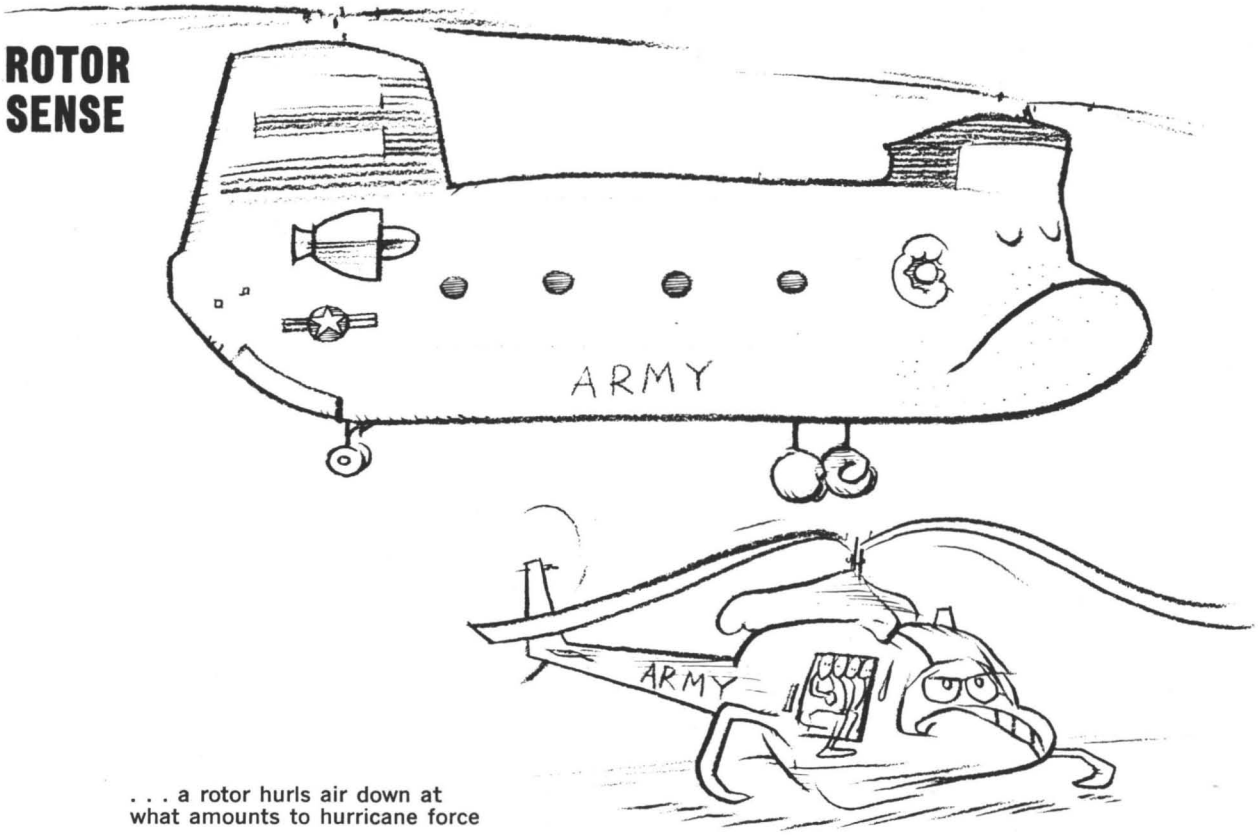
KILKENNY CATS

When two helicopters tangle blades, a rotor hits a revetment, tree, snowbank, or the flagpole in front of the commanding general's quarters, the result can be about as noisy and colorful as a pair of bobcats fighting in a barrel of beer cans. But not nearly as much fun. At best it will put the helicopter out of action for a spell and if the encounter happens to take place aloft, it can be **quite** a spell for both aircraft and crews.

The business of blades meshing or striking objects much denser than custard pies or airborne jellyfish is one of the basics of the rotor problem, an illustration of the dismal fact that a pilot must always have the blades somewhere near front row center in his mental auditorium no matter how many other pressing problems he is coping with.

Rotors are the most accident-prone part of any helicopter. If there's one thing for certain in this world, it is that when one loses a blade in midflight you can't bring it home in a poweroff glide the way you might a fixed wing. Blow a blade anywhere — in the air or on the ground — and you've had it. If you're lucky you can pick up the marbles and go home. Anyway things turn out, you're out of commission.

ROTOR SENSE



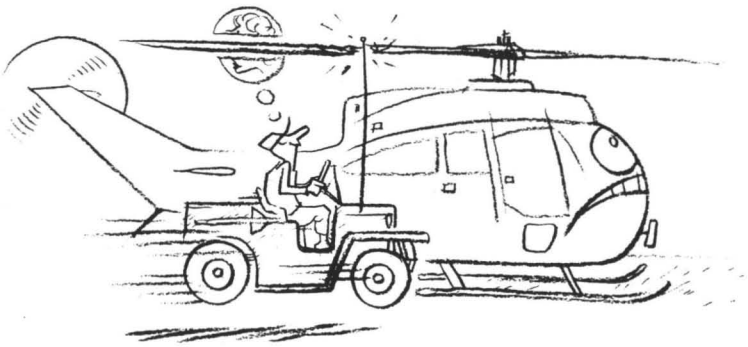
. . . a rotor hurls air down at what amounts to hurricane force

Proper care and feeding of rotors is therefore not only of prime importance, but is, sad to say, easy to overlook. Even fixed wing pilots, with a propeller up front in plain view, occasionally stick their noses into haystacks or mudbanks. A helicopter pilot, with rotors above and behind him and no wings as a measuring device, can drift into the danger zone if he lets his alertness fail him for the split second it can take a rotor to get itself into a mess of trouble. Really top-flight airmen not only think about rotors all day long, they dream about them at night.

DAILY DOZEN

The ounce of prevention formula Oog stumbled upon? Any sensible helicopter airman starts by admitting that everybody concerned knows what can be involved when rotors are mishandled. From there he goes on to recognize the sad fact that rotor accidents keep happening anyway. By adding two and two you're bound to reach the conclusion that some people occasionally don't let what they **know** get in the way of what they **do.**

Rotor accidents can be eliminated from the statis-



. . . his mind was dwelling on a blonde rather than on the job at hand

tical columns only when airmen are **constantly** concerned with the possibilities and alert to the dangers. **Constantly.** It doesn't do much good to think about sound rotor procedures at stated intervals and forget about them the rest of the time, the way you do all those gaudy resolutions you adopt every New Year's Day. Remember the time you swore a solemn oath to give up smoking and stop raiding the refrigerator? Crazy.

Sound rotor procedures have to be a daily affair, like the sitting-up exercises you do every morning unless you want to develop a waistline Santa Claus might envy.

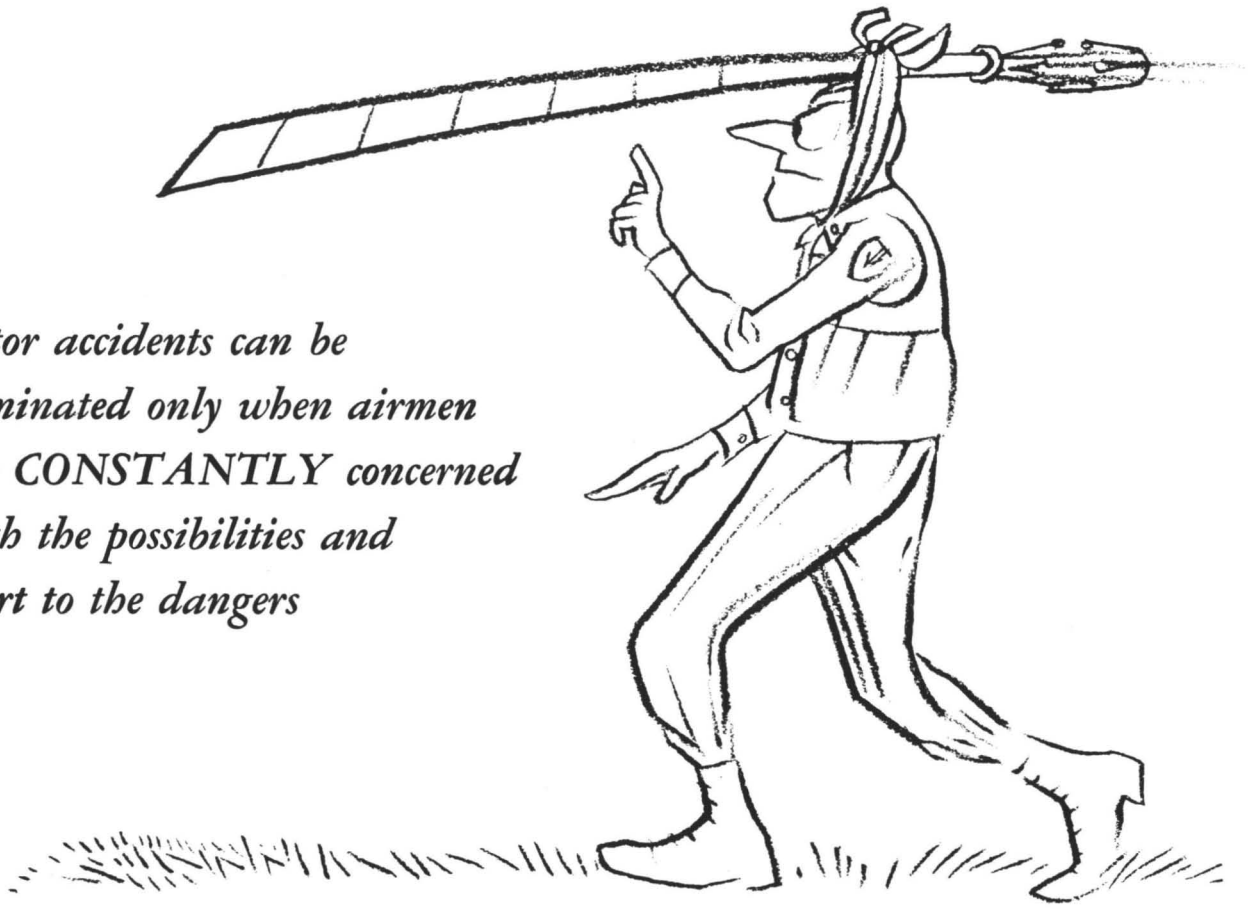
The penalties for lapses are too great. There aren't any areas of aviation in which you can safely ignore sound procedures, but when it comes to rotors, the difference is that between 5 yards for offsides and being thrown out of the game for roughing the referee.

Where helicopters are operating, skies are more crowded than a subway at the rush hour. It's easy for the chap whose alertness is the tiniest bit off to stick his rotor elbows where they don't belong. To protect himself, he must be always on the lookout for the other fellow **and he has a right to expect the other fellow to be on the alert for him.** It's a matter of teamwork on the part of all hands, the way just about everything in the Army must operate if the job is to be done in topflight, professional style.

Finally, a helicopter airman doesn't have to be told that what can be only a minor mishap for fixed wings can turn into something for helicopters just about as hairy as King Kong, and twice as mean.

Who needs King Kong? Nobody with brains enough to tie his own shoelaces wants a King Kong type of rotor-inspired accident on his hands for any reason—personnel strikes, blades meshing, or anything else. And the way to stay out of King Kong's clutches is to know what he can do, find out where he is, and stay out of his way.

As Oog says, an ounce of prevention doesn't cost anything at the corner drugstore, but the pound of cure can set you back a king's ransom. Alertness and foresight, taken three times daily, are guaranteed to prevent King Kong-sized rotor headaches. Ask the man who's had one.



Rotor accidents can be eliminated only when airmen are CONSTANTLY concerned with the possibilities and alert to the dangers

H. E. Roland, Jr.

Institute of Aerospace Safety
University of Southern California

UP TO THIS POINT the flight had been completely normal. The gunship had struggled into the air a bit easier than usual. But then the morning was clear and cool. The Huey had pounded off in the low density altitude without protest. Cruising easily at 1,000 feet over the green countryside, life seemed almost good and the rotation home in 35 days made it all the better.

Suddenly a heavy vibration, a kick of the pedals, and the aircraft started a right rotation and then snapped nose down. As the fuselage tumbled towards the ground, the pilot realized with horror that there had been a major failure in the tail boom. The machine did not respond to the controls and the ground came into view repeatedly from crazy angles. Through the confusion of the moment, he knew that for him there would be no rotation. The short 1,000 feet to the ground was covered in a few seconds. The crash was accompanied by a burst of flame. The wreckage burned for some time punctuated by exploding ammunition. Lying blackened in the flames was the cause of it all, one end of a broken tail boom bolt.

The real cause was not, of course, the bolt. It was the slight embrittlement during manufacture, the small tool mark on one side, the lack of inspections, the many many hours the Huey had operated at high power settings shaking, vibrating all such bolts and fasteners. The real cause was **metal fatigue.**

To understand the mysterious phenomena which cause metal parts to fail at less than their design strength, we must first understand two basic terms, load and stress. A load is merely the force acting to a part. It is measured in pounds. It may be applied slowly or suddenly. It may be steady or oscillating. It is the oscillating or intermittent load which causes fatigue.

Stress is the calculated load applied to each square inch of material. If a load of 1,000 pounds is applied to 2 square inches, the stress is $\frac{1,000}{2}$ or 500 pounds per square inch. If it is applied to one-half square inch, the stress would be $\frac{1,000}{1/2}$ or 2,000 pounds per square inch.

It is very convenient to speak in terms of stress on a part. If we talk in terms of pounds per square inch, there is no need to refer to the size of the part or the thickness of the metal which is taking the load. The amount of the stress on a metal part provides a ready reference to the degree to which a part is loaded with respect to its failure load. The failure stress of a metal can be determined by testing. A metal part constructed of this same material will then always fail at or near this same amount of stress. Therefore, if the kind of metal in the part is known, its failure stress can be predicted with a reasonable degree of accuracy. Knowing the number of square inches in the part which is taking this stress, the failure load can also be predicted.

There is, however, one very large "if" in the above statement. The failure stress can be predicted **if** the part is sound or constructed of metal which is very similar to the test material, **if** there are no small scratches, indentations or irregularities in the part, and **if** the stress is applied only once. In other words, it may be possible to predict the failure of the part if **metal fatigue** is not a factor in its failure. If we understand why each of the above three factors may influence the failure stress of the part, we will be

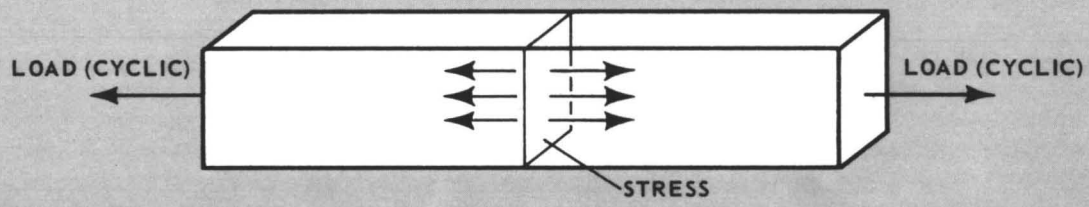


FIGURE 1

well along the road to an understanding of the nature of metal fatigue.

Imagine a metal bar which is under tension. This bar is not under continuous tension but the tension is released and reapplied as shown in figure 1.

Each square inch of cross section of the above bar is being placed under tensile stress each time the load is applied. This load, of course, causes much less stress in the bar than the failure stress of the metal of which the bar is constructed. So the bar is able to take the cyclic tensile stress without visible failure. Or is it? If the cyclic tension continues for a long period of time, a change will begin to occur in the metal on the atomic level. Slip planes will begin to form within the bar in the crystalline structure of the metal. If the cyclic tensile stress is allowed to continue, these slip planes will eventually become microscopic cracks. As the cyclic stress continues, the cracks increase in size until they are microscopic cracks.

The crack may appear as shown in figure 2.

Now, it is obvious that the cracked portion of the metal will not withstand any stress. So, as the load remains constant, the value of the cyclic stress on the undamaged portion of the metal will increase. As the crack continues to propagate through the metal, the stress on remaining undamaged portions is continually increased. Finally, the crack progresses to the point where the stress on the remaining portion of the material is equal to the failure stress for the particular metal of which this bar is constructed. The next application of the load fails the bar.

Many questions immediately come to mind. Is there a stress below which this crack will not form? How can the progress of the crack be detected? Once the crack is detected can its progress be stopped or hampered? Is there a difference in the manner in which the crack progresses through steel as compared to aluminum?

The formation and propagation of this crack is the phenomenon known as **metal fatigue,** and in the answers to the above questions we will have the means of coping with this most dangerous condition. Before addressing these questions, it would be well to first consider irregularities of the part and soundness of the material as further causes of metal fatigue.

In the case of the bar (figure 2) subjected to a cyclic load, the stress throughout the thickness of the bar is uniform. However, if there was a small notch in the bar, the local stress near the notch would be a value somewhat greater than that which would be computed by dividing the load by the cross sectional area of the bar. This notch is called a stress raiser and the stress around it, a stress concentration. Figure 3 illustrates this point.

to understand the mysterious phenomena which cause metal parts to fail at less than their design strength, we must first understand two basic terms, load and stress

While the notch is not sufficiently deep to appreciably reduce the area of the bar, its presence does raise the magnitude of the stress locally by approximately the value of six. Thus, it can be seen that while the stress of the smooth bar might be below the failure or ultimate stress of the metal of which the bar is constructed, the local stress around the notch could be well above such an ultimate stress. If this were true, a crack would form very quickly from the end of the notch and propagate through the bar to the point at which the remaining area of metal was insufficient to withstand one application of the stress.

The shape of the irregularity in the metal structure strongly influences the amount of the stress increase. A smooth round rivet hole will cause an increase in stress around it of three. However, the

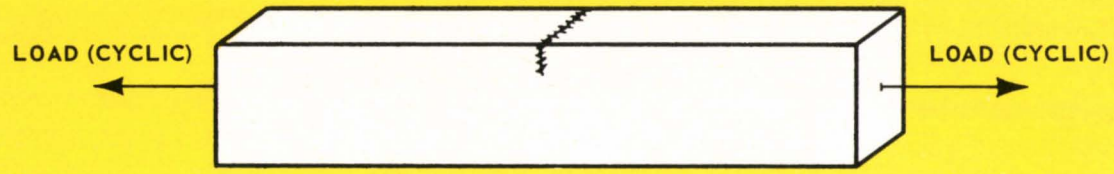


FIGURE 2

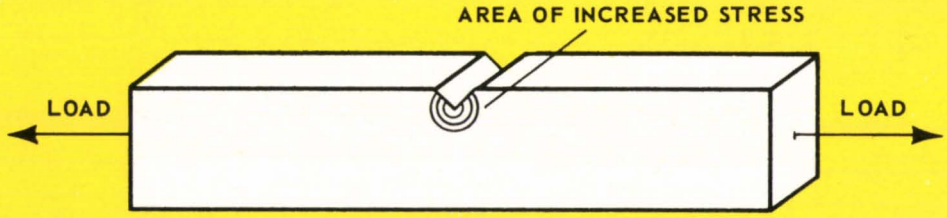


FIGURE 3

stress increase around the end of a fine crack may be as high as 20 or more. It is obvious that no metal part, however strong, could resist continual extension of a crack which had a small area of stress which was 20 times the applied stress, surrounding the end of the crack. Under such circumstances the crack must grow and eventually the remaining portion of the part would be insufficient to withstand one application of the load and the part would fail. It is emphasized that **any** irregularity in the metal part will cause a stress increase whether it be due to design or accident. A corner or keyway will cause some stress increase, and it is incumbent upon the designer to determine that the part is strong enough to continue in service for the anticipated service life without failure.

Fortunately, there is another characteristic of metal parts which modifies this rather alarming picture. This is ductility or the ability of metal to elongate without failure when under stress.

If metal which possesses some degree of ductility is stressed, it will deform. In the process of deformation or stretching, the shape of the stress raiser is altered and the stress concentration is somewhat relieved. Not only does this reduce the amount of the stress increase due to the stress raiser, but when the stress is relieved, a residual compression is present at the point of the stress concentration. At the next application of the load, the residual compression must be removed by tensile stress before any further damage will be done to the part. Thus we see that to cut a pane of glass, it is only necessary to make a small scratch which serves as a stress concentration. A small stress, caused by striking the glass a sharp blow, will be increased above the allowable stress at the apex of this scratch and a crack will instantly propagate through the glass, causing a smooth break. However, the aluminum skin of aircraft which is covered with scratches does not shatter because of the ductility of aluminum.

Now, is there a stress below which a metal part will not fatigue? To answer simply and generally, in the case of steel, yes. If the part is made of aluminum, no. It is possible to describe with a graph the fatigue life of a metal part. Suppose that a metal part is tested in a laboratory for its fatigue life. Initially, it

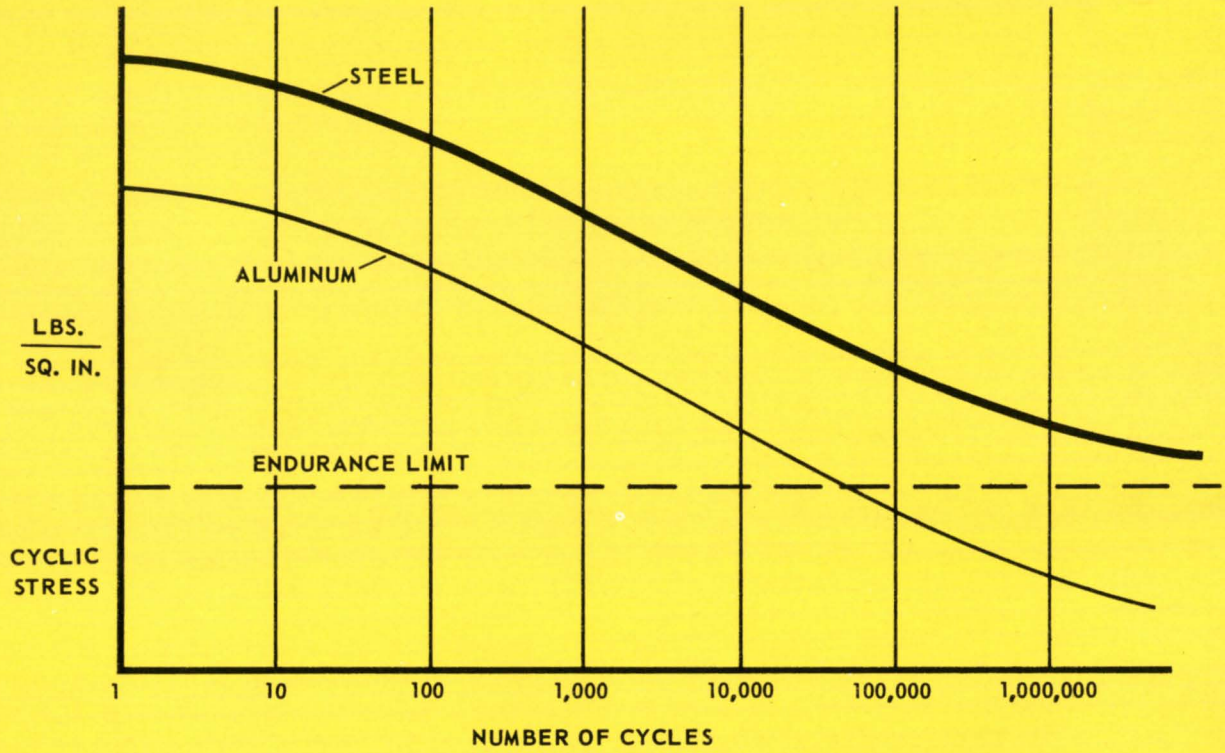


FIGURE 4

is stressed once to a complete failure. A second and identical part is then loaded to a lower value of stress several times until it too breaks. Of course, the phenomenon which causes the second part to fail at less than the ultimate stress is fatigue. Third and fourth parts are stressed at successively lower values and greater numbers of cycles until they too fail. This process is continued until a large number of parts have been failed in this manner. If the results are plotted, they will appear somewhat as shown in figure 4.

The initial point of each curve is the ultimate stress at which the part will fail at one application of the load. As the part is cycled an increasing number of times, it can be seen that it will fail at successively lower values of stress. In the case of steel however, there is some value of stress below which failure will not occur. As can be seen in the figure, such a value does not occur in aluminum. This low limit on fatigue stress is called the endurance limit. At values of stress below this amount, the part will not fail due to fatigue. It must be remembered that tool marks or

other. alterations in the shape of the part will alter the shape of the above curves.

Figure 4 says that since many aircraft parts are made of aluminum, and since aircraft, particularly the helicopter, are generators of cyclic stress, there will be a finite service life for much of the aircraft structure. It is therefore incumbent upon maintenance personnel and pilots to know what the service life is on the various components of the aircraft, and to perform the necessary inspections, maintenance, and replacements as the end of the service life approaches for the various parts. The manufacturer will determine to the best of his ability, by laboratory and flight testing, just what service life can be expected of all critical components of an aircraft. The chief of these is in the operation of the aircraft. If the aircraft is operated at higher gross weights, higher power settings, higher speeds, and has imposed upon it more frequent and greater accelerations, the cyclic loading imposed upon many of its components will be increased. And with this increase will come a decrease in service life due to the increased action of metal fatigue.

The service life of an aircraft part is also based upon correct maintenance of the aircraft. This implies that all parts will be installed correctly and correctly torqued. Torquing is an excellent way to relieve fatigue by stiffening a joint and placing in a part a residual compressive stress. This stress must then be relieved by an equal tensile stress before fatigue damage can begin.

Furthermore, if an aircraft is operated in a corrosive atmosphere, the progress of fatigue will be much more rapid. Not only will the corrosion decrease the effective area of metal which can take the service loads, but the corrosion pits form stress raisers which accelerate the rate of fatigue damage.

Is there anything which can be done other than wait for the inevitable surprise failure if an aircraft is being operated beyond design limits in a corrosive atmosphere? Yes there is — INSPECTION!

Initial fatigue damage may be detected by ultrasonic and X-ray methods. Various dye-penetrant methods will detect fatigue damage which is further advanced. And, of course, in its last stage, visual inspection may detect serious fatigue damage which has progressed to the point where final failure is imminent.

The subject of fatigue cannot be left without considering that well known practice, stop-drilling. Stop-drilling is a method of reducing the stress concentration and thus the propagation of the fatigue crack. The stress concentration around the end of the crack may be of the order of 20. The perfect circular hole of the drill will have a stress concentration of only three. This is quite a reduction but is it sufficient and is it effective? In most cases it is not.

Inspection of the wreckage of one of the British Comet jet aircraft which crashed into the Mediterranean Sea disclosed stop-drilling during manufacture in metal surrounding an opening in the fuselage where the catastrophic failure first occurred. The crack had progressed beyond the stop-drill to the ultimate catastrophic failure. An increase in stress level of three is still a formidable increase. So although the decrease from the value which existed in the pure crack is attractive, it will not be sufficient to permanently stop the progress of fatigue. Furthermore, in many cases in the field, it is difficult to hit the end of the crack with the drill. The very end of the crack may be microscopic and the twists and turns of a fatigue crack are difficult to anticipate. So although stop-drilling of a helicopter windshield where the eventual failure will not be catastrophic may be allowed, stop-drilling of metal structural components which are difficult to inspect and catastrophic in failure should never be permitted.

Briefly then let us reconsider the fatigue failure of the Huey tail bolt in the light of the newly acquired knowledge of metal fatigue. This bolt had a certain anticipated service life. It was located at a critical location and was under cyclic tensile loads. Eventually it could have been expected to fail. However, if the Huey had been operating beyond the normal handbook limits which the manufacturer had anticipated and for which he had designed, the progress of fatigue damage in this bolt should have been more rapid than anticipated. If there was a deep scratch or tool mark on the side of the bolt, this would have acted as a stress raiser and decreased the service life. If the metal was slightly embrittled during manufacture, its service life would have been further decreased because of the greater sensitivity to the stress raiser. And finally, if this bolt was not inspected with sufficient frequency, the progress of the fatigue crack through the bolt would not have been detected until it was discovered in the wreckage. Its service life was shortened . . . and so was the pilot's.

pearls

personal equipment
and rescue/survival lowdown

AT THE SIXTH Joint Services Safety Conference, committee discussions were held on the subject of rescue procedures and equipment. In response to an apparent need for information, the commandant of the U.S. Coast Guard assigned the author to research and prepare this article. The author, a Coast Guard aviator with both fixed and rotary wing search and rescue experience, has twice been awarded the Air Medal for helicopter rescues. He is a graduate of the Aviation Safety Officers Course at the University of Southern California and is presently serving as Coast Guard Liaison Officer at the U.S. Army Aviation Test Board. Welcome to these pages.

Pearl

Survivor Wishes to Meet Helicopter—Object: Survival

LCDR Robert C. Williams

DESPITE THE FACT that many military personnel are not directly associated with aviation, any of us may someday become the specific object of a helicopter rescue mission. The outcome of that mission may very well determine whether we live or die or in some cases, whether or not we escape capture by the enemy. The success of the mission could hinge on how well prepared we are to aid the helicopter crew in making the pickup.

Helicopters come in a wide assortment of sizes, shapes, colors, markings, and equipment. The recovery techniques and equipment used by the various services differ somewhat because of varying missions. If *you* are suddenly placed in a survival situation, it is most likely that you will not be able to "requisition" the helicopter with which you are most familiar. Simply stated, you will undoubtedly take the first "friendly" chopper that comes along. Nowhere is the possibility of a random selection greater today than in Southeast Asia where each service employs several different helicopter models.

Search and Rescue professionals from the several services have periodic meetings to determine how they can better serve us. At several recent meetings, committees reported a need for more knowledge of rescue procedures by potential rescuees. SAR people believe that we should learn more about how they can help us and how we can help ourselves. Survival schools and safety publications do their best to keep us informed, but the job is monumental and the degree of individual exposure is not uniform. To improve the odds of survival, it behooves each of us to make an individual effort to learn something of the methods and equipment currently used in helicopter rescue operations. Hopefully, this article will shed some light on this subject which could be of vital importance to any of us in the very near future.

HELICOPTER RESCUE EQUIPMENT

There are numerous rescue devices available to helicopter forces and almost any helicopter can be used as a rescue vehicle. However, the rescue equipment carried by a helicopter will vary somewhat from service to service, unit to unit, and mission to mission.

Pearl's lowdown

The items listed below are frequently used by hoist-equipped helicopters:

- Rescue Sling (Horse Collar)
- Rescue Seat (three-pronged Seat)
- Forest Penetrator
- Stokes Litter
- Rescue Basket

Helicopter hoist cables vary in length from about 100 feet to 250 feet or more. As you will see later, this could be an important factor in determining where *you* are picked up.

In some situations, a helicopter crew may be forced to postpone rescue and may drop supplies to aid you until a rescue is possible. It would be impractical to list all such items available for this purpose; however, the following is a representative list:

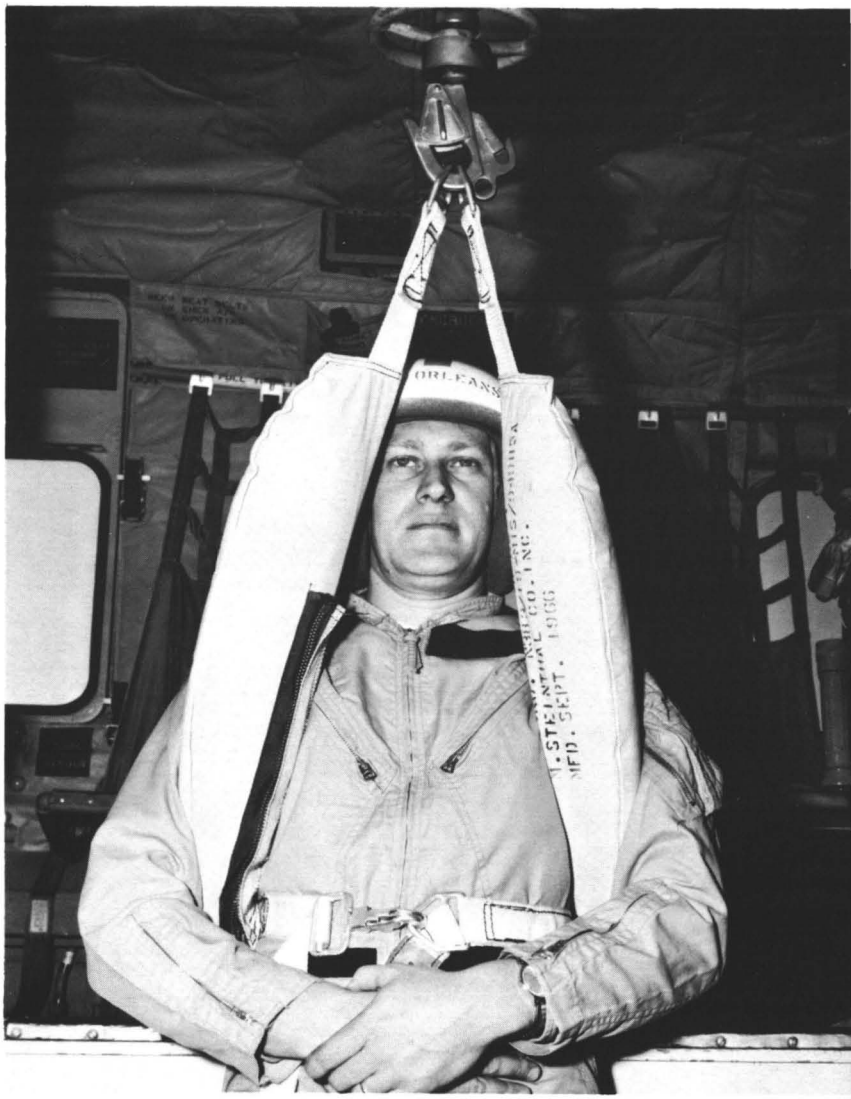
- Survival equipment (rafts, shelters, survival kits, medication)
- Signaling equipment (visual aids, electronic aids)
- Food (standard and non-standard containers)
- Water (same as above)
- Weapons

The type and amount of equipment available and the containers in which it is packed will vary according to the dictates of the local command.

HELICOPTER RESCUE PROCEDURES

Unit doctrine is paramount in delineating rescue procedures, but certain aspects of helicopter rescue procedures are universal.

Rescue sling



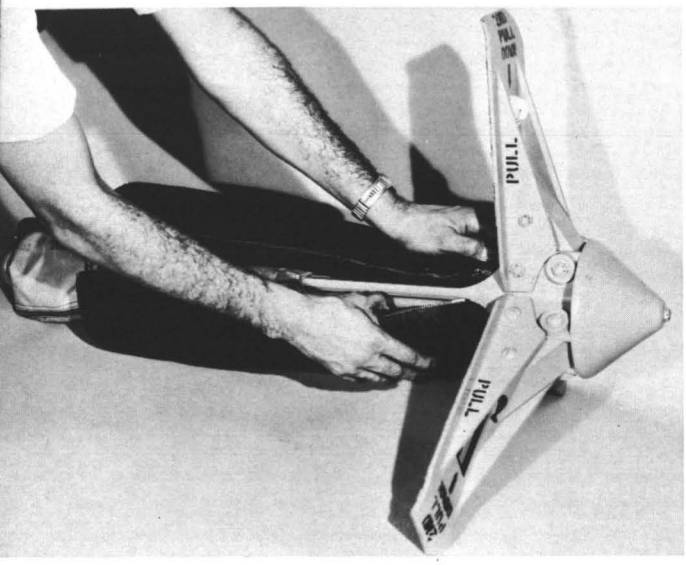
Rescue seat

A helicopter pilot will normally hover the aircraft into the wind. Though not mandatory in all cases, this procedure is usually desirable. Various techniques can be used to position the helicopter over the survivor into the wind. A circling approach, a tear drop approach, and a 90/270 approach are three such maneuvers. As a survivor, you should understand why a helicopter may fly overhead, then turn away. There is no cause for alarm; just rest easy (?) while the pilot makes his approach.

Don't be surprised if the chopper drops a smoke generator in your vicinity. This technique is often used to help determine wind direction and velocity. A word of caution — don't touch such a device, as it may be quite hot.

The altitude at which a helicopter will hover is determined by the weight of the helicopter, terrain, wind, unit doctrine, pilot preference, and the length of the hoist cable. Some helicopters do not have a hoist cable long enough to penetrate vegetation over 100 feet high. It may be necessary for you to find a new location. In such cases, your physical condition, natural hazards, distance involved, and enemy proximity will determine the feasibility of this choice. In any case, lacking radio contact with the helicopter, you should try to avoid any action which would cause the helicopter crew to lose sight of you.

In some situations, such as mountainous terrain, the chopper may hover close enough for you to climb onto a skid or into the cabin. Of course, the aircraft will land if possible. Amphibious helicopters may land on the water and taxi to your position with the crewman assisting you aboard a rescue platform.



Forest Penetrator

HOW TO ASSIST IN YOUR RECOVERY

The following is a list of things to do and things not to do when being picked up by a helicopter.

1. Don't panic! Remain calm and think. This is the key in any survival situation. Easier said than done.

2. General Twining once said, "Without some signaling device, the chance of seeing the tiny dot of a raft in the hills and valleys of the sea are about equal to the chances of finding a collar button in a plowed field, even when passing overhead." Conserve your signaling equipment; have it ready for use, and use it when it will do the most good. In dense jungle, the smoke from an MK 13 day/night distress flare (the type normally carried in life jackets) may not penetrate the foliage. In this event: (a) tie a cord or rope to an MK 13 flare, (b) throw the flare over a tree limb, (c) let the flare fall to the ground, (d) ignite the flare, and (e) hoist the flare into the tree. An MK 13 flare will assist the pilot in evaluating wind conditions. Don't forget your mirror. This piece of equipment is one of the best signaling devices you have.

3. If possible, before touching the hoist rescue device, allow it to touch the ground or water to dissipate any static electricity which may be present.

4. Get out of your parachute before being hoisted!

5. Rescue slings are known by several names and come in slightly different shapes and configurations. You may hear people refer to this device as a survivor's sling or "horse collar." In general, the rescue sling is a padded, buoyant loop which supports a rescuee across the back and under the arms while being hoisted. The loop is about 3 feet long. Some have a chest safety strap as shown in the picture. The proper way to get into the sling is as follows:

- Allow the sling to contact the surface before you touch it.
- Grab the sling at the bottom of the loop (opposite the cable hook).
- Steady the sling with the loop flat or horizontal while you put one hand UP through the loop. This step is important. If you do not put your hand and arm up through the loop from the bottom, you will find yourself in the sling backwards.
- Now put your head through the loop in the same manner — up from the bottom.
- Your other arm must obviously follow the same path. The sling will now encompass your body around your back, under your arms and be positioned such

Stokes litter (safety strap not shown)

that the cable hook is in *front* of your head or chest. If the cable hook is behind you, try again.

• Fasten chest safety strap (if provided).

• Clasp your hands together and nod your head or give the "thumbs up" signal to the hoist operator.

6. The rescue seat (three-pronged seat) resembles a small anchor with three prongs set 120° apart. The shank may have a web belt type safety strap. This is an easy device to use on land but is somewhat more difficut when in the water.

• Allow the seat to contact the surface before touching it.

• Hold the seat upright in front of you.

• Straddle one or two prongs.

• Put the safety strap (if provided) around your body as you would the rescue sling and pull it tight. The strap is often used for an incapacitated survivor. In this case another survivor or a rescue crewmember will assist in rigging the strap. (If the helicopter crew assumes that you are not incapacitated, they may lower the seat without the strap.)

• When you are securely on the seat, hang on and give a signal to indicate that you are ready to be hoisted.

• Keep the seat close to your crotch and keep both arms around the shank.

7. The *Forest Penetrator* is rapidly becoming the primary military hoist rescue device. This piece of equipment is basically a rescue seat with folding prongs and a weighted "nose." The Navy version incorporates a flotation collar around the shank. To use this equipment, proceed as follows:

• Allow the Penetrator to contact the surface before you touch it.

• Go to a kneeling position — it is awkward to hold the device and get into it from a standing position.

• Hold the Penetrator upright in front of you and pull down on the velcro tape. Remove the safety strap from the protective cover. Do not unhook the strap. Put the safety strap around your body as you would the rescue sling and pull it tight.

• Pull down two seats and snap them in place. Do not pull down third seat as it may become entangled during the ascent.

• Straddle the two seats with one seat under each leg.

• Give the "thumbs up" signal.

• Hold on with both arms around the shank. Keep the Penetrator close to your crotch and your head and shoulders close to the cable.

• When two men are being hoisted at the same time, one man gets on the Penetrator as previously

Rescue basket

described, but uses only one seat. The other man sits on two seats with his legs resting over the first man's legs. Each holds on to the other. If both are injured, the most seriously injured man should be placed on the Penetrator first.

• It is possible to hoist three men at one time (obviously, each man uses only one seat).

• Remember to put the safety strap on first. In an emergency, such as under attack, the helicopter crew can hoist the survivor by the strap alone.

8. The *Stokes Litter* is a special type of stretcher frequently employed in helicopter rescue operations. It consists of wire mesh attached to a metal frame and is used to hoist litter patients. If you are required to assist in a Stokes Litter pickup, the following procedure should be followed:

• Allow the litter to touch the surface before you touch the litter.

• Unhook the litter from the hoist cable hook. *Do not fasten the hoist cable to anything on the surface.* Helicopters don't fly well at anchor.

• Lay the suspension cables on the deck or ground alongside the litter.

• Unfasten the safety straps.

• Place the patient in the litter. If the patient is on a stretcher, remove him from the stretcher before placing him on the litter.

• Secure the safety straps.

• Place the two lifting rings (attached to the suspension cables) together over the center of the litter and snap them into the hoist cable hook.

• Do not put any equipment in the litter with the patient.

• Signal the hoist operator that the patient is ready for pickup.

• Steady the litter until it is out of reach. A steadying line may be attached to one end of the litter. It is recommended that "ground" personnel use such a line to steady the litter during ascent.

9. A *Rescue Basket* is a device made of wire mesh on a metal frame and is ideal for hoisting untrained persons for they need only sit in the basket. The rules for using the basket are simple:

• Allow the basket to contact the surface before you touch it.

• Sit in the basket. Do not stand up while being hoisted.

• When ready to be hoisted, signal the hoist operator.

• Remain seated until the basket is in the helicopter.

10. If a helicopter lowers a rope, *do not climb it!* Tie a loop in the rope and use it as you would a survivor's sling. Be careful not to make the loop too large and do not tie a slip knot. The crewman in the helicopter probably will not be able to pull you in hand-over-hand; for this reason, don't be surprised if the helicopter flies away with you still hanging in the loop. The pilot will locate a safe place to put you down and will then land so that you may enter the aircraft. This procedure will only be used in an emergency when there is no alternative.

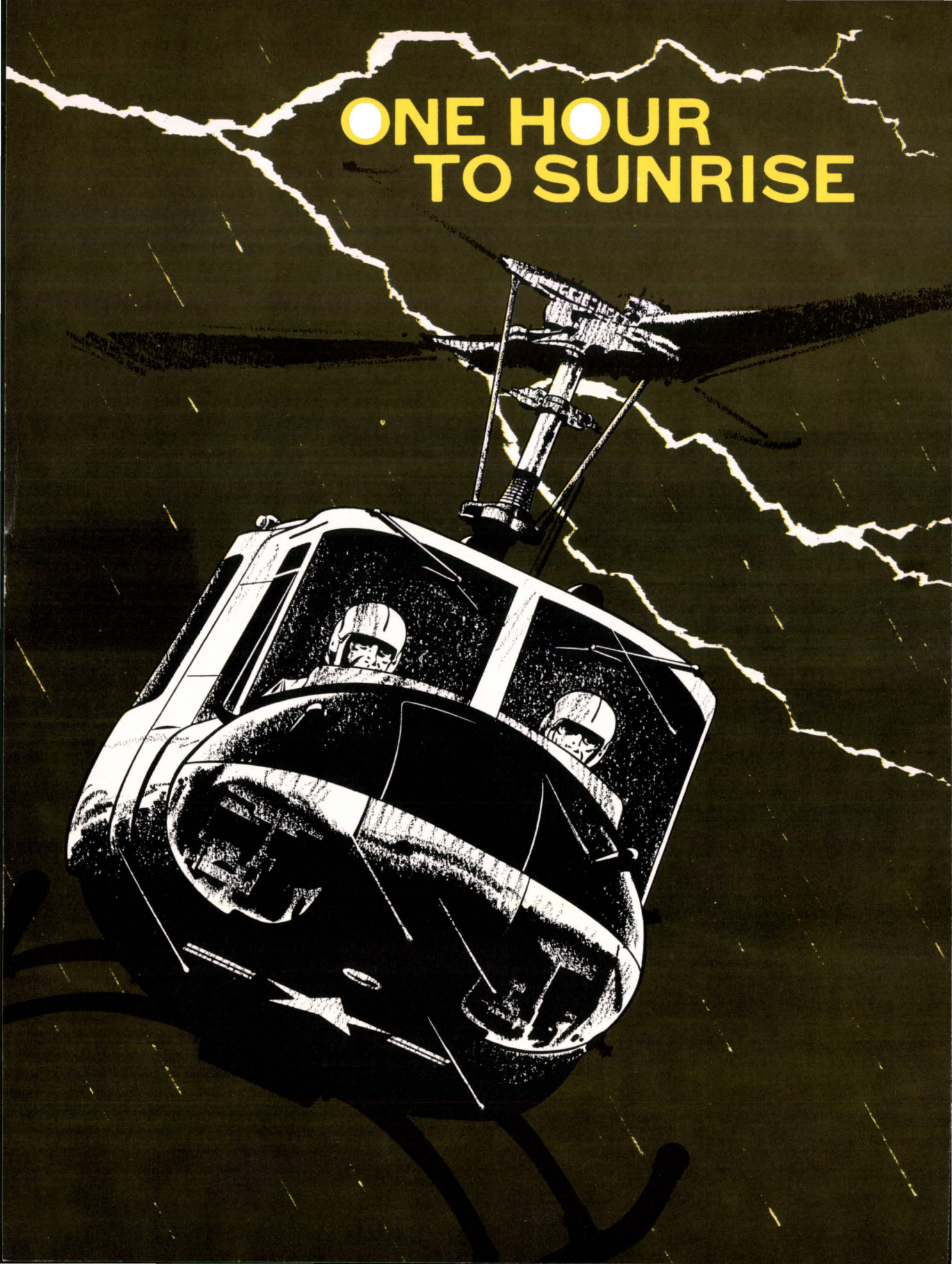
11. When being hoisted, keep your hands away from the hoist cable swivel. It will spin rapidly as tension is placed on the cable.

12. Always allow the crewman to pull you into the helicopter and take you out of the rescue device. The hoist operator may turn you so that you are facing away from the helicopter before pulling you inside. Just hang on until you are told how you can help.

Devices which may be available in the future include a rescue net designed to literally scoop the survivor out of the water (USN), a modified version of the Forest Penetrator which incorporates a plastic shield to protect the survivor from obstacles during the hoist (USAF and USN), and an improved plastic litter.

Well, there you have it. Some of this material may be "old hat," but don't leave it on the shelf. Take it out and dust it off now and then — *you* may have to wear it.

ONE HOUR TO SUNRISE



FLIGHT SURGEON: "The aircraft was being used in a medical evacuation mission from our hospital to another hospital 120 miles away to take a patient who had sustained a serious injury earlier that night in a hit-and-run accident . . . . The crew consisted of two aviators who had recently completed flight training, a crewchief, and a medical corpsman . . . ."

Dispatcher: "The UH-1H pilot came in with his completed flight plan, except for the weather and passenger manifest. He went back to check the weather and then returned, asking if I had a map of his destination area. He was not sure about the location of the hospital pad. We looked at the map and I showed him the location. He asked me about radio frequencies for the helipad and checked the map for more frequencies in the area. Someone from headquarters phoned several times, trying to speed up the flight. I kept telling him it takes time to get everything ready before takeoff. . . ."

Destination hospital medic: "At approximately 0402, I was in the emergency room when I received a call from the information desk clerk. He said that a helicopter crew was at the desk asking for coffee and he would send them to the emergency room. Two pilots and an enlisted man in flight clothing and an enlisted man in a white uniform came in and I gave them coffee. I left the emergency room area and went to the lobby where the clerk told me he had a message from the fire department for the flight crew, saying there was a correction of a figure which I believe was a radio frequency. I went back to the emergency waiting room and one of the pilots was using the telephone behind the desk and the other three crewmembers were sitting in the waiting room. As I repeated the message, the pilot in the waiting room appeared to write something on his hand with a pen. He repeated the figure I had given him and I left the area. I did not see the crew again."

At approximately 0500, the aircraft was flown to a nearby heliport for refueling.

Heliport CQ: "I received a call from the helicopter, asking for landing instructions. I gave the pilot the wind direction and speed. He landed and told me he would like to refuel. I refueled the aircraft with 156 gallons of JP-4. After refueling, I returned to the operations office where the pilot and copilot were waiting. The pilot asked me where he could get a weather briefing and file a flight plan. I directed him to the hot line. After calling, the pilot said he would not need to file a flight plan and tore up the 175 that he had started to fill out. He asked me what time it got light and I told him it was about 1 hour to sunrise. He said, 'Well, if we get lost, we get lost . . .' They went out to the aircraft and started the engine. The pilot ran the engine for about 5 minutes, then called me for takeoff. I gave him the wind speed and direction and he took off to the north. It was not raining at that time, but it started to rain a short time after they took off."

Flight service station log:

"0520—Pilot called on telephone, indicating a desire to file a VFR flight plan. He was advised that a round-robin type flight plan was already on file for his flight and that only a departure time and time en route was required. He agreed to make radio contact with this information upon departure.

"0538—Pilot called on radio and advised that he was preparing for takeoff. The current area weather and a SIGMET were given to him at this time.

"0542—The pilot called and advised he was departing at this time, estimating 1 hour and 30 minutes en route."

Weather observer: "When this flight was briefed by the forecaster, prior to initial departure, the briefing contained information about an isolated rain cell located 50-75 miles east of the destination area. The pilot was told that the tops of these clouds extended to 12,000-15,000 feet. Other briefing data included a broken ceiling at 2,000 feet in the destination area.

"In relaying the flight plan data between the departure point dispatcher and the destination traffic controller, an error occurred. Though the flight was filed as a one-way trip, it was relayed as a round-robin flight. This could have indicated to the destination flight service station that the pilot had a weather briefing for the return trip as well as the outbound flight.

"Shortly after the aircraft departed its home station, the weather in the destination area began to deteriorate rapidly. . . . During the time the aircraft was on the ground at its destination, there was considerable rainshower activity in the area, with lightning reported overhead and to the east.

ONE HOUR TO SUNRISE

"When the aircraft departed for the return flight, the flight service station advised the pilots about the airport weather report (ceiling 1,900 feet, visibility 7 miles) and a SIGMET, which described a line of thunderstorms building on an east-west line through the area . . ."

"SIGMET, issued at 0215, valid from 0415 to 0800: Thunderstorms with heavy rainshowers and surface winds from east-northeast, 15 knots, gusting to 30 knots."

Accident report: "At 0542, the pilot reported his takeoff for the return flight and gave an estimated en route time of 1:30. The aircraft flew approximately 11 nautical miles before crashing. Local residents, located 500 yards north of the crash site reported the accident by telephone at 0556. Witnesses reported that the aircraft was flying very low and in a very heavy rainshower just prior to the accident. . . ."

Witness: "I heard the helicopter go by. . . . I then heard an explosion. This all took place around 0545. I went to the phone, reported the crash, then got dressed, and went to the scene. My wife and I arrived at the crash about 0600. Approximately 5 minutes later, another man arrived and he and I proceeded to the wreck. As we approached, we saw small parts of the helicopter scattered all around the area. The main part of the wreckage was still burning. . . . It was raining very hard during this entire period."

Accident report: "Initial impact occurred at approximately 0553, with the aircraft traveling on a easterly heading. The combination of the right side impact of the aircraft and the white main rotor blade strike snapped the mast off just below the main rotor hub and broke the transmission from its mounts. The right side of the aircraft sheared on impact, rupturing the right aft fuel cell. Parts of the aircraft flooring, skin, and auxiliary external fuel tank connections were found compressed in a hole at the point of initial impact. JP-4 fuel was also found buried in the hole below the compressed wreckage . . . The remainder of the aircraft traveled another 60 feet and burned.

"The first military personnel to arrive at the scene was the crash rescue team. They arrived at approximately 0654. . . .

"An Army aviation safety officer arrived at 0930 and took charge of the accident scene. He secured the names and addresses of all persons who had information about the accident from the crash rescue team and from members of the sheriff's department who were still at the scene. He arranged for MPs to take over security of the site."

INVESTIGATION: "The following actions were taken by the board to ensure that all aspects of the crash were investigated and all pertinent information gathered.

"Technical assistance was requested from three sources.

"All known witnesses were interviewed as quickly as possible. The sheriff's office, newspapers, and radio and TV stations were contacted for photographs and leads to additional witnesses. Residents of the area were canvassed in an attempt to locate additional witnesses.

"Aerial and ground searches of the area of the general flight path were made to locate additional debris and any evidence of the aircraft striking anything prior to impact.

"A civil engineer and aircraft technical inspector assisted in identifying parts and preparing a wreckage distribution diagram. Photographs were taken and the board flight surgeon conducted interviews. . . .

"An air safety specialist, a metallurgical engineer, an airframe specialist, and a propulsion systems specialist arrived to assist the board.

"Servo components were sent to a laboratory for teardown inspection and analysis. A telephone reply from the laboratory ruled out failure of these items.

"A fuel sample was taken from the truck that refueled the aircraft before it took off for the return flight. There was no fuel, oil, or hudraulic fluid available from the wreckage.

"The wreckage was taken to a nearby base and inspection of each major component was made by the specialists and boardmembers.

"The propulsion systems specialist disassembled part of the engine, inspected it, and determined that the engine was operating under power at the time of the crash.

"An inspection of all aircraft records was made. . . .

"Evaluation of the training and experience of the aviators involved in the crash and other aviators of their unit was made to determine if supervisory factors were involved. . . ."

ANALYSIS: "There was no evidence of materiel failure, nor any maintenance deficiencies. A review of records indicated that 3-day runups were not being conducted in accordance with TM 55-1520-210-20 and aircraft total time was in error by 25 minutes. These are considered nonrelated factors. . . .

"The metallurgical engineer stated: 'The collective, cyclic, tail rotor, pitch controls, and synchronized elevator systems were examined and all major components identified. Fractures were a result of overstress, exhibiting gross plastic deformation. There was

no evidence of fatigue, wear, mechanical malfunctions, nor other deterioration.'

"The propulsion systems specialist stated: 'The fuel control servo filters were inspected and no contamination found. The top half of the compressor section, both axial and centrifugal, was removed. The compressor rotors and blades were sheared and evidence of foreign matter was found in the section. All evidence indicated the engine was under power at the time of impact.'

"The laboratory analysis of the servos indicated they were functioning properly prior to impact. Examination of the mast break and main drive shaft indicated the transmission was functioning properly. There was no evidence of airframe failure prior to impact.

"It is the consensus of the board that all components of the aircraft were functioning normally prior to the accident.

"It is apparent that the pilot and copilot, due to their lack of experience and judgment, placed themselves in an extremely dangerous situation by taking off in marginal weather during the hours of darkness and without a valid weather briefing. Their flight plan had been forwarded in error as a round-robin. Therefore, the weather briefing received prior to their 0239 departure was void at 0415 when they landed at their destination. At 0538, just prior to departure for the return flight, they were given a SIGMET which indicated a line of numerous thunderstorms 10-15 miles wide over the area. With this information, they should have elected to remain on the ground, since it would be difficult to see a thunderstorm under a 1,900-foot overcast at night in time to avoid it.

"Based on the known flight conditions and the experience level of the pilots (both had less than 250 hours total time), it is probable that they became spatially disoriented in the heavy rain and darkness.

"Of the 19 pilots assigned to the unit, five of the rotary wing qualified pilots eligible for the duty roster had more than 1,000 hours flight experience. If one of these pilots had been assigned the mission, the accident could have been avoided. In the judgment of the board members, a more experienced pilot would not have taken off at night under the marginal weather conditions radioed to the pilot and the conditions that were obvious to him from the ground before departure."

ESTABLISHED CAUSE FACTORS:

"Operations: Poor judgment in taking off into known thunderstorms and marginal weather at night without a valid weather forecast.

"Failure to cope with unfavorable conditions once airborne.

"Supervision: Assignment of two inexperienced aviators to a very demanding mission."

PROBABLE CAUSE FACTOR: "Spatial disorientation."

RECOMMENDATION: "That adequate SOPs be established at the assignment unit to provide pilots whose experience level is commensurate with the demands of the mission."

Flight surgeon: ". . . It was not revealed by any evidence, such as witness statements, why the pilots felt it was necessary to take off and return at that time, except that it is known that one of the pilots was to have met relatives later that day at another town.

". . . Inexperienced pilots should not be required to carry out such a demanding mission. In this case, it would have taken only about an hour longer to evacuate the patient by ground ambulance . . .

"Recommend appropriate personnel be further educated in the necessity and importance of guarding the wreckage site after an aircraft accident. Once it is established beyond doubt that there are no survivors, or that survivors have been adequately cared for, no one should be allowed access to the site until the accident investigation board arrives. In this accident the bodies had been removed . . .and numerous people had been wandering through the accident site prior to the board's arrival."

Note: A joint service booklet entitled WHAT TO DO AND HOW TO REPORT MILITARY AIRCRAFT ACCIDENTS has been prepared for the country's civil authorities who often arrive at the scenes of military aircraft accidents before military personnel. It is designed to be carried in the glove compartment of patrol and emergency vehicles. Army units may obtain copies by writing to: Director, USABAAR, ATTN: ELD, Fort Rucker, Alabama 36360. Others should address their requests to: U.S. Naval Aviation Safety Center, U.S. Naval Air Station, Norfolk, Virginia 23511. Coordination among military units in the same area is requested to avoid duplicate distribution.

In addition to the booklet, a film on the same subject entitled A NIGHT ON JACK RABBIT MESA has been prepared for showing to civil authorities. This film has Army designation MF 46 5290; Navy designation MV 10537; and Air Force designation SFP 1392. It is available through military film libraries.

Approving authority: "I concur with the findings and recommendations of the aircraft accident investigating board. The substantiating data contained in this report established a direct relationship between the accident and the cause factors enumerated by the

board. The facts adequately support their conclusions.

"Although not indicated in this report, an aggressive training program, directed specifically to the recently rated aviator, has been implemented at . . . subsequent to this accident. An aviation accident prevention survey team from this headquarters scrutinized the training and assignment of these aviators to assure that full utilization of the available resources provide for the continued and progressive training of aviation personnel at the unit level. Further, experienced senior aviators are now assigned as aircraft commanders on 'lifesaver' medical evacuation missions. Specific flight routes and night weather minimums have been established. The final authority in determining ability to undertake a mission rests with the aircraft commander."

Additional support for the findings and recommendation of this outstanding report and the remarks of the approving authority are found in the following article from the February 1959 issue of the AVIATION DIGEST.

SCHOOLS CAN'T DO IT ALL

Army aircraft are made to go faster, farther and higher; they are larger and more complicated; auxiliary and communication equipment crowd cockpits with an ever-greater complex of dials and knobs. Every aspect of Army aviation is in a rapid state of growth — everything, except the human element.

Shifting responsibility is one human quality that requires no psychology to understand and recognize. Any performance other than perfect always seems better fitted to other shoulders than our own. Army aircraft accident investigation boards are no exception. Responsibility for cause factors in the field of training is frequently shifted back to the U.S. Army Aviation School by such comments as:

"The school should stress crosswind landing technique."

"The school should stress pinnacle operations for cargo helicopter qualification."

"More time should be made available for instrument training at the school."

"Formation flying should be taught at the school."

"More night cross-country training should be given by the school."

Where does school training end and unit training begin? What should the newly graduated aviator know when he reports to his first assignment? Authorities in all fields of education have long stressed a tenet that should answer these questions. These learned men say:

"No school can train its students to be highly proficient in any particular skill. Students would have to remain in training too long. Schools must provide instruction in the fundamentals of the skill and sufficient practice to provide a sound basis on which individual experience can build greater proficiency."

A commanding general, in reviewing an aircraft accident report wherein the board had recommended additional schooling as a corrective action, commented quite appropriately:

"Slipshod performance of duty will not be remedied by schooling. Schools only teach how; they do not impart responsibility. This latter is obtained only by an effective chain of command that permits no dereliction. The pilot alone is not responsible."

The newly graduated aviator should have the basic knowledge and skill to support a growing proficiency. Guidance and opportunity to build experience must be provided by the unit. This tenet implies no shift of responsibility from the school for supplying basic knowledge and skill. The U.S. Army Aviation School recognizes the need for improvement in all aviation courses. The program of instruction is under constant evaluation and alteration to fit the growing needs of Army aviation. Suggestions from using agencies are welcomed and given careful consideration.

Accident cause factors are of preventive value only if they accurately pinpoint areas in need of change. Shifting responsibility, without thorough analysis, will not isolate these areas. Some questions that will help to determine where training deficiencies originate are:

Are unit instructor pilots qualified to instruct, or is it a convenient way for two pilots to log time?

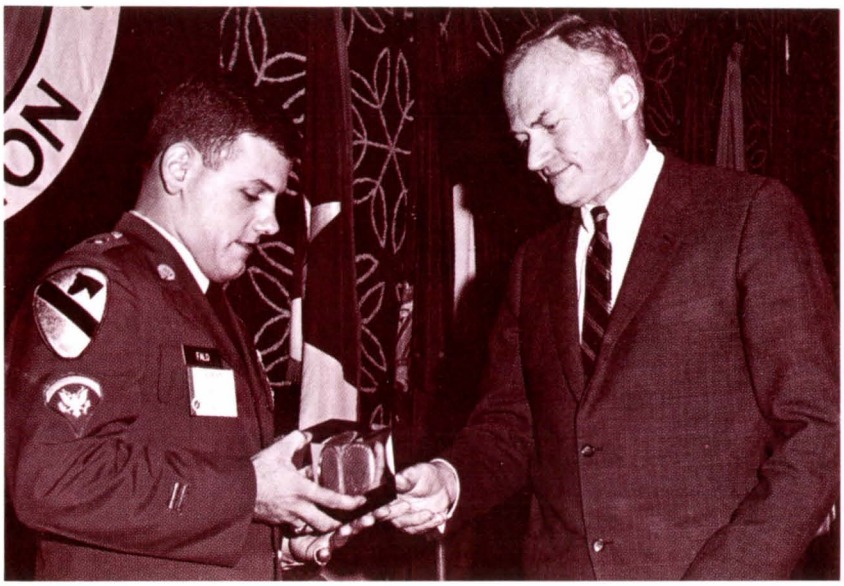
Is the training schedule carefully planned and followed?

Are unit weak points known? Is practice concentrated in those areas?

Are new aviators given priority for aircraft assignment?

When these questions are satisfactorily answered, there remains one other important truth that must be recognized by all: The newly graduated aviator is not ready for the ultimate. He is not a professional. He cannot assume a mission that requires maturity of judgment and top-level skill. This capability comes with careful preparation under the strict guidance of older, more experienced aviators. It is not enough that a soldier is given an airplane; he must also be taught to use it. The school has given him a sound basis for further training which must inevitably come from experience in the unit. If his experience is not broad enough to cope with the problems of the mission, an accident results. It is as simple as that. Proficiency training must come from the unit.

AAAA Awards 1967-1968



SP-5 Dennis L. Falo, chosen by the Army Aviation Association of America (AAAA) as the "Aviation Soldier of the Year" for 1966-1967, is presented the Stanley Hiller award by Secretary of the Army Stanley R. Resor

PROPER RECOGNITION of those individuals and units whose tireless efforts give that extra emphasis to our expanding program is most important.

As one means of giving proper recognition to them a broad spectrum of awards are given, taking the form of trophies, plaques, medals, and certificates. Among those are the following which are presented annually at the AAAA National Convention:

AA OF YEAR AWARD. Sponsored by the Army Aviation Association and presented to an Army aviator who has made an outstanding individual achievement in Army aviation during the previous April 1-March 31 period.

AA SOLDIER OF THE YEAR AWARD. Sponsored by Stanley Hiller, Jr., and presented to the enlisted man serving in an Army aviation assignment who has made an oustanding individual contribution to Army aviation during the previous April 1-March 31 period.

OUTSTANDING UNIT AWARD. Sponsored by the Hughes Tool Company — Aircraft Division and presented to the aviation unit that has made an outstanding contribution to or innovation in the employment of Army aviation in furtherance of the Army mission, over and above the normal mission assigned to the unit.

McCLELLAN AWARD. Sponsored by friends of Senator John L. McClellan in memory of his son, James H. McClellan, a former Army aviator who was killed in a civilian aviation accident in 1958. This is presented to the person who has made an outstanding individual contribution to Army aviation safety during the previous April 1-March 31 period.

Nominations for these awards may be made by either units or individuals (military or civilian) who desire to see a deserving individual or unit recognized.

Documentation to support nominations should present a brief outline of substantiating facts and include:

For Individual Awards: Name, rank, unit, and duty assignment, address and photograph.

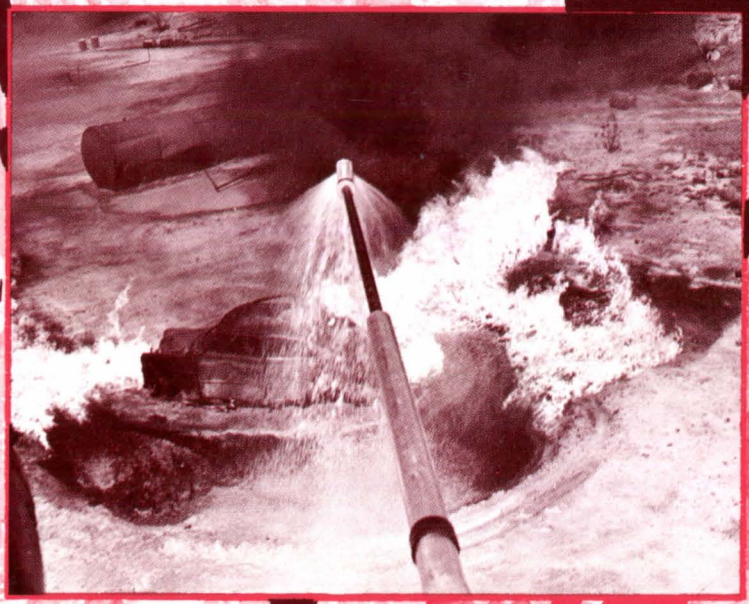
For Unit Awards: Unit name, present assignment or official address and name of commanding officer or chief.

(Documents should be typed but not tabbed since they will be photocopied and limited to 1,500 words or 3 pages, whichever is greater.)

The wide variety of oustanding contributions made to our program by many individuals and units throughout the year will undoubtedly make your choice difficult, but *now* is the time to consider their relative merits and start sending in your nominations. **Nominations must be in by 1 August 1968.**

Remember, no matter how outstanding or deserving the individual or unit, they won't receive an award and recognition without a nomination!

Send nominations to: Army Aviation Association of America, ATTN: Awards Committee, 1 Crestwood Road, Westport, Conn. 06880.



A HELIBORNE FIRE suppression system designed to allow quick recovery of personnel trapped in crashed and burning aircraft is being considered for use by the Army.

The system can be attached to a UH-1B and consists of two 25-gallon tanks containing a special "light water" concentrate that is mixed with plain water, a telescoping boom for discharging the resulting foam, emergency extraction equipment, and evacuation provisions for three litter and two ambulatory patients.

At the crash site, the helicopter hovers at the edge of the fire while the rescue team rappels to the ground. At the same time the pilot applies the foam, which is carried downward and forward by the rotor downwash, opening a path through the flames as shown in the above photograph. The crash rescue team is then able to follow the path and pull the occupants of the downed aircraft to safety.

The designers hope the system in its final form will be simple enough that it can be installed at company level, making it a field operational piece of equipment.

The heliborne fire suppression system has an advantage over fire-fighting trucks in that it can be used over a wide area, including remote sites inaccessible to trucks.