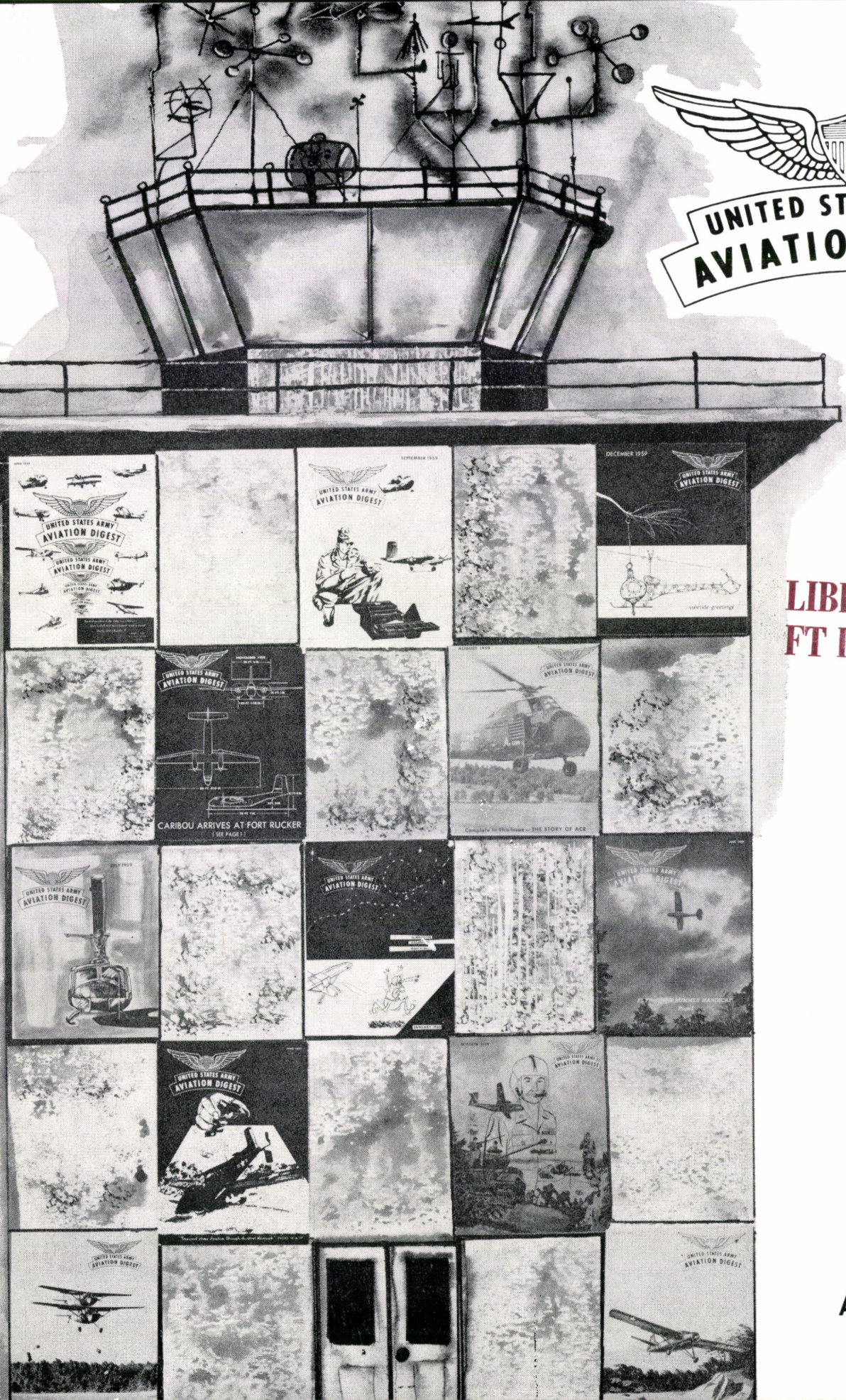


UNITED STATES ARMY AVIATION DIGEST

LIBRARY, USAARL
FT RUCKER, ALA

APRIL 1960

United States Army

AVIATION DIGEST

EDITORIAL STAFF
CAPT JOSEPH H. POOLE
FRED M. MONTGOMERY
RICHARD K. TIERNEY
DIANA G. WILLIAMS

APRIL 1960
VOLUME 6
NUMBER 4

ARTICLES

ASOC 1
Col Delk M. Oden, Armor

MAINTENANCE APPRECIATION 3
Capt James E. Miller, Inf

WHAT'S A MAC CHART? 6
Capt William R. Swift, Arty

WHY TANDEM? 10
CWO Ben G. Thomas, TC

HE LEARNED ABOUT FLYING FROM THIS! 13
Lt Ted Neu, Armor

SURVIVAL ON MOVING ICE 17

WATCH YOUR MP 21
Lt Ivan D. Butgereit, Armor

LESSON IN SILK 25
M/Sgt Charles E. Buchanan

RUSH HOUR 28

SMARTY FEVER'S LETTERS FROM EDDIE 30
Lt William L. Patrick

ISLAND HOPPING . . . . . Inside Back Cover
Capt Theo C. Watkins, TC

DEPARTMENTS

TWX 8

PUZZLER 29

CRASH SENSE 32

U. S. ARMY AVIATION SCHOOL

Maj Gen Ernest F. Easterbrook
Commandant

Col Delk M. Oden
Assistant Commandant

SCHOOL STAFF

Col Robert H. Schulz
Director of Instruction

Lt Col Jack Blohm
CO, USAAVNS Regiment

Lt Col John W. Oswalt
Combat Development Office

Maj Mark F. Fowser
Acting Secretary

DEPARTMENTS

Lt Col Ritchie Garrison
Tactics

Lt Col James B. Gregorie, Jr.
Advanced Fixed Wing

Lt Col Harry J. Kern
Maintenance

Lt Col Thomas J. Sabiston
Publications and Non-Resident Instruction

Lt Col G. Wilfred Jaubert
Primary Fixed Wing

Maj Alvin F. Burch
Rotary Wing

The U. S. ARMY AVIATION DIGEST is an official publication of the Department of the Army published monthly under the supervision of the Commandant, U. S. Army Aviation School.

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.

Manuscripts, photographs, and other illustrations pertaining to the above subjects of interest to personnel concerned with Army Aviation are invited. Direct communication is authorized to: Editor-in-Chief. U. S. ARMY AVIATION DIGEST, U. S. Army Aviation School. Fort Rucker, Alabama.

Unless otherwise indicated, material in the U. S. ARMY AVIATION DIGEST may be reprinted provided credit is given to the U. S. ARMY AVIATION DIGEST and to the author.

The printing of this publication has been approved by the Director of the Bureau of the Budget, 22 December 1958.

Views expressed in this magazine are not necessarily those of the Department of the Army or of the U. S. Army Aviation School. Unless specified otherwise. all photographs are U. S. Army.

Distribution:

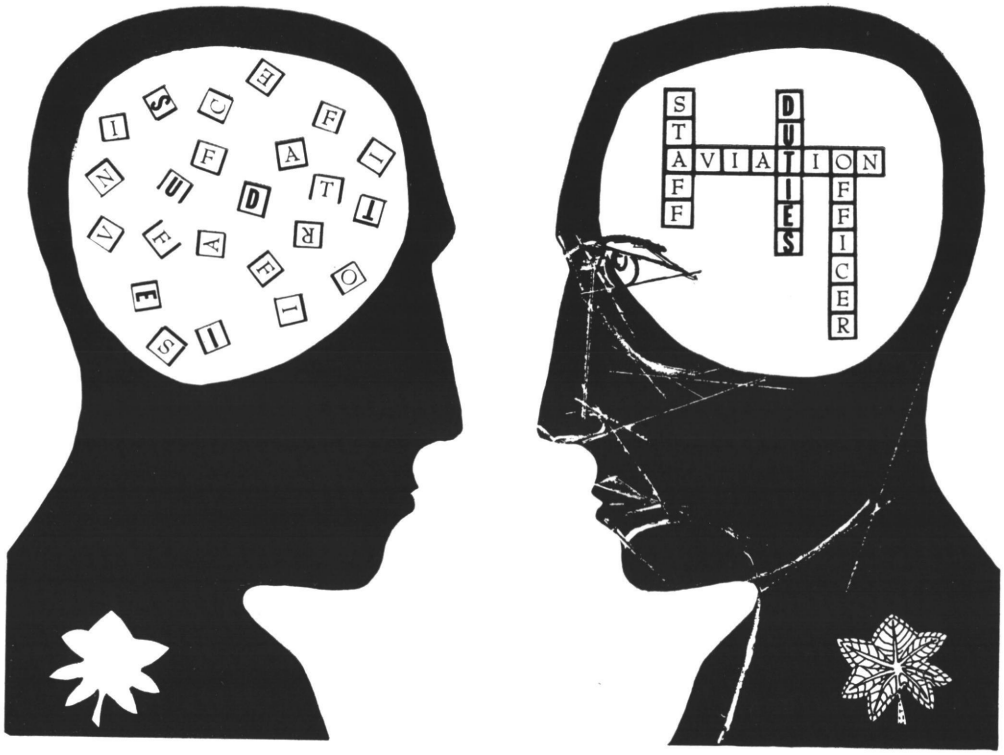
To be distributed in accordance with requirements stated in DA Form 12.

A

S

O

C



Excellent Opportunity for Army Aviators to Further Their Military Career

Colonel Delk M. Oden, Armor

IF YOUR NEXT assignment were one of the command or staff positions in Army Aviation, would you be confident of your ability to fulfill the duties of the job? Do you possess the overall and detailed knowledge to qualify as a technical expert on Army Aviation? Let's look at the duties of a field grade Army Aviator who is assigned as the Division Aviation Staff Officer.

The DAO is charged with all special staff responsibilities pertaining to Army Aviation within the command. In the name of the commander, he may exercise operational control of all organic aviation units which have not been assigned or attached to subordinate units within the command.

The aviation staff officer's duties are similar at division, corps, and army command levels, with the difference arising from his increased scope of supervision at higher levels. These are a few of his more important duties: advise the commander and staff on technical aspects concerning capabilities, limitations, and operational characteristics of Army aircraft; establishment and improvement of airfields; advising the commander and staff on doctrine, tactics, and techniques; monitoring the employment of aviation within the command, and integrating the aviation effort for more effective utilization; and supervising aircraft accident investigation and reports.

He is further responsible for a continuous estimate of the situation and formulation of plans for the employment of assigned aircraft. These plans become the basis for his recommendations to the tactical commander. He also effects coordination with other staff elements within the command.

These duties and responsibilities are many and varied and require extensive administration and supervision. To assure himself and the commander that the Division Aviation Company is capable of meeting these tactical requirements, he administers strict control of the individual and unit training programs. He strives to develop the individual officer's skill to assure maximum utilization. His knowledge that the demands of military flying and various inflight emergencies require judgment and skill to prevent disastrous results is tested daily. He also knows that these qualities require time and effort to develop

---

Colonel Oden is Assistant Commandant of the U. S. Army Aviation School, Fort Rucker, Ala. He is dual rated and instrument qualified.

and maintain. To this end, he molds the training programs to meet the capabilities and experience level of his unit. He must also ensure that the aviators within his command comply with their annual requirements—a large but worthwhile headache.

A constant check and recheck of individual abilities are necessary to eliminate weak links and strengthen the unit's overall capability. This program will be repetitious in nature and cover all types of maneuvers. Location of the unit will play a big part in this phase, for terrain and climate are major determining factors of aircraft performance or individual abilities to accomplish the mission.

To conscientiously perform the duties of the aviation staff officer requires skill, knowledge, patience, and perseverance — descriptive qualities of all good Army officers.

The responsibilities of being an Army Aviator are constantly increasing as the program expands and the overall doctrine of the Army flexes to cope with the latest thought on future warfare. ASOC is not limited to senior officers. Any Army Aviator who has completed his branch school is eligible to apply for admission.

An excellent opportunity is afforded the conscientious Army Aviator to stay abreast of current and projected doctrine, organization and principles of employment by attendance at this course, conducted at the U. S. Army Aviator Center.

ASOC is an 8-week course designed to give the Army Aviator necessary training for filling aviation command and staff positions. The course of instruction covers all phases of Army Aviation, including: the Army Aviation Program, organizations, staff organization and functions, materiel, tactical employment, and research and development. Throughout the course, an active guest speaker program is conducted. Addresses are made by representatives from the Department of the Army, USCONARC, ARADCOM, etc. These presentations by prominent speakers add interest and enhance the course of instruction. Graduates of the Aviation Staff Officers Course are awarded MOS 2518 which qualifies them to fill the many aviation staff positions in the Army.

Today, there are approximately 1,600 Army aircraft in the Type Field Army, and over 5,700 in the actual Army inventory. Army-wide, there are over 6,000 authorized commissioned and warrant officer Army Aviators. More than 18,000 other personnel are assigned to the program. Within the CONARC Type Field Army, there are 352 Army Aviation command and staff positions, either in Army Aviation units, or in the aviation special staff sections of divisions, corps, and Army headquarters.

In addition, aviation staff positions are found in MAAG organizations, National Guard advisory groups, the Federal Aviation Agency, industry, Research and Development, test agencies, CONARC and Department of the Army staffs, as well as in the various service schools. These totals are comparable to or surpass the total number of command and staff positions found in some of the combat arms or service branches.

No one questions the need for courses to provide special training so the officer is thoroughly grounded in the duties and responsibilities peculiar to his particular branch. Certainly a requirement exists to provide advanced training for the Army Aviator in his rapidly expanding and complex field. The art of employing vast numbers of aircraft to support a tactical operation and of solving the intricate and perplexing problems incident to airspace utilization cannot be obtained through any of the branch courses or at the Command and General Staff College. The Aviation Staff Officers Course fills this void.

In the field, units have been formed and doctrine has been developed, sometimes without the benefit of adequate experience. There has been considerable "crystal ball gazing," and much thought has been put into these units and organizations. More is needed. There is a definite requirement for the officer with imagination and foresight in the reorganization and establishment of doctrine for Army Aviation.

Commanders must realize the magnitude which Army Aviation has achieved and the importance of having well trained and well qualified aviation staff personnel. If we are to keep pace with the tremendous expansion now underway, we must provide fully qualified aviation staff officers to meet the growing need.

The Aviation Staff Officers Course presents an excellent opportunity for the Army Aviator to further his military career. Through it, Army Aviators and Commanders are better prepared to meet the challenge of the Army's new mobility.

Quotas are available. Apply now.

Maintenance Appreciation

Captain James E. Miller, Inf

MOST OF US are familiar with high school and college courses in Music Appreciation and Art Appreciation in which the students study the great masterpieces in each field as a part of cultural growth. I recommend a new course for Army Aviators: Maintenance Appreciation. I ask myself these questions: "Do we aviators appreciate good aircraft maintenance? And do we know maintenance and our aircraft the way we should?"

Too many Army Aviators have no real appreciation of good maintenance and don't know all they should about the aircraft they fly. Take the student going through flight school. What appreciation does he gain for aircraft maintenance? During the course of instruction, he calls for a mechanic if something is wrong with the aircraft, and usually ends up taking a "spare." He seldom sees equipment repaired. Contract maintenance and a large fleet of aircraft see to that.

Our young student aviator is exposed to numerous maintenance courses; but he usually sits there in a dream with a sense of security (often false), believing that after graduation he will be sent to a large aviation unit, at least company size. And these units always have an overflow of trained mechanics and supervisory personnel!

But put this young aviator in my fledgling shoes. When I graduated from flight school, I received orders to a unit in Germany. On arrival, I found a battalion aviation section, all alone on a small airfield, with an authorization for two L-19A's, two Army Aviators (lieutenants), and three mechanics. Add to this, a top priority mission that required aircraft to be ready to go on a moment's notice. My big shock came when the aviation officer greeted me with, "You're going to be the maintenance officer!"

Things weren't too bad for a while, for I had the guidance of more experienced aviators and the work of some well-trained and seasoned mechanics. But less than two years later, I was the only aviator in the battalion and I had three mechanics — one had been school trained on reconnaissance helicopters and the other two came with a 670.0 MOS.

It wasn't long until I realized my job wasn't limited to reading magazines, playing cribbage, and flying operational flights. The magazines gave way to TMs; instead of shuffling cards, I began leafing through forms of all sorts; and functional test flights appeared on my schedule. I found myself spending more and more time out in the hangar with the mechanics, helping them solve problems and supervising their work. Due to their inexperience, they made a lot of honest mistakes; someone had to catch them before something serious happened.

Captain Miller is chief of the 672 Branch of the Department of Maintenance, USAAVNS, Fort Rucker. He is dual rated and instrument qualified with approximately 1,500 flight hours.

This experience opened my eyes to maintenance and the necessity for an aviator to know just what is going on. But even this has not kept me from occasionally lapsing into an apathetic attitude and thinking: "Why know all this business about how something works? If it runs, okay; if not, get a replacement." And this, I'm afraid, is all too often the attitude among Army Aviators. We are content to sit back and let our mechanics do the work and the NCOs do the supervising.

It is this matter of supervision with which all aviators should be vitally concerned. Army Aviation has some fine NCOs who have been with the game for a long time and really know their way around the Army's aircraft. However, at the present time, a number of NCOs are just getting started in aviation. When these people report to field units, they will naturally be used in supervisory slots. They might very well end up as the line chief of some aviation section where there is no other NCO to help them. It must be realized that these men have no more experience, in some cases less, than some of the unit mechanics. Therefore, it is up to the officers to give them a hand and get them started. They are going to make mistakes; and these errors must be corrected.

Is your appreciation of maintenance limited to this idea: "Why all the fuss about maintenance? If it runs, okay. If not, get a replacement"? Or are you familiar with the capabilities of the mechanics in the unit and the maintenance requirements of the aircraft assigned you? Be professional in your attitude toward safe maintenance practices.

One answer to this problem of inexperience is a good unit training program for aviators, supervisors, and mechanics alike. Sure they've all been to school and have received some of the finest instruction possible, but there are always some loose ends to tie up and local procedures to learn. This training doesn't have to be run on an elaborate scale; the size of the unit will determine the degree of formality. With a small aviation section, training might be in the form of a "bull session," with aircraft maintenance the subject instead of girls.

The material for unit training is abundant. One of the biggest problems of an aviation unit is keeping up with the 781 series forms. Everyone seems to have a different interpretation of the basic technical bulletin; hence hundreds of different local procedures and SOPs. This is an excellent place to start your unit training. Let the "Old Timers" pass along their knowledge of local ground rules and just what's to be done on the forms. Get the new men off to a good start and you'll be able to keep form consistency. Few people know everything about forms and records; so take the opportunity offered by a unit training program to brush up and set up a uniform program.

Technical manuals provide another source for training. Unless a person works around TMs day in and day out, he forgets the general contents of the manuals. An occasional period of training is necessary to keep

people up to date and to refresh memories. Also, don't put your new men behind the "eight ball" at the start by keeping the TM files a big secret. Have someone lead the new arrival around and show him what you've got and where things are kept. Let him spend some time browsing through the books so that he'll have some idea of their makeup. It may save a lot of time later on.

Many opportunities and situations may be found to give the mechanics and the aviators additional training. Occasions may arise when something "different" will come up in the way of aircraft maintenance within your unit. A simple organizational modification might be required or a field maintenance team might arrive to change an engine or do some other higher echelon work. These opportunities should be used to give the less experienced personnel that little bit of "extra" training that may help them **and** you out at some later time.

I am certainly not advocating that every Army Aviator be a qualified, school trained maintenance officer. The normal flying proficiency requirements and the additional duties heaped upon the officers preclude this. However, I am suggesting that all of us should become more familiar with the maintenance requirements of the aircraft we fly, and, more important, with the capabilities of our mechanics. An aviator should never have to ask a mechanic whether or not a certain condition is safe. He should know the necessary tolerances and limitations. This is a mark of a professional Army Aviator.

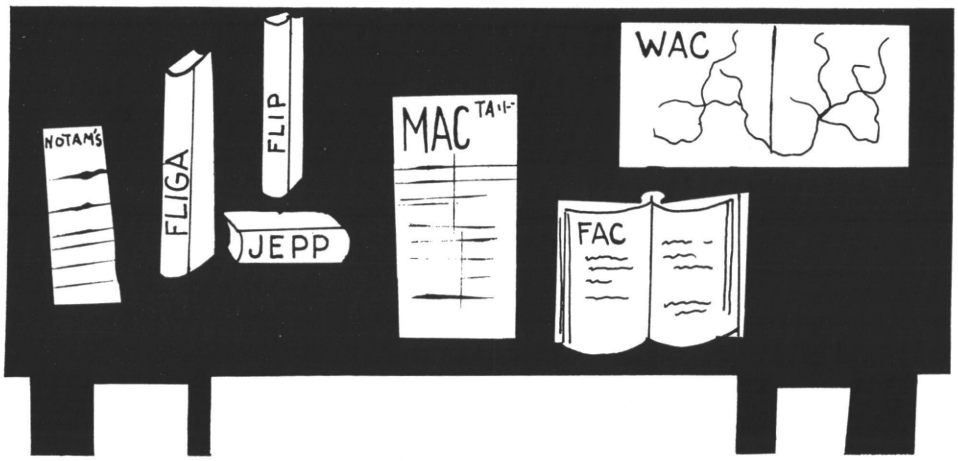
Good aircraft maintenance is the key to successful operations; and the key to good maintenance is adequate supervision of our personnel. To supervise properly, we must gain an appreciation of good aircraft maintenance.

TWO ACCIDENT-FREE years of operation have just been completed by the Aviation Branch, U. S. Army Chemical Corps School, Fort McClellan, Ala. This record is a tribute to the attention of personnel to safety regulations. No ground accidents involving men or aircraft have occurred since creation of the Aviation Branch at Reilly Army Air Field in February 1958.

Simple safety practices and devices are the answer. For example, color contrast is used to assist flight personnel in identifying members of ground crews. As the landing strip is surrounded by grass and wooded areas, maintenance personnel wear white coveralls instead of Army fatigues, which are designed to blend in with open terrain. The sharp contrast is more readily visible from the air and has contributed to Reilly Field's outstanding safety record.

A member of the ground crew, contrasted in white coveralls directs a pilot in the taxiing of the fixed wing aircraft on the landing strip. As personnel leave operations for work assignments, they are reminded (by the message in the insert) to **take time** to be safe.

WHAT'S A MAC CHART?



Captain William R. Swift, Arty

A MAINTENANCE ALLOCATION CHART is a guideline that determines the echelon to work on your aircraft and/or certain components. This little chart is one of the most important parts of your technical manual file. Faithful compliance with the concept behind the MAC chart will make for more efficient organizational maintenance. Your tech supply will be a smoother running branch of the organization, because it will be handling only those repair parts essential to the category of maintenance you are engaged in, organizational.

Pages 1-2 of your MAC chart give a quick concise rundown of the why, where, when, who, and how. Let's go a little further and try to explain more in detail what these two pages mean.

First, the MAC as prescribed in ARs 700-18 and 750-6 is a technical manual which applies the established maintenance concept to each aircraft. There's one for every type of Army aircraft. The MAC assigns maintenance functions and repair operations to be performed by each echelon of maintenance. It is the basis for the establishment of tool sets, the selection of parts, special tools and equipment, and the information in supply catalogs.

These charts are developed by the Transportation Materiel Command and submitted to a committee consisting of representatives of TMC, USCONARC, the Army Maintenance Board, the Army Aviation Board, the Transportation School, and the Transportation Corps Combat Development Group, with the TMC representative as chairman. Committee meetings are requested as necessary by TMC. The policies governing the implementation of the maintenance allocation charts by activities and the decision as to whether a maintenance function is to be assigned to organizational maintenance must be concurred in by TMC, USCONARC, and the Army Maintenance Board. Any disagreements must be resolved by the Deputy Chief of Staff for Logistics.

Once it has been decreed that

Captain Swift is Chief, Operations Branch, Department of Maintenance, USAAVNS, Fort Rucker, Ala. He is dual qualified and has logged approximately 4,000 hours flight time.

organizational maintenance will **not** accomplish the function, the decision as to which echelon **will** accomplish it is made by the TMC representative.

Second, the MAC standardizes the echelon of maintenance at which a function will be performed. For example, the replacement of engines and cylinder and piston assemblies has been assigned to third echelon maintenance for all aircraft. **Deviations** from this standard are based on the particular aircraft and the functions involved. Paragraph 3a of each MAC lists the standards for determining the echelons of maintenance for each function. Factors to be considered in determining echelons are these.

Distribution of Aircraft: The capability of the maintenance facility at a Nike site which has, say, one Shawnee is not the same as the capability of a Shawnee company with some 21 aircraft assigned. The assignment of aircraft within commands must also be considered. For example, a fleet of 100 aircraft might generate a requirement to overhaul 40 struts. If all 100 aircraft are stationed within one command, it might be economical to overhaul the struts; however, if the 100 aircraft are distributed around the world, it would probably be far more feasible and economical to destroy those that could not be repaired at fourth echelon.

Frequency of Occurrence of a Maintenance Function: A maintenance function may be required so infrequently at a lower echelon that it justifies evacuating the aircraft to a higher echelon or requesting personnel from the higher echelon to do the work. If the maintenance function is a frequent one, the lower echelon may be authorized to do the work.

Complexity of the Maintenance Function: If a specialist is required, there must be sufficient work to justify his assignment — in other words, enough to keep him busy. Specialists are preferred because they can do the job quicker and more efficiently, and they can develop shortcuts and special techniques to assist them. Specialists are naturally the best "trouble shooters" when and where needed.

Range, Type, and Size of Parts Required: Even though the HU-1A Iroquois engine can be changed in 30 minutes with common hand tools, it is assigned to third echelon as their responsibility to alleviate the problem of getting the new engine to the unit and the old one back. Too, engines generally fail gradually and replacement can be scheduled.

Equipment Required: Carburetor repair requiring a flow bench is a fifth echelon function because most fourth echelon activities do not have a sufficient amount of this type of work to justify the cost of a flow bench. However, fourth echelon can have one if needed.

Maintenance Manhours Required: A rule of thumb says requirements are one day for organizational and three days for third echelon to complete a prescribed function.

Administrative Costs Incurred: An example is the repair or overhaul of parts removed for cause. The overhaul cost of an item is carefully compared with the cost of a new item. Sometimes it is more economical to discard an old item and use a new one. An item costing less than $100.00 must justify overhaul by a large volume or a low unit overhaul price.

Mobility Requirements: Maintenance functions assigned an echelon must **not,** because of equipment or manhours required, interfere with the desired mobility.

MOS Capability Available: Specialists assigned in certain areas where the volume of work is justifiably high might overrule any requirement to place the maintenance at a lower level.

Now, with this small bit of explanation, take another long look at your maintenance allocation chart; believe in it; give it an honest trial. You will probably find that your maintenance problems are fewer and that you have more aircraft available for flight. This is brought about because there is more time for thorough organizational maintenance; little troubles can be corrected before they become too big to handle.

L-26C RAN OFF RUNWAY DURING LOW VISIBILITY TAKEOFF IN HEAVY SNOW. NOSE GEAR WASHED OUT AND FORWARD FUSELAGE TWISTED. PILOT SUFFERED STRAINED BACK AND CONTUSIONS. COPILOT RECEIVED BUMP ON KNEE.

H-23D STUDENT PILOT HEARD LOUD CLANKING NOISE AT APPROXIMATELY 2,400 FEET, AIRCRAFT SWERVED TO RIGHT. STUDENT PILOT ENTERED AUTOROTATION AND AIRCRAFT TOUCHED DOWN WITH NO DAMAGE. MAIN TRANSMISSION CASE CRACKED AND OIL LOST. SYSTEM FROZE AND ONE-INCH DRIVE SHAFT SHEARED, CAUSING LOSS OF ANTITORQUE CONTROL.

HU-1A TAIL ROTOR DENTED TWO INCHES FROM TIP. DAMAGE FOUND DURING DAILY INSPECTION. CAUSE UNDETERMINED.

HU-1A PILOT SMELLED SOMETHING BURNING DURING CLIMBING TURN AT 200 FEET. HE REACHED AND LOOKED UP TO LEFT TO TURN OFF HEATER. AIRCRAFT ASSUMED NOSEDOWN ATTITUDE AND PILOT WAS UNABLE TO RECOVER BEFORE IMPACT. PILOT SUFFERED BROKEN LEG AND HAND, LACERATIONS OF SCALP. AIRCRAFT DESTROYED.

H-34 ENGINE FAILED AND PILOT COMPLETED FORCED LANDING WITH NO DAMAGE. FUEL STARVATION CAUSED ENGINE FAILURE. APPROXIMATELY 400 LBS. FUEL REMAINING IN FORWARD TANK. SUSPECT ICE ACCRETION IN FUEL SYSTEM. TEMPERATURE 11°F.

H-13G ENGINE FAILED, SURGED DURING AUTOROTATION, FAILED AGAIN DURING POWER APPROACH ATTEMPT, SURGED RAPIDLY AT GROUND CONTACT. AIRCRAFT SPUN TO RIGHT, TURNED OVER. PILOT SUFFERED SLIGHT CUT ON RIGHT HAND. AIRCRAFT DESTROYED. CAUSE OF ENGINE FAILURE UNDETERMINED PENDING TEARDOWN INSPECTION.

H-19C ENGINE RPM DROPPED DURING CLIMB AFTER TAKEOFF. PILOT BEGAN AUTOROTATION, HELD AIRSPEED AT 50 K, FLARED AT 35-50 FEET TO SLOW AIRSPEED AND BUILD ROTOR RPM. ROTOR RPM FAILED TO BUILD AND TOUCHDOWN WAS MADE WITH SLIGHT FORWARD SPEED. NOSE GEAR DUG INTO SOFT GROUND AND MAIN ROTOR BLADE FLEXED DOWN, SEVERING TAIL BOOM. CAUSE OF ENGINE FAILURE UNDETERMINED PENDING ANALYSIS.

H-13E SKIDS WERE FROZEN TO GROUND. WHEN SKIDS BROKE FREE, AIRCRAFT WENT HIGH INTO AIR AND PILOT BOTTOMED PITCH. AIRCRAFT STRUCK GROUND AND BENT SKID. NO INJURIES.

L-23D PILOT WAS INSTRUCTED TO USE AREA ADJACENT TAXI STRIP TO REACH RUNWAY BECAUSE OF SLIPPERY SURFACE. NOSE GEAR COLLAPSED IN SOD RUT. PROPELLERS STRUCK GROUND, CAUSED SUDDEN ENGINE STOPPAGE TO BOTH ENGINES.

L-20A STRUCK TELEPHONE WIRES DURING CLIMB FROM SIMULATED FORCED LANDING. DAMAGE TO PROPELLER, LANDING GEAR, AND SKIN.

H-13E STRUCK HIGH TENSION WIRES DURING TAKEOFF. MAJOR DAMAGE. NO INJURIES. WEATHER NOT A FACTOR.

TL-19D ENGINE FAILURE OCCURRED DURING IFR FLIGHT. PILOT BAILED OUT, LANDED SAFELY. LOSS OF OIL CAUSED ENGINE FAILURE. OIL FILLER CAP NOT SECURED.

H-13G SETTLED INTO SMALL TREES DURING TAKEOFF FROM CONFINED TACTICAL HELI-

pts from february and march

PAD. PILOT EXPERIENCED LOSS OF POWER AND COULD NOT MAINTAIN RPM. MAJOR DAMAGE. NO INJURIES. WEATHER NOT A FACTOR. NO KNOWN MATERIEL FAILURE.

H-13E PILOT HEARD LOUD NOISE IN FLIGHT, EXPERIENCED SEVERE VIBRATION. AIRCRAFT WAS AUTOROTATED TO LANDING, SLID 20 FEET AND ROLLED TO RIGHT, CAUSING MAJOR DAMAGE. FAILURE OF CONNECTING ROD BOLT, SUBSEQUENT CONNECTING ROD FAILURE; NUMBER SIX CYLINDER CAUSED VIBRATION. NO INJURIES.

H-19D MAIN ROTOR BLADE STRUCK TAIL BOOM AS AIRCRAFT ROLLED OVER ROUGH TERRAIN DURING FORCED LANDING. PILOT INITIATED FORCED LANDING DUE TO CONTROL LOSS. SUSPECT ICING OF PILOT VALVE ON LATERAL SERVO.

H-23D STRUCK TELEPHONE WIRES WHILE CONTOUR FLYING. EXTENSIVE DAMAGE TO MAIN ROTOR, TAIL ROTOR AND TRANSMISSION. PILOT SUFFERED FRACTURED ARM AND BROKEN RIBS.

H-13E STRUCK UNMARKED WIRES DURING RECONNAISSANCE FLIGHT. MINOR DAMAGE TO PITCH HORN, SWASH PLATE ASSEMBLY, AND ROTOR ASSEMBLY. NO INJURIES. VISIBILITY LIMITED DUE TO SMOKE AND HAZE. PILOT FLYING INTO SUN.

L-23D LANDING GEAR COLLAPSED DURING LANDING ROLL, CAUSING MAJOR DAMAGE. NO INJURIES. CAUSE UNDETERMINED.

L-19A SKIDDED INTO PARKED H-21C WHILE TAXIING OUT FOR TAKEOFF. MAJOR DAMAGE TO L-19; MINOR DAMAGE TO H-21. NO INJURIES. WEATHER NOT A FACTOR.

H-13H PILOT HEARD LOUD POP AT 150-FOOT ALTITUDE AND EXPERIENCED VIBRATION. PILOT WENT INTO AUTOROTATION; STATED THE AIRCRAFT DID NOT RESPOND TO COLLECTIVE PITCH. SKIDS BROKE OFF ON INITIAL GROUND CONTACT AND AIRCRAFT PITCHED FORWARD, NOSING OVER. MAIN ROTOR BLADES CUT OFF TAIL BOOM. NO INJURIES. FAILURE OF LEADING EDGE OF MAIN ROTOR BLADES CAUSED BY EXTENSIVE OPERATIONS ON DUSTY TERRAIN.

L-19E PROPELLER STRUCK OIL DRUM WHILE TAXIING. INCIDENT DAMAGE. NO INJURIES.

HU-1A COPILOT DOOR BLEW OFF DURING HOVER, STRUCK GROUND AND BOUNCED INTO LOWER LEFT PLEXIGLASS NOSE SECTION. INCIDENT DAMAGE. NO INJURIES. CAUSE UNDETERMINED.

H-34C CLAMSHELL DOORS CAME OPEN IN FLIGHT AND BENT BACK AGAINST MAIN GEAR. DOORS DAMAGED BEYOND REPAIR. NO OTHER DAMAGE. NO INJURIES. CLAMSHELL DOOR LATCH MALFUNCTIONED.

H-21C INADVERTENTLY FLEW INTO FOG. PILOT LOST CONTROL DURING 180° TURN AND AIRCRAFT BEGAN STEEP ANGLE OF DESCENT. DURING RECOVERY, ENGINE OVERSPEED RESULTED IN PARTIAL ENGINE FAILURE. AIRCRAFT FORCED LANDED IN OPEN FIELD WITHOUT OTHER KNOWN DAMAGE.

H-13G SETTLED INTO TREES WHEN ROTOR RPM WAS LOST. MAJOR DAMAGE TO MAIN ROTOR BLADES. NO INJURIES. WEATHER NOT A FACTOR.

L-19A PILOT DESCENDED FROM 5,000 FEET TO 500 FEET FOR LOW-LEVEL OBSERVATION PASS OVER GROUND TROOPS. ENGINE FAILED TO RESPOND AFTER DESCENT AND MAJOR DAMAGE RESULTED FROM FORCED LANDING. THERE WERE NO INJURIES. SUSPECT CARBURETOR ICING.

CWO Ben G. Thomas, TC

IN THE UNITED STATES there are 60 manufacturers of helicopters. Only two of these manufacturers have chosen to produce the tandem configuration. Why have these two chosen the tandem configuration while the majority of the helicopter manufacturers have chosen to produce the single rotor configuration?

If you are a submissive type person, you would probably say that the single rotor helicopter must be far better than other types, otherwise such a majority of manufacturers would not produce this type. However, if you are an inquisitive type, you might say that these two companies must have a reason for producing a different type configuration and maybe they have something.

Apparently the Army must think the tandem configuration has possibilities because it plans to replace the H-21, H-34, and H-37 transport helicopters with the 2-3 ton **Chinook,** which is a tandem rotor helicopter.

It must be kept in mind that we are speaking of configurations and principles, not of specific helicopters. Present-day configurations show the single rotor helicopters to be lighter in weight with less wasted space than the tandem configurations. This is due to the manufacturer's design, and future designs are utilizing all available space within the structure. In other words the new designs are smaller on the outside, yet larger on the inside.

The utilization of this bulky wasted space in tandem design should put it on a more equal competitive basis with the single rotor helicopter in lifting capability and forward speeds. While single rotor helicopters have been able to pick up heavier payloads than a comparable tandem rotor helicopter, the two will gross out at about the same weight.

The same will hold true in forward speeds. The more compact designs will naturally have less drag-producing surface exposed to the relative wind, enabling the tandem helicopter to obtain much higher forward speeds with less power. This also is an economic factor in that it gives a much longer radius of action when less power is required for cruise. The newer tandem helicopter will have an approximate 350 nautical mile rescue radius with a capability of a 15 person pick-up. Tandem configurations are not the only ones making these strides, but they are making greater progress to get on a more competitive basis with the single rotor configurations in these aspects.

One of the big problems in helicopter stability is compensating for the great amount of

---

CWO Thomas is assigned as an instructor in the 674 Branch of the Department of Maintenance, USAAVNS, Fort Rucker. He is rotary-wing rated.

Two equal sized counterrotating rotors in tandem configuration compensates for torque, eliminates power - consuming antitorque devices without weight or performance penalties.

torque that is the result of turning the large rotor blades necessary for flight. The tandem configuration compensates for this torque by having two equal sized rotors counterrotating, thus utilizing all available power for flight by eliminating a power consuming antitorque device. However, the overlapping rotors require approximately 4 percent increase in hovering power over the nonoverlap rotors. This increase in hovering power requirement for the overlap rotors is compensated for by the reduction in structural weight and a reduction of drag in forward flight. Hence, the overlap tandem has the advantage of compactness and lower weight without performance penalties.

The single rotor configuration must use a power consuming antitorque device. The only reason for the tail rotors on the common single rotor helicopter is to maintain directional control; it does not produce any lift or forward thrust. Extensive testing has shown the tail rotor to absorb approximately 8 percent of available power in hovering where the power requirement is high and 3 percent under cruising conditions where the power requirement is much less. However, the tail construction to support this antitorque device is much lighter and less complex in structure than the tandem configuration.

Another critical problem in the helicopter field is center of gravity travel. In this field the tandem configuration seems to excel. Its large permissible displacement of the center of gravity permits wide latitude in the placement of payload within the passenger-cargo compartment. The two longitudinally displaced rotors give the aircraft superior longitudinal stability and control, permitting indiscriminate personnel seating and regrouping in flight.

Along this same line an airframe connecting two longitudinally disposed rotors allows maximum space for accommodation of payload with minimum drag - producing frontal area. This permits the tandem configuration to carry large internal bulky loads without sacrifice of forward speed or maneuverability of the aircraft.

Some single rotor helicopters, while still not having this wide center of gravity displacement, compensate for this limitation by the use of the offset hinge which allows the attitude

of the helicopter to follow in the same plane as the rotor hub. This gives the pilot full control, regardless of the attitude of the aircraft.

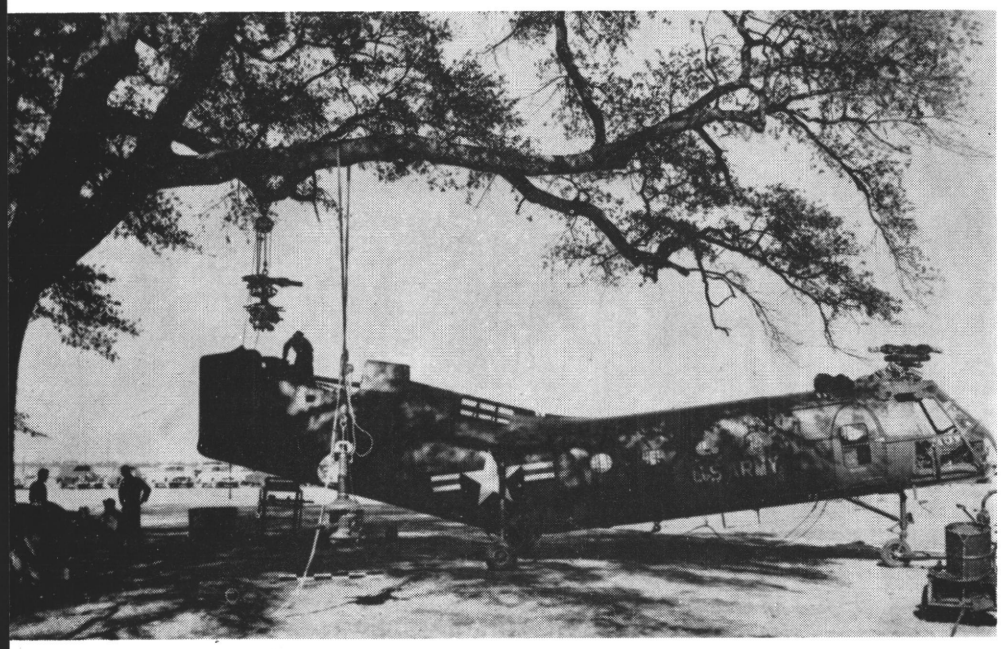
One advantage of tandem rotor helicopters is the high mounting of both rotors. This provides adequate clearance between the rotor blades and the ground or ground objects, assuring less likelihood of damage to the helicopter in tail-low, quick-stop landings or other maneuvers. This enables the helicopter to land in rough terrain with high shrubs and other obstacles that would normally cause severe damage to the low-mounted tail rotors. Also there is no hazard to personnel on the ground, loading or unloading, with both rotors mounted at the top of the structure. The tandem configuration requires a more complex fuselage structure to support the aft rotor system than does the single rotor helicopter. Even though more complex, it increases the efficiency of the structure because the cabin, engine and fuel installation, and rotor supporting structure can all be combined within the fuselage and disposed between the rotors. This system may incorporate more moving parts, but the two rotors of equal size afford interchangeability of parts of the forward and rear rotor hubs, upper controls, and rotor transmissions. This is more of an advantage than disadvantage because if a shortage of parts should occur, especially in the field where parts are often scarce, they may be interchanged. As an example, maybe there was an abundant supply of forward upper flight control bellcranks, but aft upper flight control bellcranks were as scarce as hen's teeth. This shortage of parts could be dealt with by substituting one for the other until the scarce parts were available again, without grounding the aircraft.

Another inherent trait of helicopters is that of vibrations. The vibrations in present-day helicopters have been reduced to a minimum, but not completely eliminated. The single rotor configurations have fewer vibrations than the tandems. One cause of vibrations in the tandem configuration is that the rotor wash of the two rotors conflicts with each other to induce inflight vibrations. This is especially apparent at slow forward speeds up to approximately 40 knots, the most critical speeds being from 20 to 40 knots. At this slow speed the helicopter has just entered translational lift or is about to leave it and the attitude of the aircraft is such that the aft rotor is passing through the turbulent air of the forward rotor, thus causing excessive vibrations to be transmitted through the fuselage.

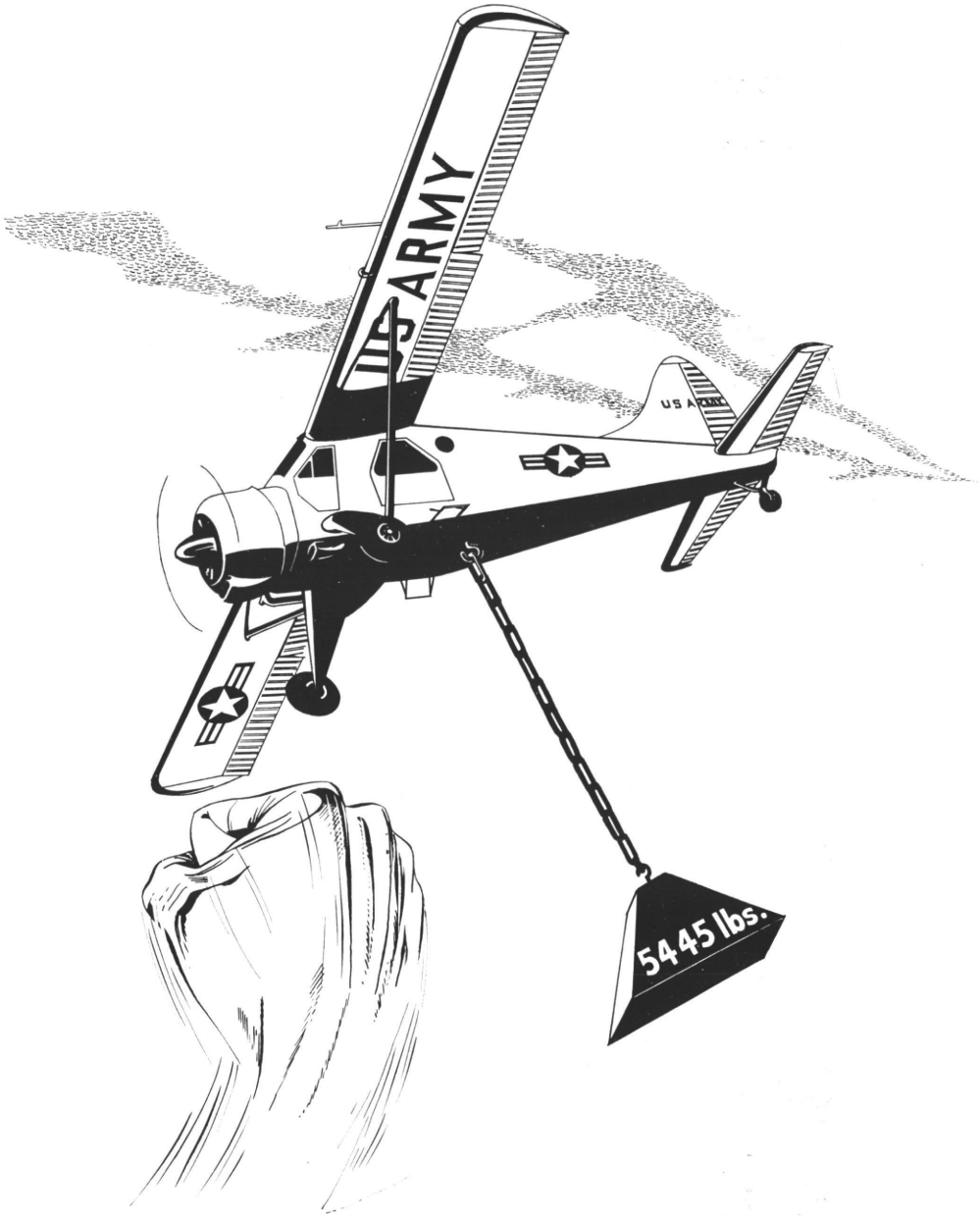
The records of worldwide helicopter competitive meets show a fine record of victories for the single rotor configurations. Almost every year single rotor helicopters have walked away with first place honors. This fine record doesn't tell us much though, because tandem configurations were not entered for most of those years. However, tandem rotor configurations were entered in 1953, and look what happened. The tandem configuration walked away with a new speed and altitude record. This does not mean that tandems would have won every year if they had been entered, but they would have been good contenders.

Whether one configuration is better than another remains to be seen. As indicated by this article we lean toward the tandem, which looks very promising for the immediate future. However, we realize both types have their advantages and disadvantages.

Many parts of equal sized tandem rotors are interchangeable



He Learned About Flying From This



Lieutenant Ted Neu, Armor

"You want to see me, Captain?"

"Yeah, Lieutenant Fuzz, I sure do. Let's walk out to the line a minute; I want to show you something."

"See those wrinkles on the wing there, Lieutenant?"

"Yes sir."

"Know what they are?"

"Not exactly, sir, but I think they indicate some sort of structural damage — and maybe trouble for ole Number 1, since I was probably the last to fly this airplane. But I don't know how they got there. I sure didn't do any violent maneuvers."

"Let's go back to the office and talk about it.

"Lieutenant, you've succeeded in doing something that isn't particularly easy to accomplish. You've overstressed a Beaver and caused structural damage. As a matter of fact, I'd say you came pretty close to augering in. Since I'm the safety officer, the maintenance officer reported it to me. Of course, it constitutes an accident and we'll have to have an investiga-

---

Lieutenant Neu is dual rated and instrument qualified. A graduate of the University of Southern California Army Aviation Safety Course, Lt Neu is the Flight Safety Officer of the Armor Center Aviation Command, Fort Knox, Kentucky.

tion, but I'd like to get some idea how it occurred before we convene the board.

"You were the last one to fly the airplane, I believe. You got back last night from a trip to Camp Swampy, didn't you?"

"Yes sir, but I couldn't have caused the damage. I didn't do any aerobatic maneuvers at all. This was just a straight administrative passenger haul. I took 5 passengers and baggage down to Camp Swampy Monday and brought them back yesterday. That's all there was to it."

"There has to be a little more to it than that, because that Beaver didn't wrinkle itself. Now how about weather? Did you get into any turbulence?"

"Negative. We went down early Monday morning, and it was real slick till around 1000. Then it began getting just a little bumpy, but nothing to mention. It was quite gusty when we left Swampy yesterday, but certainly nothing to get excited about. We always have it this time of year. But as for any real weather, no. We were strictly VFR all the way down and back."

"Did anyone fly your airplane while you were at Swampy?"

"No sir. I parked it across from Swampy Operations and it stayed there till we left yesterday afternoon. There must have been something wrong with the wing before this; though to tell the truth, I never saw those wrinkles during preflight."

"That's possible, of course. Now, how about the trip back yesterday; did you just take off and fly straight back?"

"No sir, not quite. We took off a little after 1500. You know my passengers had gone down to Swampy to coordinate for Operation Footblister this fall. Well, just after I took off Colonel Crunchie asked if we could make a recon of the maneuver area so he could get some idea of the terrain. We sure did make a recon! We flew around between 45 minutes and an hour, and I had to change my flight plan. Put us way after dark getting in. They wanted to see every crossroads and creek in the maneuver area."

"Did you do any sort of maneuvers during the recon, and by this I don't mean aerobatics, but any real steep turns or dives?"

"Nothing particularly excessive, sir. I did make some steep turns to give them a good view of one thing and another."

"Now we're beginning to get to it, Fuzz. I want you to tell me **exactly** what you did from the time the colonel asked you to recon the area till you again started on your course."

"Well, I'm not trying to hide anything from you, sir. As I said, we took off from Swampy AAF about 1500, and about the time I got to 2,500 feet Colonel Crunchie asked if we could make a low recon of the area. He was sitting in the right seat, incidentally. I went into a shallow dive toward a road junction he pointed out. He said he wanted a good look at that particular area. I banked pretty steep to give him a good look as we got down to about 500 feet and then leveled out and flew down the road.

"We stayed about 500-600 feet for the rest of the time, flying all over the area, while Colonel Crunchie and his group made notes on their maps. I made several fairly steep turns during the recon, but nothing unusual. After about 45 or 50 minutes they had seen enough, so I started to climb out on my heading. I came all the way home at 5,500 feet until I started letting down near here. That's all there was to it, and I sure don't know how I could have done any damage to that airplane."

"There are a couple of points there I'd like to check. You say you were about 2,500 feet when the colonel asked you to make a low-level recon and that you went into a shallow dive. Did your airspeed build up at all during the dive?"

"It built up a little I think. I pulled off power to around 25 inches and trimmed it nose-low. I'd say to around 125 knots."

"Now how about angle of bank? How steeply did you bank?"

"Well, pretty steeply. Maybe 70 to 75 degrees."

"And how about your attitude? Were you level or still descending at that bank?"

"If I remember right, sir, I was still descending when I rolled into the turn; then when I reached 500 feet I began to roll out parallel to a road and level off at the same time. I did get quite a tug in the seat of my pants, come to think of it, but it couldn't have been enough to hurt the airplane. I've racked the ole Beaver up that tight lots of times."

"Well, I think maybe it was enough to hurt the airplane. How about fuel? Did you have the tiptanks full?"

"Yes sir. The trip back is normally around 5 hours, so I filled tiptanks so we wouldn't have to stop."

"How much baggage?"

"One small bag each. I'll tell you, it's quite a job to get six big men plus baggage in a Beaver and still close the doors."

"No doubt. Well, Lieutenant,

your load combined with those maneuvers was enough to put wrinkles in that wing, in all probability. Let's see the weight and balance form for this airplane and see how much weight you took off with. Do you ever make out a weight and balance form before you take off?"

"No sir, I haven't yet. I don't have much time in the Beaver. Anyway, the IP told me when he checked me out that if you could close the doors it'd fly."

"That figures. Well, I'm gonna show you right now why that's a dangerous piece of poop to teach. Right here's the basic weight of this Beaver: 3,250 lbs. That's the airplane as she stands, ready to load for a mission. It doesn't include gas, oil, or pilot. So we add pilot and oil and that makes another 247 lbs. We count 200 lbs. per person, since with a parachute it'll average out pretty well. Now we can start thinking about the load, which includes fuel, cargo and/or passengers.

"Here's how you did it — or should have. Gimme your pencil. You had 95 gallons of gas internally and 43 gallons in the tiptanks. That's 138 gallons at 6 lbs per gallon, or 828 lbs. of fuel. Your Beaver then weighed 3,250 lbs. basic plus 247 lbs. pilot and oil, plus 828 lbs. fuel, or 4,325 lbs. Then you crammed in 5 people at 200 lbs., or 1,000 lbs. How much baggage?"

"Each of us had a small bag, about 20 lbs. apiece, I'd say."

"Okay, there's another 120 lbs. So now we have 4,325 plus 1,000 plus 120. That's 5,445 lbs., right?"

"Looks like it, sir."

"What's the maximum gross weight on the Beaver?"

"5,100 lbs."

"Then you were around 345 lbs. over gross at takeoff."

"Still, Captain, I don't see what difference that makes. The airplane is stressed for 3.5 g."

"That's just the point. Many pilots don't realize that when an aircraft is 'stressed' for so many g, it means so many g at a **certain weight**! Now the Beaver was originally designed for 3.5 g **at** 5,400 lbs., which was maximum gross overload. What does this mean? Well, it means that the wing spars, tail spars, fuselage — all the structure — were designed so that at 5,400 lbs. gross weight the structure would not yield at 3.5 g. In other words, it could pull 3.5 g at 5,400 lbs. with no damage.

"Let's take the wing for example. It carries the total weight of the airplane in flight. That wing structure is designed for 3.5 g at 5,400 lbs. That is, it will not yield at 5,400 lbs. multiplied by a load factor of 3.5. The wing must be able to support, let's see . . . 18,900 lbs. It doesn't make any difference to the wing whether you're pulling out of a dive at 5,400 lbs. and pull 3.5 g or whether you take off — if you had the power, with a total gross weight of 18,900 lbs. and fly perfectly straight and level. All it can feel is load — so many pounds.

"Now, we know the wing is good for 18,900 lbs. Suppose you were not fully loaded and the airplane weighed 5,000 lbs. The wing is still good for 18,900 lbs. Then you could have a load factor, or g, of 18,900 divided by 5,000; that's about 3.9 g. To the wing or aircraft structure it would be all the same, see? As you decrease the weight you can increase the number of g you can pull.

"All g is a load factor—what the **apparent** weight of the airplane is to the structure. If you bank and maintain altitude, for example, you increase the apparent weight of the airplane because the vertical component of the total lift must equal the weight of the aircraft. Here, let me draw a little sketch. You remember from Principles of Flight in school that the weight always acts straight down and the lift always acts perpendicular to the wing span. Are you still with me?"

"Yes sir."

"Okay, when you bank through some angle the lift swings over to remain perpendicular to the wing and it swings over an amount equal to the angle of bank, call it angle a. Then the vertical component of the total lift must still equal weight, or the airplane won't maintain level flight, right? The horizontal component of total lift will be balanced by centrifugal force acting in the opposite direction, also, but we're not concerned with that. So I'll call the vertical component of lift, weight, too, and complete the little triangle by drawing in this dotted line from the lift line perpendicular to the vertical component of the lift line, or weight.

"So I have a right triangle, and I know from trigonometry that the cosine of an angle equals the adjacent leg divided by the hypotenuse. In this case, the cosine of the bank angle equals the weight of the aircraft divided by the total lift generated by the wing. Or, writing it down, $\cos(a) = \frac{W}{L}$. Now we define the load factor, or g, as lift divided by weight, which figures, because the lift is what the wing feels, and it's in pounds, not g. That is, $\frac{L}{W} =$ g. I inverted the right side of this little equation, so I've got to invert the other side, and I

end up with this: $\frac{1}{\text{Cos a}} = \frac{L}{W}$, or $\frac{1}{\text{Cos a}} = g$.

"You see, the load factor, or g, is one divided by the cosine of the bank angle. Up to about 45° you don't pull many g in a level turn. For example, the cosine of 30° is about .866, so the load factor for a 30° bank is one divided by .866 or 1.16 g. At 45°, the cosine's .707 and you pull 1.4 g. At 60°, you pull 2 g and if you were a little steeper than 70°, say 72 or 73°, you pulled right around 3.3 or 3.4 g.

"Provided your airplane had never been overstressed before, and your passengers didn't mind, this wouldn't have been too bad, because it was a load of 5,430 times 3.3 or 17,919 lbs. on the wing, knocking off some for gas used up. You wouldn't have pulled this magnitude until you reached a constant altitude turn attitude, either. But here's the joker: you also began to **pull up** and **roll out** at the same time you were racked over in the steep bank.

"Now a rolling pull out is about the hairiest maneuver you can do as far as stressing the airplane is concerned. When you pull out, you put additional downward forces on the low wing. In this case the right wing, because there has to be an unbalanced upward force on the wing to start the roll out. This is logical, too, because in a roll out the aileron deflects downward on the low wing, increasing the lift on that wing. At the same time the lift was reduced on the high wing due to the upward deflection of the aileron. These last two forces are too complicated for me to compute, but they **are** significant. When you add them to the 17,919 lbs. total load you already had due to bank, they put the low wing in an overloaded condition because it was carrying more than its half of the total load due to downward aileron deflection.

"On top of all this, it's always possible that you hit a gust just at this critical time. That would have increased your load factor even more. Result? Structural damage. Had you been at a lower gross weight, you might have gotten away with it, but that all depends on how much lower and how great the overload on the low wing was."

"But sir, I thought our airplanes all had a safety factor built in. If that's so, then I still shouldn't have hurt the structure."

"You don't understand what a safety factor is. All aircraft, by FAA regulations, must have at least a safety factor of 1.5. But that means only that you can load the structure up to 1.5 times its design load **once** and it won't come unglued. It doesn't mean there won't be damage or that it won't break the second time. If the Beaver wing is built to take 18,900 lbs. without causing any permanent deformation of the structure, then it can take 1.5 times that load or 28,350 lbs. without breaking **once**! It **could** break the **second** time though.

"If it weren't for this, we'd be policing up the wreckage out in the boondocks right now. But if you exceed the 18,900 lbs. load on the wing or 3.7 g at the 5,100 lb. maximum gross weight, you **can** get structural damage. You have just proved that when you exceed the design load factor at an overload weight you get structural damage. It can be done; those wrinkles prove it. The wing'll have to be replaced and the rest of the structure checked for damage. Do you understand what I've tried to tell you?"

"Yes sir, I think so. I wish I'd known this yesterday."

"I wish you had too. But just to make sure everyone else knows it, I want you to start preparing a class on this for the rest of the pilots. I'll get it cleared through the training officer. Understand?"

"Yes sir."

"All right, get out of here and reflect on your sins awhile. We'll have to have a statement for the investigation, too. Any questions?"

"Yes sir. May I have my pencil back, sir?"

DID YOU KNOW

That a headwind 10% of landing speed will reduce landing distance 19% and the reverse is true for a tail wind?

That 20% increase in weight is equal to 44% increase in landing distance?

SURVIVAL ON MOVING ICE

RECENTLY 29 CIVILIAN and military scientists were evacuated from their "laboratory" ice floe as it slowly crumbled into the sea about 400 miles northwest of Barrow, Alaska. The rescue of men and scientific equipment went off smoothly, despite some anxious moments when the breakup quickened and huge cracks inched toward the main campsite.

Fortunately rescue teams were constantly standing by and no one was left to fight for survival on a cake of ice floating in a treacherous Arctic sea.

This possibility is ever present for Army Aviators on duty in Arctic and Antarctic zones. Knowledge of proper survival techniques may spell the difference between life and death for the crashed aviator who finds himself on an ice floe.

Just about the most miserable predicament imaginable for an aviator is to be down on moving ice in the Arctic Ocean

or Bering Sea. However, all is not hopeless. Enough possibilities exist to justify reasonable hope for survival. With a minimum of equipment, an average constitution, and a strong will to live, the unfortunate has a fair chance. But we must not fool ourselves. Land survival is relatively easy. On moving ice, there is little to work with.

Except for the coastal fringe, and large or small bays and narrow straits between islands, all Arctic ice moves with the currents. During October and November the ice moves south; in May and June the pack moves north again. Between these months, it may move north for two days and then south for four days. It is not unusual for the currents to change three times in 24 hours.

Many current movements are local. In the middle of the Bering Sea, the ice seems to move in an eddying motion. Further north, the ice all seems to move towards the Bering Straits, or away from them in a fan-like shape.

Two types of ice abound in the Bering Sea and Arctic Ocean: the main ice pack that never completely thaws out, and the new ice formed each winter. In the fall of the year, the ice pack moves down through the Bering Sea and spans out all the way from Siberia to Alaska, extending down usually as far as Nunivak and the Pribilof Islands.

When the weather gets very cold, the open water between the spread-out freezes, the thickness of the new ice depending on the amount of open water. The movement of the current forces the ice up into smaller or larger pressure ridges. The ridges are larger when the surrounding ice is heavier or when close to shore, since in those cases there is more resistance. Consequently, in the center of the Bering Sea, there are small ridges and lots of smooth ice. Along shore and around the islands, the ridges are much larger and more compact.

The ice usually moves up to 4 miles an hour, although in certain localities, such as the Bering Straits, it might move as fast at 7 mph. Once it was measured between the two Diomede islands and was found to be moving north at 9 mph. Men have been known to drift 100 miles in 24 hours, but again, men camped on a large isolated floe have moved less than 5 miles in that period of time. It is not unusual for hunters to take off against the ice and travel out 15 miles and be eventually carried home.

When traveling on moving ice, keep in mind that you are in an unfortunate situation. No more lonely situation is imaginable. One is tempted to despair and make no effort to survive. Nothing around seems to be of any help. Ice extends as far as the eye can see. No shelter seems available. There are no edible grasses, no birds, no trees, no animals moving around that can possibly be caught, very often no sun, nothing that can be used for making a fire, no one to consult, no one to rely on; in fact, nothing!

Yet men have been known to survive on moving ice for as long as 5 weeks. It is not unusual to be out 2-5 days as a matter of routine that causes no concern. In the past 10 years, 40 men have been out for periods ranging from 3-10 days and all survived with few ill results. They made use of the equipment they carried. These men were Eskimos, but any white man can do the same thing provided he uses common sense, has great patience and the necessary stamina. A service man is conceded to have common sense; he can develop patience, willingly or unwillingly as circumstances dictate, and the stamina is taken for granted.

SURVIVAL SUGGESTIONS

A shelter can be made of snow; or if snow is not available, use slabs of thin ice. Make it as small as convenient so less area will have to be heated. Use the lee side of a pressure ridge that seems old and solid, preferably a little in from the edge of the ice. Don't be elaborate about it as it will not be used for a long period, unless you are on an isolated floe. This shelter can be made with the hands alone if necessary. Seal blubber can be ignited to furnish heat. An initial hot flame is necessary, so everyone should carry heat tablets and matches. Light the tablets on the raw side of the blubber with the hairy side on the ice. Once the blubber catches fire, and it should if four tablets are burned at once, you have a good fire. A square foot of blubber will burn for several hours.

Blubber fires need no shelter; in fact, the stronger the wind the better the fire. Tinder of any description burned with the heat tablets will help, but once the blubber catches fire, save your heat tablets. The smoke from this fire is dirty, black, and heavy, but not nauseating. Its flame is very bright and can be seen from several miles away. The smoke will penetrate your clothes and blacken your skin, but no one will be around to object any-

way. If you are on a large isolated floe, build the fire near the opening of the shelter, outside, of course. A lot of the heat will enter the shelter. The burned blubber cinders are edible; in fact, carbon from seal-oil lamps was the original Eskimo chewing gum.

If unfortunate enough to be stranded on moving ice, the following procedure is advised. If you know your direction, proceed towards the nearest land. If the ice is good for traveling, it is advisable to leave the plane, unless your course was followed and you expect to be picked up or spotted. The ice might be drifting away from safety. Besides, ice floes far from land often break up. The chances of an aircraft being seen on the ice are less than on land.

The decision to stay with or abandon the aircraft is up to the individual. If it is on a large, solid, reasonably isolated floe, perhaps it is better to remain with it. If it is down among the pressure ridges on moving ice, it's better to leave it, because it won't be above the ice very long anyway. Many parts of the aircraft equipment can be used, such as extra clothing, small life raft, and anything else that can be carried without too much effort. A spear to test the ice should be improvised, but it need not be elaborate. Much will depend on whether or not distress signals were sent out. If they were and you are sure you are located, remain in the vicinity. If not, it is better to move and keep traveling until you come to the shore ice, or until you find a floe you think will last some time.

If you are going to walk toward known land or solid ice, either with or against the ice, observe the following precautions. The only danger is crossing from one floe to another. When obliged to jump, do not take off from the edge of a piece of ice, but rather a couple of feet from the edge. This lessens the chance of the ice turning over. When the ice is closely packed, you can walk as though it were all solid, using obvious common sense. You can easily note if the touching edges or, in most cases, overlapping edges are solid enough.

When large, heavy ice floes touch each other, an added precaution is necessary. Usually, the ice between the floes has been ground into a powder, and can bear no weight; but, moving with the powdered stuff, will be larger chunks that will hold you up. This situation is even more prevalent where moving ice touches the solid shore ice.

When crossing pressure ridges, be careful to step on the ice only. Bridges of snow can be formed between the peaks of ice, and these are not always solid. One can fall 20 feet down. The powdered ice may be as much as 20 feet wide, but by moving against the ice you will usually find a place to cross. During the winter and spring months, the floatice is always solid enough to hold a freight train. Until December one must be careful, as the patches of new ice may not be more than three inches thick. In midwinter and spring, a good way to test new ice along the edges of solid ice is by observing the "frost flowers."

On the lee side of solid ice and especially along the offshore line, smooth new ice will form, starting at and extending away from the solid ice. It will continue to form and extend until the current changes. Then the heavier ice coming against it will push it up into ridges. These "frost flowers" will begin to form when the ice is one day old. They look like small fern plants and come up scattered like growing corn. If you have no other means, such as ice spear or knife, to test it, the ice is safe to crawl over when you can make a distinct footprint. In general, sea ice 4 inches thick will hold just about any man.

Your food supply will be seals, and for that you need a rifle. There are always seals where there is moving ice. They come up to breathe in the patches of open water, with their heads above water for perhaps 30 seconds. They are never on the ice until May and June, and then only occasionally. Usually, they do not sink when shot. The head, neck, and shoulders are the only parts visible and a head or neck shot will always kill them. Whether or not they sink when shot depends on the amount of blubber. The number that sink is about one in five.

During February and March, the male seal has a disagreeable odor, but this doesn't affect the taste of the meat too much. Most parts of the seal can be used. The skin can be used to make moccasins if necessary. The blubber can be used for fire, and the flesh eaten. Frozen seal meat, especially frozen liver, is palatable and easily swallowed. When a seal is shot, a grapple hook and line are usually necessary to bring it in. If these are missing, one can move around to the ice where the animal will eventually drift. Seals are more plentiful at daybreak and evening, but they are liable to pop up at any time of

the day at any place.

The following items are suggested as minimum necessary equipment for survival:

1. firearm of some description;
2. an abundance of heat tablets;
3. waterproof matches or matches in waterproof container;
4. small grapple hook and line;
5. necessary stamina and common sense.

Moving ice can be frightening. Blocks the size of a large room can be upended. It makes a grinding and squeaking noise. Several miles of it might be piled up like some bombed-out city and be moving along at 4 mph.

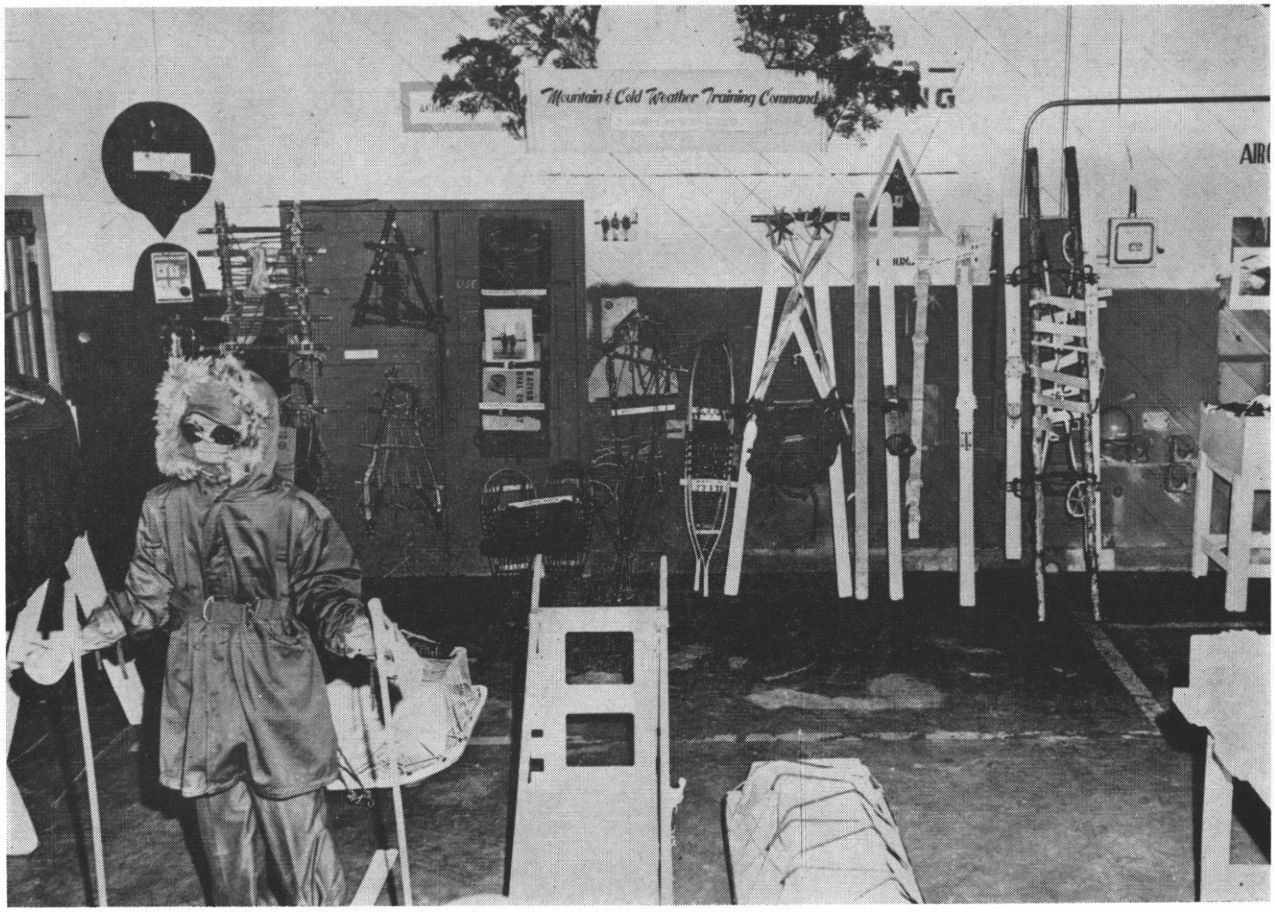
Here are a few examples of men who have survived on moving ice. Recently one man survived 11 days on moving ice during very adverse weather. Several years ago a King Island boy was out 6 days when the temperature was 22° - 42° below, with a strong wind. He traveled when the weather was better and holed up when too cold and windy.

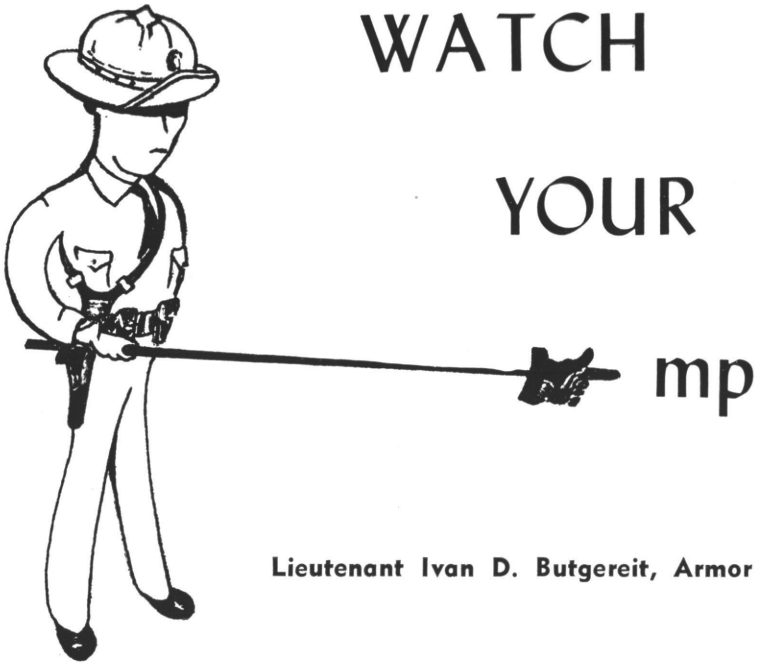
Five men were out for 32 days. They lived on seals alone. The ice traveled a long time in the opposite direction from home, but they simply camped until the currents became more favorable.

In the late 1930s a white man was 4 days and nights on the ice. He was on a large, isolated floe and remained there until it drifted close enough to other moving ice and eventually got to an island in the Bering Strait. He kept reasonably warm by alternately jogging around on his ice floe in as few clothes as possible and sleeping fully dressed in an ice shelter. When lost, his equipment consisted of the hunting clothes he was wearing, 30-30 rifle, 8 shells, one pair of gloves, a can of tobacco, and some cigarette papers and matches. He says the only thing that bothered him particularly was the silence.

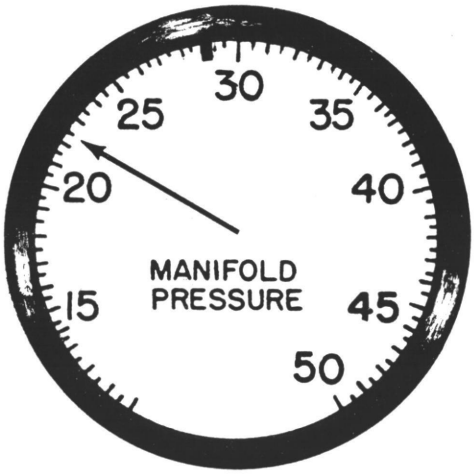
One U. S. corps soldier, years ago, drifted around for 18 days, then eventually made the solid ice. And the Army required him to make up the lost time!

Part of the training equipment used at Ft. Carson to teach cold weather survival to Army personnel





WATCH YOUR mp



Lieutenant Ivan D. Butgereit, Armor

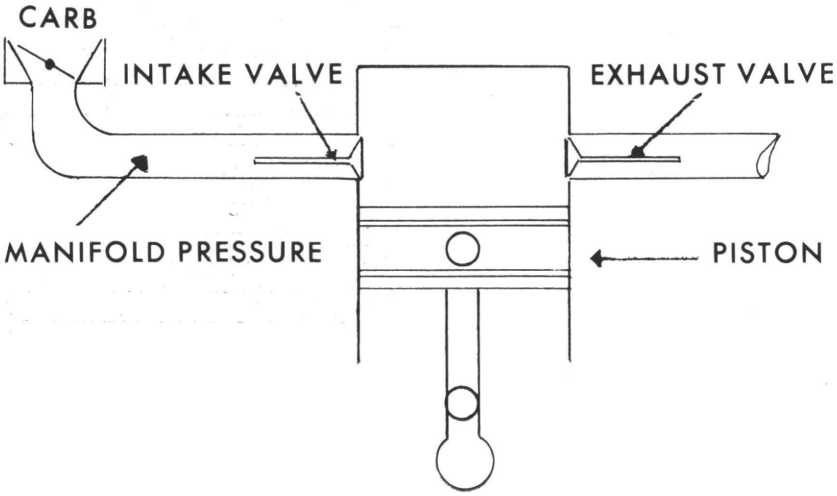
WHAT IS manifold pressure? Where does it come from? What does it do? Can it damage an engine? Does it have any effect on fuel economy? Is there a relation between manifold pressure and power? The answers to these questions should be known by all Army Aviation personnel regardless of the type aircraft that they are flying or performing maintenance on.

Manifold pressure is the pressure in the intake manifold. Let us illustrate how manifold pressure is formed by looking at a diagram of one cylinder of a nonsupercharged engine.

If the cylinder diagrammed (fig. 1) were operating, each time the piston moved down in the cylinder on intake stroke, a low pressure would be created. Assuming that the intake valve is open, this low pressure would also be found in the intake manifold. Why? Because the butterfly valve in the carburetor will allow only a given volume of fuel-air mixture to enter the manifold. If the butterfly valve is opened to the maximum, the pressure in the intake manifold will try to equalize with atmospheric pressure. (With engine running, manifold pressure wouldn't reach atmospheric pressure because of the friction losses caused by the fuel-air mixture as it passes through the induction system.) The throttle controls the position of the butterfly valve. In turn the butterfly valve controls the amount of fuel and air which can enter the intake manifold. With the throttle open slightly, the butterfly valve will only be open a small amount, and the engine will run at a slow speed with a low manifold pressure. As the throttle is opened, the butterfly valve opens, manifold pressure increases and the engine develops more power.

On supercharged engines, the manifold pressure works in exactly the same manner except that the fuel-air mixture is compressed and the manifold pressure can exceed atmospheric pressure. An engine is supercharged to increase manifold pressure above atmospheric pressure to provide high power output for takeoff and to sustain high power output at high altitudes where atmospheric pressure is low. The following diagram (fig. 2) shows the relation of horsepower to manifold pressure for a certain engine.

Figure 1



Lieutenant Butgereit is an instructor in the Powerplant Branch, Department of Maintenance, USAAVNS. He is fixed-wing qualified.

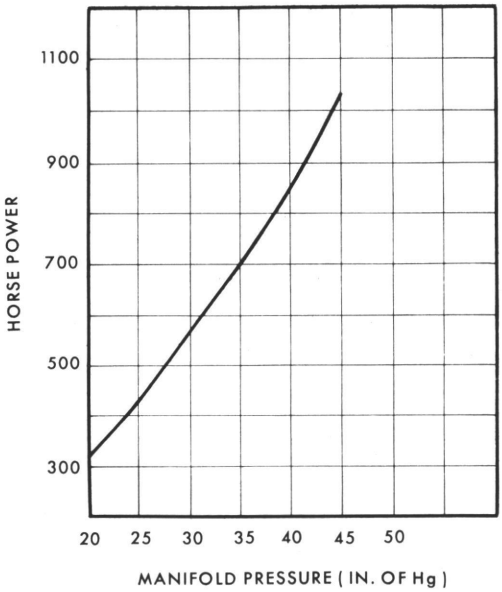


Figure 2

Power is increased by increasing manifold pressure in two ways.

1. It increases the weight of the fuel-air mixture delivered to each cylinder on each intake stroke of the engine. At a constant temperature, the pressure of the fuel-air mixture will determine the weight of the fuel-air mixture that can be contained in a given volume of space.

2. It increases compression pressure. The greater the pressure of the fuel-air mixture at the beginning of the compression stroke, the greater will be the compression pressure (pressure of the mixture at the end of compression stroke). A higher mean effective pressure and consequently a greater engine output will be caused by higher compression pressures.

To illustrate the increase of the compression pressure (fig. 3): In cylinder A with an intake pressure of 36 inches of mercury, the compression pressure is 270 inches of mercury, as shown in A_1. In cylinder B with the same compression ratio with an intake pressure of 45 inches of mercury, the compression pressure is 405 inches of mercury as shown in B_1. As has already been noted, the higher the intake pressure, the higher the compression pressure.

It would appear that the manifold pressure could be increased indefinitely to obtain more power, but it must be emphasized that this is not true. Excessive manifold pressure adversely affects the operation of the engine and ultimately damages it permanently.

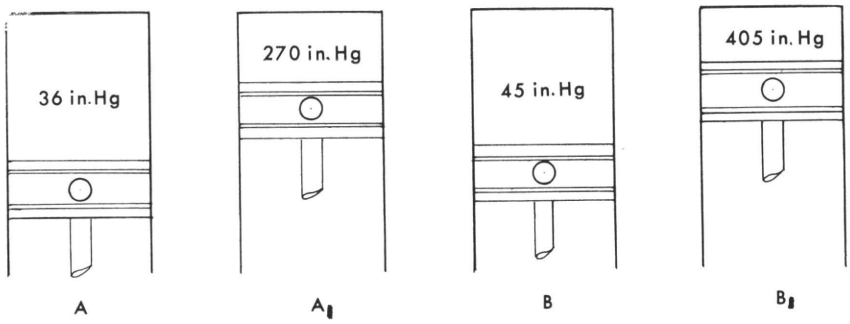
Manifold pressure is indicated by a manifold pressure gauge. A pressure sensitive mechanism located in the manifold pressure gauge is connected to the induction system by a pressure line. The movement of the diaphragm in the pressure sensitive mechanism is increased by a multiplying device and transmitted to the pointer of the gauge. The manifold pressure gauge is usually calibrated in inches of mercury. On a supercharged engine the pressure line goes from the gauge to a point in the supercharger that is subject to the exact supercharger discharge pressure. On nonsupercharged engines the line will go directly to the intake manifold.

Have you ever wondered why there is no manifold pressure gauge on an L-19A or E? We don't need one on a nonsupercharged engine using a fixed pitch propeller because we can read the rpm from the tachometer and thereby get an adequate indication of the power being developed by the engine. It is necessary to have a manifold pressure gauge on any aircraft which has a constant speed propeller, since the pilot could not tell how much power the engine is developing without it. This is true because an increase or decrease of the throttle only changes the blade angle of the propeller and not the rpm (within the limits of the propeller governor).

How is manifold pressure changed? Obviously, if the throttle is opened while the engine is running, the manifold pressure will rise. As higher altitudes with lower atmospheric pressure are reached, the manifold pressure will decrease (assuming a constant throttle setting). We can also change the manifold pressure by changing the rpm of the engine. The resulting increase or decrease in rpm will change the manifold pressure because the mixture flow in the cylinders of the engine will be altered. This is the reason for the change in manifold pressure when the constant speed propeller is exercised while maintaining a constant throttle setting.

Manifold pressure is one of the causes of detonation. Detonation is abnormal combustion, which has a very adverse ef-

Figure 3



fect on the engine. Other causes of detonation are: fuel with too low a resistance to detonation; high cylinder head temperature; using too lean a mixture.

While it is possible to provide essentially the same horsepower using several power settings (manifold pressure and rpm) when operating with a constant speed propeller, a power setting with a low manifold pressure and high rpm offers an advantage in detonation prevention. Excessive engine speeds waste power in overcoming friction losses, produce abnormally rapid engine wear, and are uneconomical in fuel consumption.

The relationship between manifold pressure and power can be understood if it is remembered that the horsepower developed by any engine is a function of torque and rpm. The following table from FAA Manual 107 shows the horsepower required to turn a fixed-pitch propeller at a given rpm.

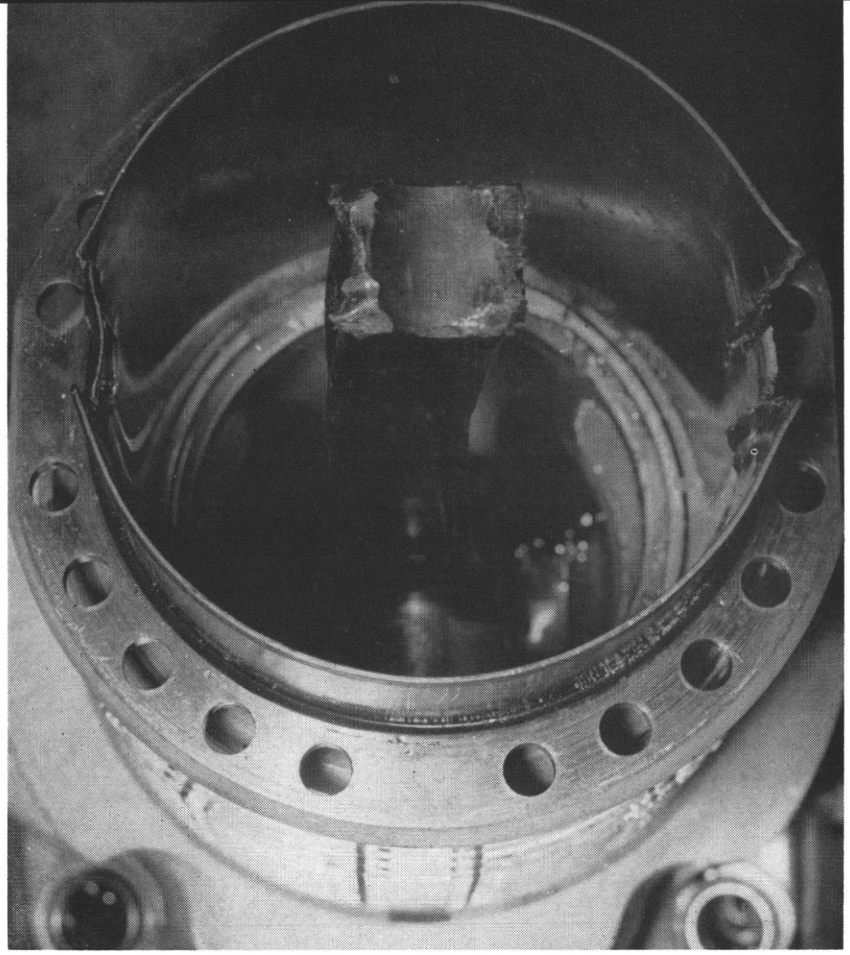
Prop rpm	Required hp
1,000	80
1,500	270
2,000	640
2,500	1,250
3,000	2,160

This table applies to only one particular propeller. Larger propellers will require more horsepower for any given rpm; smaller propellers will require less. But the relation between rpm and horsepower will in all cases be given by the formula:

$$hp = K \times rpm^3$$

(K is a constant whose value depends on such factors as air density, and the number, size, shape, and blade angle of the propeller.)

As the rpm becomes higher, the additional horsepower required to produce a given increment in speed (say 500 rpm) increases very rapidly. Only 190 additional horsepower are required to raise the rpm of the propeller in the example from 1,000 to 1,500; but 910 extra horsepower are needed to raise the rpm from 2,500 to 3,000.



Possible effect of high compression pressure

Since speed is the only means of regulating the torque, and hence the power absorbed by a fixed-pitch propeller, if the power output of the engine is changed, the engine will accelerate or decelerate until an rpm is reached at which the power delivered is equal to the power absorbed. In the case of the constant speed propeller a given torque may be absorbed at an infinite number of rpm (by changing the blade angle). Since power is a function of both torque and rpm, a particular horsepower may be developed at an unlimited number of torque-rpm combinations.

Keeping the foregoing facts in mind, let us examine the process by which the torque absorbed by the propeller is produced and delivered by the engine. The process is the familiar one of applying a force at right angles to an arm. The complications in this instance are that the amount of the force and the length of the arm are continually changing. The force is a varying pressure — the pressure exerted on the piston by the gases expanding in the cylinder. This force reaches its maximum shortly after the beginning of the power stroke and acquires a negative value, in effect during the compression stroke. In spite of the fact that an engine actually delivers its torque unevenly, the frequency and duration of the power impulses, together with

the momentum of the moving parts, make it possible to consider torque and with it power and rpm as being continually produced.

Therefore, any factor which affects the average pressure acting on the piston will change the torque. If the mixture strength, temperature, and type of fuel remain unchanged, the pressure developed in the cylinder will depend on the mass of the charge that can be forced into it. This in turn will depend on the manifold pressure. Thus torque turns out to be a function of manifold pressure and varies directly with it throughout almost the entire operating range of the engine.

Horsepower in effect then becomes a function of manifold pressure and rpm. As the throttle is increased on aircraft with a fixed-pitch propeller, the rpm increases. The engine then develops its greatest power when manifold is at the highest figure, since this will correspond with maximum rpm. On engines with constant speed propellers, the engine runs at a constant or set rpm; and when the throttle is opened manifold pressure, torque, and horsepower all increase. The additional power is absorbed by the propeller, as it will change to a higher blade angle. In fact, power may be increased without a change in rpm until maximum manifold pressure is reached, or until cylinder pressures become excessive or detonation begins.

In theory, the maximum power should be developed at maximum permissible manifold pressure and rpm. In practice, the characteristics of supercharging and volumetric efficiency vary with engine speed. A change in engine speed will usually be followed by a change in manifold pressure, if the throttle is left unchanged. For the same reason maximum power at constant manifold pressure is not necessarily obtained at highest speeds. Furthermore, because of variations in propeller efficiency with changes in blade angle and rpm, maximum propeller thrust horsepower does not necessarily coincide with maximum engine horsepower.

It is desirable to run an engine at the lowest possible rpm consistent with propeller and engine efficiency. Friction is thus reduced; oil and fuel consumption are also reduced. The engine running at a low rpm will have high cylinder pressure which will produce the most power or force to drive the piston down on power stroke. Naturally this is assuming that cylinder pressures are not excessive. To get away from excessive cylinder pressures the pilot may go to a higher rpm and lower manifold pressure. This will result in more friction to be overcome by burning more fuel. Higher rpm also leads to higher reciprocating loads and the engine wears out faster. Proper operation therefore lies somewhere between these two extremes.

As manifold pressure is increased, cylinder pressure increases, thereby putting load on the internal parts of the engine. There has to be a limit to the stresses imposed on these parts. Likewise, excessive rpm cannot be allowed because of the danger of setting up excessive centrifugal and reciprocating forces. It is also possible that detonation may be the deciding factor in establishing a safe limit for either manifold pressure or rpm with a certain grade of fuel. Other limiting factors could be cylinder and oil temperature, and oil and fuel pressure. Hence, the familiar red lines on the instrument panel. Operation within the limits assures dependability, as amply demonstrated by the tests required by the military procuring or regulating agency. When operating outside these limits, the pilot is relying on unproved margins of safety.

It is a known fact that takeoff requires the maximum amount of power. Takeoff, however, is a condition with definite time limits. To obtain takeoff power for continuous operation would require a larger engine. Allowances in the form of limitations for the high power output during takeoff for short periods of time are made primarily to increase the efficiency of the aircraft. Some aircraft engines can actually be run continuously with manifold pressure and rpm above the red line limits. When this occurs, the period of reliable engine operation is reduced.

The limitations of the aircraft engine are very real. The maximum manifold pressure and rpm limitations are painted on the instruments. Except for emergencies, live by them and they will help you or the next occupants of that aircraft stay alive. If there is any doubt about other limitations, for instance maximum continuous power, consult the -1 for the aircraft that you are flying.

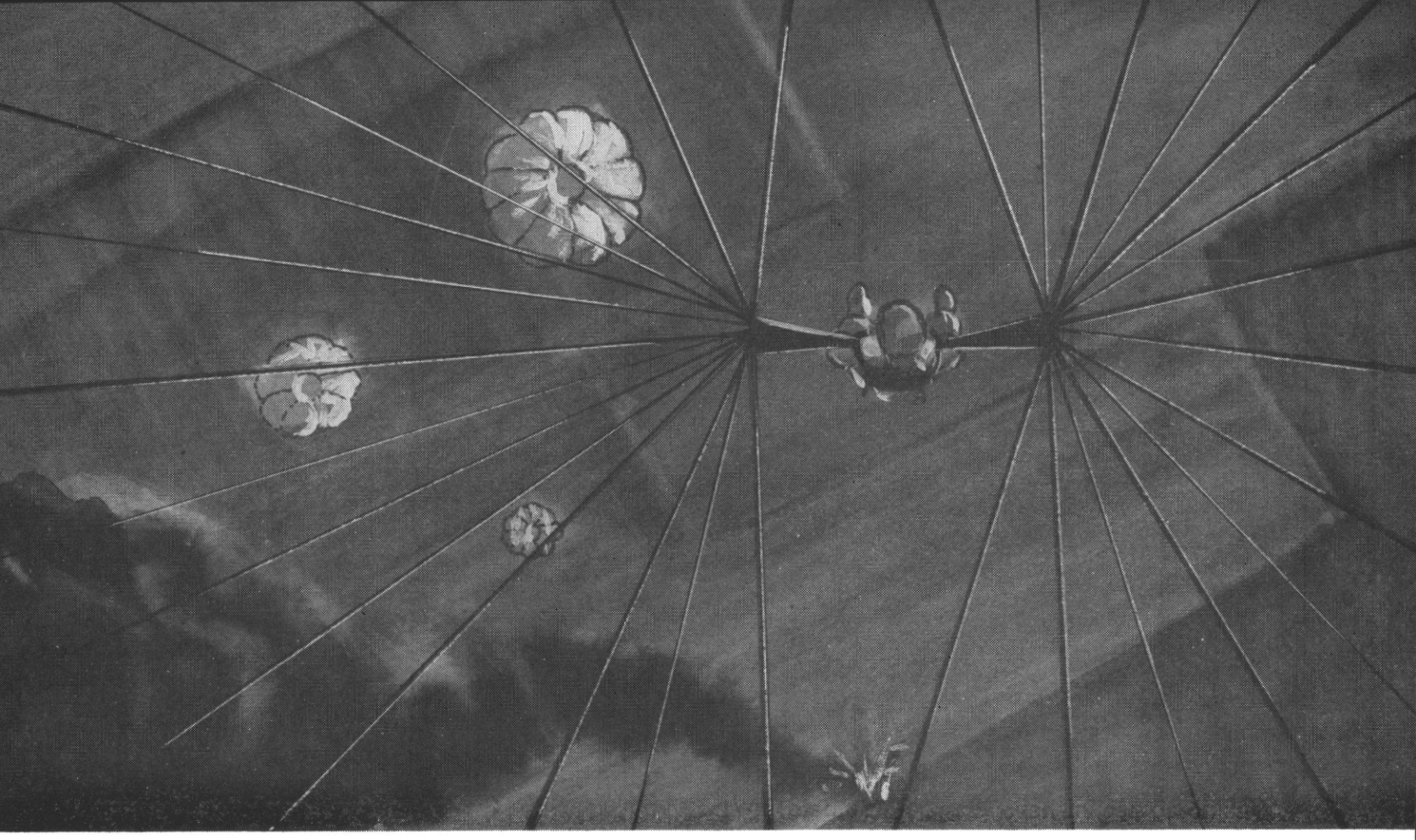
REFERENCES:

AIRCRAFT POWER PLANTS, Northrop Aeronautical Institute, pp 106-108, 117.

FAA Manual 107, pp 24-27, 30-34.

TF1 4131 Power and Octane.

USAF TO 06-5-4, pp 38, 77, 84-90.



LESSON in SILK

M/Sgt Charles E. Buchanan

CAPTAIN FRED HART glanced casually at the sky as he left base operations with his copilot, Lieutenant Ken Harris. Quite as casually, his mind's eye took in the surrounding scene. Azure bowl of sky overhead, flecked with cottony puffs of clouds. Sun-drenched asphalt apron, dotted with white-rimmed tie-down rings. Everything endorsed the carbon copy of the weather clearance in his hand. Should be a fine flight to Randall Air Force Base.

Parked a short distance away, silver nose aslant at the sky, was the "Gooney" in which they were to make the trip. Squatting alongside the plane, with a well-used B-4 bag and an olive drab "overnight kit" between them, were their two "hitch-hiker" passengers. Hart glanced at his manifest: a Lieutenant Richard M. Sloan and M/Sgt Terry Lewis.

Both passengers came to their feet and saluted smartly at the approach of the pilots. Hart returned their salute and mentally noted their appearance. The sergeant was of a rather stalwart build, with large, blue-veined hands, and a slightly furrowed face. Hash marks and overseas bars gleamed on his left sleeve. The Lieutenant, shorter, and inclined to be slender, was in his

---

This article is reprinted from The MATS Flyer. M/Sgt Buchanan was assigned to the 1709th Technical Training Squadron, Palm Beach AFB, Fla., when this article was written.

late twenties. A double row of ribbons denoted that he had been around the service quite a few years.

Captain Hart slid his own B-4 bag into the plane, and pulled himself up the steps, holding his fresh uniform on a hanger in his left hand. He hooked it onto a nearby strap and turned to help his copilot up the steps. On the floor, just inside the door, was a pile of parachutes. For a single instant he hesitated with the thought of briefing his passengers on the use of a chute, but chuckled to himself at the obvious uselessness of such a step. The sergeant was an old timer — probably with many hours in the "blue" throughout the world, and the lieutenant was no novice, either.

He leaned against gravity, trudging up the steep, inclined floor of the '47, and made his way to the cockpit, turning to edge into the seat past the aisle pedestal. His copilot closed the door and then followed him to the adjoining seat. After he had gotten the "safe" signal from the crew chief standing with the fire bottle outside, Harris reached up and fingered the starting switch. There was a familiar hum of the starter, and he heard a whir, a cough, and then a roar of both engines in turn. The plane trembled slightly and incessantly as the instrument pointers felt for "operating conditions."

Harris picked up the mike, asked for takeoff instructions from the tower, and signaled for the crew chief to pull the chocks. Hart palmed both throttles forward and felt the plane jounce ahead slowly in response. They edged past a crew of three perched on an "aero stand" beside an uncowled C-45, on past two grimy-coveralled mechanics on an approaching yellow tug, and slowly swung onto the assigned runway. Captain Hart smiled reminiscently as he watched a B-25 lumber into the air off the far end of the runway.

They pivoted into place and ran the checklist. Everything O.K. He worked controls back and forward, sharp right and left. A call to the tower gave them full possession of the runway.

He leaned slightly to lock the tail wheel, throttled forward and felt the tautness of the controls as wind and plane engaged in the takeoff embrace. The reeling belt of runway plunged suddenly away and the white specked blue of the sky saturated the "V" of the windshield. With a left 90 and a right 45, he felt slowly for altitude, and picked up his heading. A couple of deft finger movements turned it over to the auto-pilot.

Both pilots settled back to the pattern of extended flight, so identical to many before it, routinely checking instruments and idly watching the landscape crawl by below.

A tedious hour passed. Another thirty minutes. The moments seemed geared to the sluggishly moving landscape stretched below. Then suddenly the fire detector for the left engine glowed red. Hart darted a quick glance toward the indicated engine, and his heart bounced into his throat at the sight of wavering petals of yellow flame licking out of the cowling. "We're on fire on No. 1, Ken," he shouted.

Quickly he feathered the prop, cut the switch and fuel to the left engine, then reached down, opened the fire extinquisher cover, and flipped the selector to "left." He pulled savagely on the cable release. The yellow serpents of fire merely wavered slightly but continued to spill out of the cowling.

"It's no good," he yelled. "We'll have to leave her. Hit the alarm bell."

Hart squirmed out of his seat, following the stern-faced copilot. As they made their way out of the cockpit, he was horrified to find his passengers still seated.

"What you waiting for?" he blurted, "We're on fire. Got to leave it."

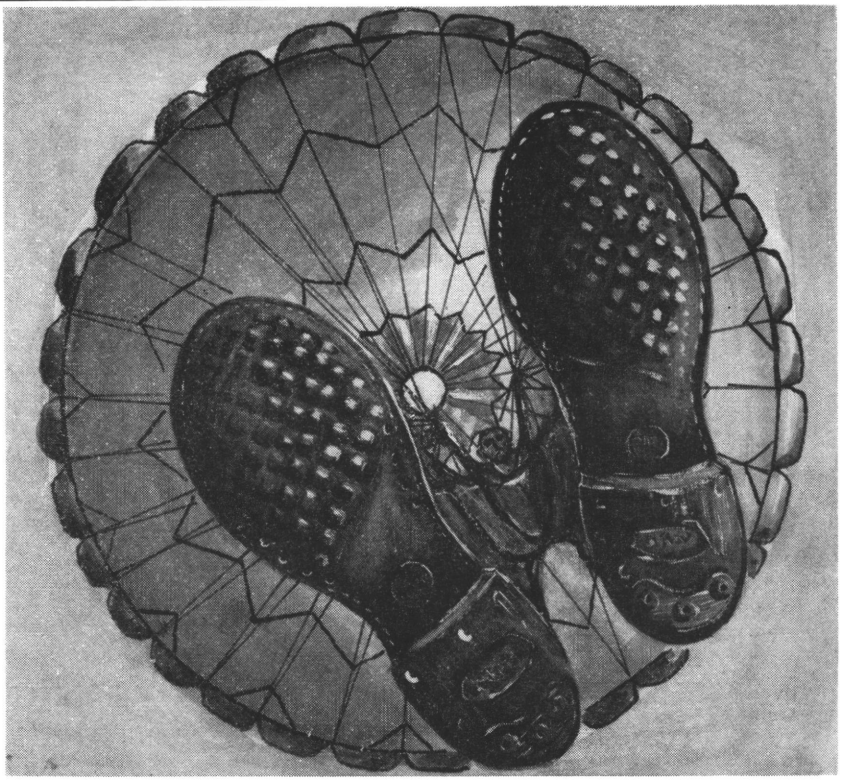
The sergeant's apologetic expression as he stood up would have been ludicrous in another situation. "I don't know how to put a chute on, sir." And it was like the dread voice of doom when he heard the lieutenant echo, "I don't either."

Fred Hart felt a block of ice jell in his mid-section. Over his shoulder he could see that the left wing was a seething mass of flames. Heavy black smoke was boiling out of the cockpit, and snaking back to where they were. The acrid fumes were beginning to claw at his parched throat.

It seemed incredible, and yet here were two grown men, an officer and non-commissioned officer, obviously holding responsible positions in the Air Force, who did not know how to put on chutes. Younger men, he would have surely briefed.

"How much time . . ." he mumbled desperately to the smoke-wavering top of the plane, and then resolution nudged by desperation filled him. "Ken, you help the lieutenant, and I'll help the sergeant."

Dashing to the rear, he dragged the chutes back to the center, and together, feverishly, both pilots worked to un-



Through his extended legs he could see the ground rushing toward him

tangle the harness of chutes, slide them onto their passengers, and tighten the straps. "Now go," he yelled.

Panic wrestled with their self-control as they both grabbed their own, shouldered into them, and tightened the straps. The cabin was full of boiling black smoke as they sprinted for the door. Behind them, the cockpit was an orange oven of shimmering flames. It was a miracle that the pitching, lumbering plane was still in flight. He saw his copilot go out the door and hurtle backward and downward and, squaring his shoulders, he lunged into space.

Outside, the wind tore at him, but he felt motionlessly pasted between the earth and sky. He seemed barely out the door when there were violent eruptions of flame, and the plane, trailing smoke, hinged its left wing upward and began a crazy spiral toward the earth.

"Thank God," Hart felt, rather than said. Dimly, as he fell, he was aware of three mushrooms of silk which indicated the others were safe. He pulled savagely at his ripcord with both hands and felt the chute's reassuring whipping and billow. The opening jolt pained him slightly, but it was unnoticed in the rush of relief through his bosom.

Through his extended legs, he could see the earth rushing up toward him. Twisting in his harness, he watched the plane strike the ground, flash orange and yellow flame, and then throw up boiling ovals of black smoke. He was mutely thankful that there was no human habitation below.

His stomach contorted violently as he thought how close they had come to being in that blazing holocaust. And then deep within him he heard the voice of his sub-conscious, that insolent, tactless companion of solitary vigils and dark moments.

"Well, mister," it taunted, "that was close. Matter of fact, you and all those people entrusted to you are just plain lucky to be alive. It's no credit to you that fate chose to grant you those precious seconds. That was a sad performance of duty. Don't you know it's a pilot's duty to brief his passengers?"

"But they look like old timers," Fred protested, "I always brief the kids, but how'd I know people like that didn't know a simple thing like how to put on a chute."

"Didn't it ever occur to you, mister, that there are hundreds of jobs in the Air Force that don't require a minute of flight. Probably that sergeant is in Food Service, and most likely the lieutenant is a desk jockey."

"Anyway, the plane was in perfect shape. It pre-flighted right on the money."

"That's a lame excuse. To make an internal combustion engine in the first place, you harness the ingredients of hell. And even the best serviced plane sometimes loses the infernal battle, for reasons that no man can say. Who knows if that flaming pile down there was human error or physical caprice. The parachute was made in acknowledgement to the Big Variable, and no pilot has a right to accept anyone's safety in his hands without making sure they have an advantage of unquestioned knowledge of its life-saving techniques."

The brown and green carpet of the earth thrust up swiftly and rammed against his feet, sending pain through his legs as he tumbled. But it was a good, solid, reassuring feeling, and Captain Fred Hart knew that he would never again throttle an aircraft into the "blue" without heeding this crucial "lesson-in-silk."

"Rush Hour"

WEATHER, rusty short-field technique, low time in type or model, flying skills atrophied through months of desk-bound duty — these hold no terror for the aviator who is straining to attain annual minimums. Compulsions of flight pay and career seem to urge the last hour rush in the face of many hazards. Annual flight minimums, designed to maintain flying proficiency, sometimes boomerang into demonstrations of the need for proficiency.

One Army Aviator considered himself very lucky to be assigned a three-hour administrative flight. His destination was a maneuver area and he'd get a chance to practice strip landings. Arriving over a strip, he called for landing instructions and was told to land as short as possible because helicopters were parked on the far end of the strip. He failed to consider the effect of the wind on the confined strip area, misjudged his approach, and landed 114 feet short of the strip. The Beaver bounced, settled on the strip, and ground-looped. The only previous power approaches this Army Aviator had practiced in L-20 aircraft were to 3,000-foot runways with clear approaches.

Two Army Aviators needed first pilot night cross-country time to meet their annual minimums. The unit commander assigned an instructor pilot to accompany them on a round-robin cross-country in an H-21C. They planned a triangular course of 355 miles, with each leg slightly in excess of 100 miles. There were to be two fuel stops. The instructor pilot talked to the forecaster on Plan 62 and received a weather briefing. Ceilings were forecast to be 2,000 feet with light rain, minimum visibility of 5 miles in rain, smoke and haze. The instructor pilot made no entries on DD Form 175 during the briefing.

The Shawnee, with the three pilots, a crew chief, and one enlisted passenger, took off at 2013 hours and completed the first leg of the cross-country at 2140 hours. The aircraft was refueled and departed on the second leg at 2230 hours. The second leg was more time consuming because of rain showers and the necessity to circumnavigate thunderstorms. It was completed at 0025 hours. While on the ground during the second stop, the aviators received an advisory from the home field warning about light rain showers and scattered thunderstorms on the third leg. The instructor pilot conferred with military flight service and was advised of deteriorating weather conditions along his proposed route. He elected to continue the flight, remarking that he could always land if the weather went below VFR. (Remember "I Can Set It Down Anywhere!"?)

The flight departed for the last leg at 0135 hours. At 0230

This article was prepared by the United States Army Board for Aviation Accident Research.

hours, a call was made to the tower of an Air Force base, reporting the Shawnee's position as 10 miles northeast and requesting local weather. The tower reported scattered clouds at 700 feet and negative local traffic. This information was acknowledged and this was the last contact with the aircraft.

A truck driver was the only witness to the final moments of flight. He reported that the helicopter flew over his truck, turned right and entered haze, came out of it and began descending, then flew into fog. The aircraft made a gradual descent, disappeared behind a hill and the driver saw flames. A light rain was falling and the cloud base was approximately 300 feet above the terrain. The aircraft crashed and burned 15 miles short of its home field.

Another Army Aviator returned from a tour of ground duty and the operations officer assigned his assistant (not an IP) to give the aviator a proficiency check in an H-13H. The assistant decided the aviator did not actually require a check because he had logged over 500 hours rotary wing time, with 25 hours in the H-13H. He did, however, ride with the new Army Aviator and was satisfied with his performance. He asked if there were any specific areas in which the aviator needed assistance, received a negative reply, and cleared him as operational.

The next day the pilot was assigned a mission to transport battle-group personnel to training sites. During a flight to Headquarters, his passenger, the executive officer, requested that he be landed on a turnaround at the end of a dead end street. The Army Aviator circled the area once, noticed heavy powerlines along one side, and began his approach down the street toward the turnaround area. During the descent the passenger alerted the pilot about wires crossing the street. The aviator's reaction was too slow; the main rotor struck the wire, snapping five strands of telephone cable. The wire trailed back and became entangled in the tail rotor, damaging the tail rotor blade and breaking the anti-torque cable. The aircraft stalled, began turning to the right, and struck the ground.

This Army Aviator had flown only 20 hours in the helicopter during the preceding year, and only 1 hour in the 6 months preceding the accident.

Minimums are minimum! Any aviator who has to fly full bore during the last few weeks of the fiscal year to attain minimums should realize that the very fact he hasn't met minimums is convincing evidence of a probable lack of proficiency. The doctor who has been performing research on the mosquitoes of Lower Slobbovia doesn't rush into the operating room, grab a scalpel, and remove a perforated appendix. He's a professional; he knows his limitations and is not ashamed to ask for help. If YOU'RE sweating minimums, chances are YOU have limitations which will need some form of help. This is April. Plan now and avoid the rush hour!

A C-47 HAS BEEN forced to make an emergency landing at an airstrip 260 statute miles from your airfield. You and a copilot are given the mission of flying an Otter to this airstrip, dropping off an engine repair crew, and returning with perishable goods from the downed aircraft. There are no refueling facilities available at your destination.

How many pounds of fuel will be required for the mission (include a 30-minute reserve), and what weight of cargo will you be able to transport on the return trip?

Maximum Gross Weight — 8,000 lbs

Basic Operating Weight — 4,490 lbs

Groundspeed (no wind) — 95 kt

Rate of fuel consumption — 30 GPH

Fuel for taxi and runup (total) — 100 lbs

Choices:

a. 1,048 lbs of fuel; 2,791 lbs of cargo

b. 1,048 lbs of fuel; 2,991 lbs of cargo

c. 1,174 lbs of fuel; 2,728 lbs of cargo

The recommended solution to the PUZZLER may be found on page 31.

SMARTY FEVER'S LETTERS from EDDIE (A SAFETY OFFICER)

Lieutenant William L. Patrick, Inf.

Dear Leghorn,

(He always said my entries in the Form 780-1, -2 looked like chicken tracks.)

Things are fine at Valley Army Airfield. You remember old Charley Clunk, don't you? Why old Charley took a flight the other day. The schedule said to go to Wash, but he won $50 when he took them to the cleaners. Nice work if you can get it, and Charley did get a working over from the old man.

Sneaky Pete has tried a unique way of getting his night minimums. He said he was helping the pilot in an L-20, equipped with dual controls, make night landings. I wonder if being in the tower operating the radio and the runway lights meets the requirement for night time?

Harvey Hurrup got all tanked up yesterday. He took a flour-bag mission and flew a little low over the tank column. At least the tank driver finally got those wings to go with his stick.

Not too much else, so will close now. I must go and help Roger. He was a copilot on an L-20 and was told, "Take off flaps" during a maximum performance takeoff. He took them off to zero, and that's what the L-20 is worth.

As ever,
Eddie

Dear Elvis,

(Air Traffic Control always said I mumbled while talking to them.)

Tom Mueller used his head last week when he had that H-13 accident. I can't see why though, as it would have been much easier if he had had his hard hat on. Oh well, he was always wishing for a scar on his face like those college kids in Germany.

Bill Knotts is on the job and back in harness working. You remember him, don't you? I'm sure he wouldn't have had that trouble if he had worn his shoulder harness in the first place.

Georgie dropped in while on leave with a real classy job on his arm. His girl friend said that he should have the cast off next weekend. Guess he will check the mags before swinging any more props.

Harry just came in Operations after getting back from a short trip in a helicopter. Maybe next time he will get away a little farther, as he sure won't forget to see that both skids are untied. At least this gives us some wood to start fires with.

Not too much else, so will close now. Gotta go help Joe, the mechanic, as he gets a big bang out of pulling periodic inspections. There he goes by the window again. I told him to stop washing parts in gas.

As Ever,
Eddie

Dear Daiquiri,

(Eddie always said I was all shook up after going thru that thunderstorm.)

Things are fine at Valley Army Airfield. Your buddy, Joe, now has a nickname. He got that for landing an L-23 with the wheels up and nicking the props.

Harry threw a flight party

Lt Patrick is an instructor in the Instrument Division, Department Advanced Fixed Wing Training, USAAVNS. He is fixed wing qualified with approximately 1,800 flight hours.

last night after collapsing a gear on an L-19. Harry threw this party right off the field for not writing up a hard landing the day before. One consolation, Jim is the seventh American satellite to go into orbit.

Old Elmer Clank forgot his form prior to his short field takeoff yesterday. I bet he wishes he had it when he hits Los Angeles, as the part 1 would be handy to have.

Buck, the mechanic, has a new Bird Dog that isn't gun shy. The only trouble is that his Bird Dog chased some rabbits off to the side of the runway. Maybe if he set the caster right on the main gear he wouldn't have that trouble.

Not too much, so will close now. I have to go and help Tom again. He just doesn't believe in the saying, "Don't attempt vast projects with half vast ideas."

As ever,
Eddie

Dear Macy,

(My supply officer always said I had enough scrounged material to start a department store.)

Things are fine and are really booming at Valley Army Airfield. In fact, after Jim was late in pulling pitch on an autorotation we had H-34 tail boom all over the place.

One of the pilots had trouble with his transfer yesterday. He didn't get what he wanted. He wanted to go to Miami but he thought his L-20 wingtips transferred into his middle tanks instead of his front tank. Air Traffic Control thought it odd when he made his approach to the Everglades instead of Miami.

We also had a disappointment and a letdown here at the field. In fact it was quite a letdown as George made it here with a Pensacola approach plate. We were disappointed to lose our L-23 so soon after getting the props fixed.

Tom Smith branched out in the flying game yesterday. He decided to try dropping messages. The only thing is that he got so involved in looking behind to see if the message hit right that his L-19 branched out instead, with an oak limb.

Joe picked up a violation and a headache yesterday. He filed a local from Valley AAF in his H-13, but took a cross-country instead. He went to Walter Reed, but the Sioux only went across the apron because the tanks were dry.

Oh well, maybe he can use the cross-country for his minimums.

Well not too much else, so will close. I must go and help Virgil, as yesterday he said he was going to face everything with a smile. I don't know about him but his H-13 will, as he ran out of rotor rpm while landing.

As Ever,
Eddie

CRASH SENSE goofed on page 34 of the March issue. Describing a shutdown procedure initiated to prevent main rotor blade tail boom strikes, we said: "After landing into the wind, turn the helicopter 135° clockwise and then shut down." This should have read **counterclockwise.** Thanks to Flight Commander Wilson, Camp Wolters, Texas, for bringing this to our attention.

Solution to This Month's Puzzler

On the basis of the factual information contained in the PUZZLER on page 29, the recommended solution is as follows:

The correct answer is **a.** First, the distance must be converted to nautical miles, or the groundspeed converted to miles per hour. Traveling 452 NM at 95 kt would take 4 hours and 45 minutes. At 30 GPH, 143 gallons, or 858 pounds of fuel, are consumed. A reserve of 15 gallons, or 90 pounds, plus 100 pounds for taxi and runup, will give a total fuel requirement of 1,048 pounds.

To determine the cargo load, add the basic operating weight, the weight of the co-pilot, and the fuel remaining on board (half the fuel required for the mission, plus the reserve). The fuel for taxi and runup can now be discounted, since it will be burned off prior to takeoff. This totals 5,209 pounds. Subtract this from the maximum gross weight of 8,000 pounds for an answer of 2,791 pounds of cargo.

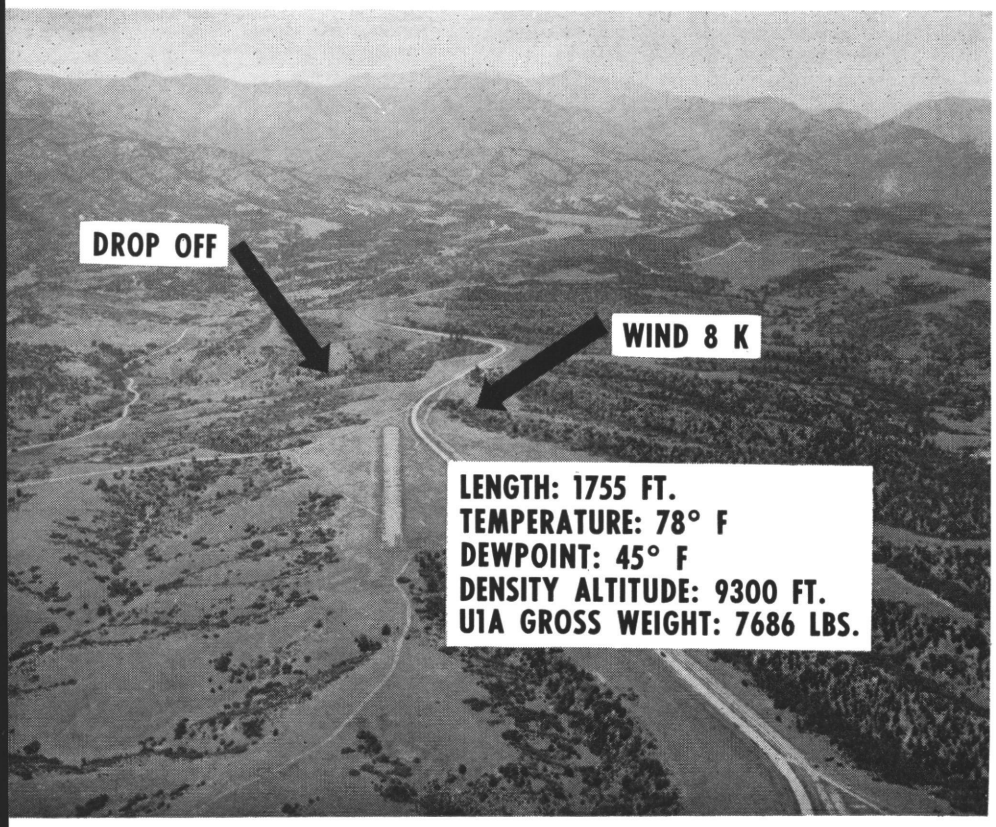
CRASH SENSE

PREPARED BY THE UNITED STATES ARMY BOARD FOR AVIATION ACCIDENT RESEARCH

SUMMER TAKEOFF

YOU COMPLETE DD Form 365°F. (weight and balance), listing basic weight of your U1A (Otter) as 4,885 pounds; oil, 81 pounds; crew (2), 400 pounds; fuel, 720 pounds; passengers (8), 1,600 pounds, for a total gross weight of 7,686 pounds. The strip is 1,755 feet long, firm, dry and unsodded. It has clear approaches and lies roughly NW-SE. With a temperature of 78°F. and the dew-point 45°F., density altitude is computed at 9,300 feet. Wind is out of the north - northeast at 8 knots. Rugged terrain surrounds the strip and there is a deep ravine approximately 1,200 feet from the northwest end. Can you make a takeoff under these conditions? Would there be a question in your mind about whether you could make it?

Would YOU try it?



One Army Aviator tried and failed. Apparently, there was no doubt in his mind that he could complete a safe takeoff. Let's see what he had to say about it: "I began the takeoff roll and was airborne approximately three - fourths of the way down the strip and crabbed slightly to the right. I was holding a 200-300 fpm climb and airspeed of 55 knots. As we passed over the edge of a ravine, approximately 1,200 feet from the end of the strip,

suddenly, the aircraft was sucked down into the ravine. At the time we hit the downdraft I had full power and takeoff flaps. Despite the application of corrective action, the aircraft continued to sink. When I determined that a forced landing was inevitable I turned slightly to the left to avoid a crash straight into a hill. I used full power and stalling attitude in order to break the fall onto the slope of the hill, and to maintain maximum control of the aircraft as long as possible."

Now, let's see what a witness had to say: "As it passed us near the center of the strip, it (the aircraft) had not reached its takeoff attitude. The engine seemed to be running smoothly and producing a lot of dust in its wake. The aircraft continued down the strip, still on the ground, and I began to wonder if it would get airborne before it reached the north end. When the aircraft reached what seemed to be the north end of the strip, it became airborne slightly and remained at a very low altitude over the ground after leaving the strip. I knew the pilot was having difficulty getting flying speed and a climb out. He continued straight ahead, remaining low, fighting for airspeed, until he dropped out of sight from the strip down a large ravine."

The weather forecaster adds: "It appears quite plausible that the area in question was subject to eddy currents and downdrafts that may have hampered the aircraft in flight. The unequal heating, because of terrain, combined with a 30°, 8 mph surface wind, would create a turbulence within the lower 200-300 feet that might occasionally be dangerous."

Checking with the -1, we find some very illuminating information in figure A-6 of Appendix 1, page 135. Takeoff and climb-away indicated airspeed with a gross weight of 7,500 pounds is 61 knots. This particular aircraft grossed 7,686 pounds. According to the chart, it would have required approximately 2,300 feet to take off and clear a 50-foot obstacle from a **hard surface** runway. But there were no obstacles on this strip; both ends were open and clear! This poses an interesting question: Do obstacles always consist of trees, wires, buildings, or other visible obstructions? How about that quartering crosswind blowing across the takeoff path and down into the ravine? Can we expect a downdraft?

Adding to this particular aviator's problem was Item 17 in DD Form 781-2. His Otter was serviced with 80/87 octane fuel. Performance data presented in the appendix in the -1 is based on fuel grade 91/98 octane. There was some question about whether the engine developed full power during the takeoff run. The report from a laboratory disassembly inspection states: 'There was no positive evidence of engine or propeller partial or complete failure prior to crash impact."

In summary, the aviator was faced with critical takeoff conditions: short strip, quartering crosswind, probable turbulence and downdraft, unsuitable terrain ahead, and a fuel grade below that used for -1 takeoff performance data. According to the aviator's statement, indi-

This one tried!

cated airspeed was 55 knots when the aircraft left the ground and began to climb (?). This was at least 6 knots below the airspeed listed in the -1 for the gross weight and very few above stalling for takeoff configuration and weight. In other words, the aircraft left the strip below recommended airspeed, staggered into the downdraft from the quartering crosswind and fell into the ravine. The aircraft was destroyed. Fortunately, there were no fatalities and no serious injuries.

Prescribed treatment for this particular type of malady consists of large doses of TO 1U-1A-1, taken daily, and additionally as needed, to relieve all symptoms of doubt.

DUST

Dust is another aspect of summer which is sometimes a nuisance to fixed wing aviators, a problem to aviation maintenance, and a downright hazard to chopper jockies. Take any open area; roll heavy equipment through it, march troops over it, shoot takeoffs and landings from it and before long, the dust begins to fly.

A combat support flight leader decided to move one of the flight's H-13s nearer a command post because of armored vehicles operating under blackout conditions in the area. Shortly after sunset he assigned a subordinate to move the helicopter. The aviator alerted the ground crew to provide guidance, and departed.

The aircraft was parked in a defiladed tactical parking position. The aviator made his takeoff and flew to a point near the command post parking area. As he descended to a hover, considerable dust was blown up by the rotor downwash. Two ground crewmen attempted to guide him into position with flashlights, and the aviator switched on his landing light. As the helicopter moved rearward through the dust, the main rotor blades struck nearby trees. It assumed a tail-low, right bank attitude and struck the ground approximately 25 feet from the trees. The aircraft bounced rearward, maintaining the same bank attitude and struck the ground again. Then it rotated approximately 90° to the right and came to rest on its right side. Flames broke out during ground impact and the aircraft was completely destroyed. The aviator, attempting to escape, was caught in the flames and fatally burned.

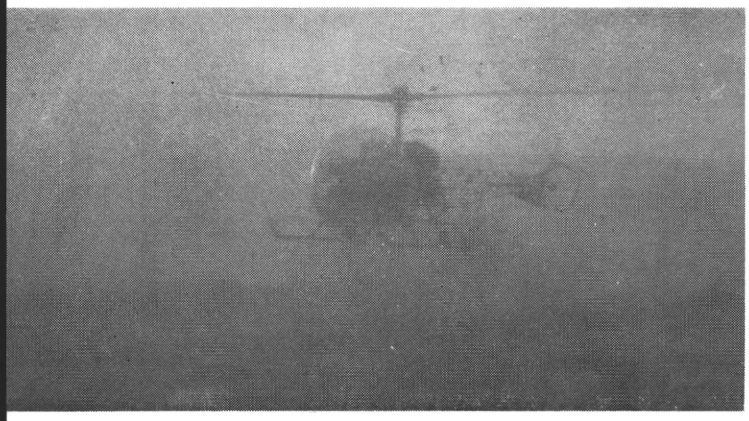
The ground guides were equipped with ordinary flashlights, and it is entirely possible that the beams of these lights contributed to the aviator's disorientation. Use of the landing light, which probably reduced visibility in the heavy dust, further aggravated the situation. The combination of dust and the movement of the ground guides apparently gave the aviator the impression he was moving forward from the initial hovering position. This would seem to be the only logical answer to why he hovered to the rear.

Dust is not limited to the summer months, but it is far more likely to exist under hot, dry conditions. The best words concerning dust are: ANTICIPATION, ALERTNESS, and AVOIDANCE.

THE AIR YOU FLY THROUGH

Skin divers either learn all there is to know about water, the element in which they work and play, or they don't remain healthy skin divers for very long. Old pros, like Mike Nelson, tell us it's a great sport, if treated with respect for its hazards. In other words, you don't just strap on an air tank, blow in the mouthpiece, and dive off the deep end. Mike tells us we

When the dust settled . . .



this is all that remained

Thin air will let you down

need a course in handling our equipment and a great deal of consideration for the inherent qualities of the particular batch of H_2O we propose to invade.

Mr. Nelson's advice is sound; it is equally important whether you prefer water or another element.

The air you fly through this morning is not the air you'll be flying through later in the day, after old Sol gets his heatlicks in. You start out fine; your chopper is as frisky as a 3-year old. Then the summer sun begins its daily burn; temperatures shoot up and so do density altitudes. The density altitude was reported to be around 8,600 feet when one aviator began an autorotation from 500 feet above the ground. He began to flare at approximately 40 feet above the ground and almost immediately sensed the H-13 was falling through. He added power and collective pitch to recover, intending to go around. The recovery was started too late and the helicopter struck the ground in a nose-high attitude. It bounced into the air, continued for an additional 350 feet, fell to the ground and turned on its right side.

The hazards of high density altitude are well known to experienced aviators, especially those with professional attitudes toward flying. Sometimes, such basic knowledge becomes so second nature that it is seemingly forgotten, even by the old pros. Many experienced pilots have bought the farm (or made substantial down payments) because they flew at noon just as they did at dawn.

ZERO-ZERO

An aviator took off on a VFR flight plan in an H-13E. He completed the first leg of his flight, landed, refueled, and took off again. One hour later, the aviator landed again at the same airfield. He then proceeded to take off again and landed next in a farmer's field. He called Flight Service, received a 30-minute extension on his flight plan and took off again. The aircraft crashed in a wooded area four-fifths of a mile from the farmer's field, killing pilot and passenger.

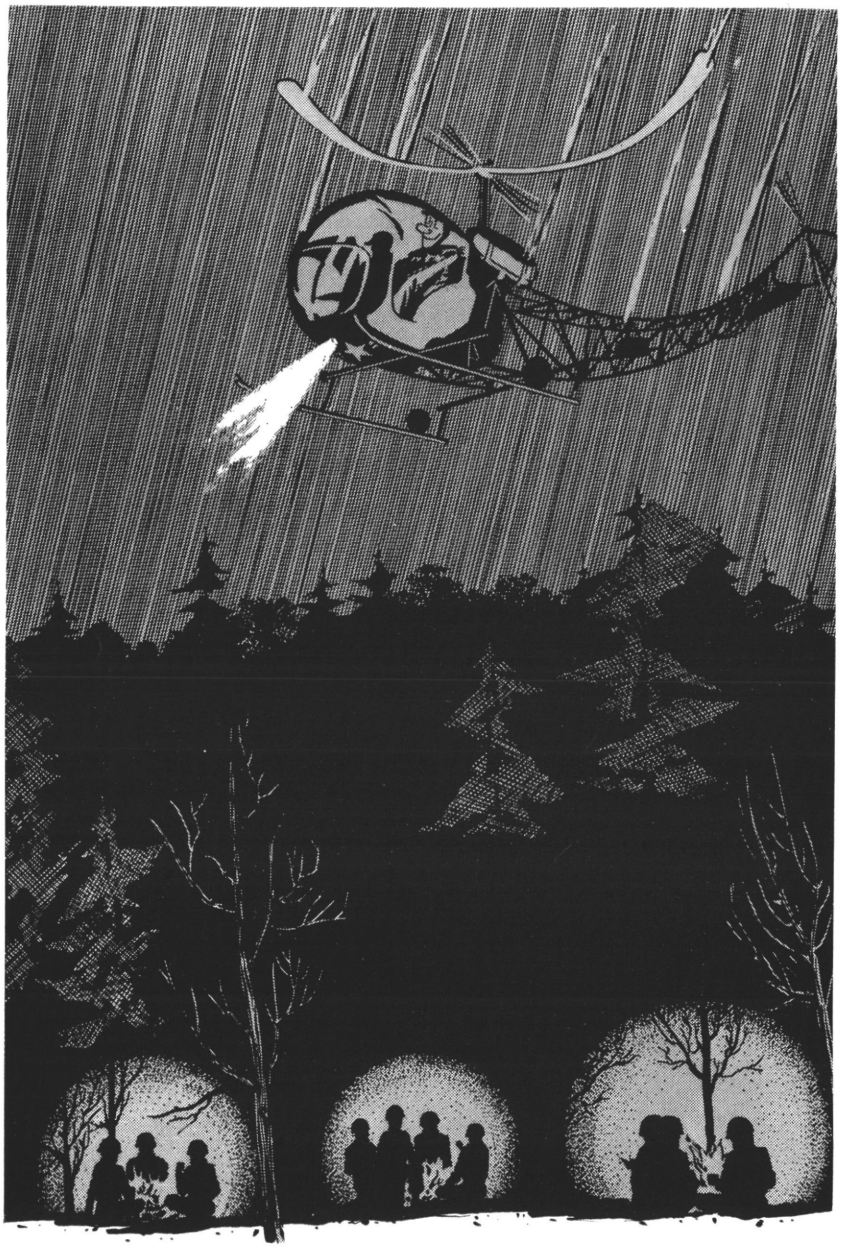
Examination of the engine, fuel and control systems of the crashed aircraft revealed no malfunction. Approximately 200 witnesses in the vicinity of the crash stated that weather was zero-zero at the time of the accident. Question is: What compelled this aviator to attempt to fly through these weather conditions after he had successfully completed two landings? The answer is unknown. One thing we do know: regardless of what his compulsion may have been, THIS TRIP WASN'T NECESSARY!

BUBBLE FOGGING*

Recently an H-13 crashed from a hover and burned at 0630 hours in the morning. Night conditions existed at the time of the accident. The pilot, badly burned, stated that the bubble fogged and he attempted to set the chopper down without an outside reference.

In discussing this problem of bubble fogging with a number of experienced helicopter pilots, it was determined that condensation of the bubble or windshield occurs in some cases gradually, in other cases instantaneously, and usually only occurs while hovering. In one case, involving an H-34, fog-

*This portion of *Crash Sense* was contributed by Lt Col Jean L. Chase, Aviation Safety Officer, Simmons Army Airfield, Fort Bragg, North Carolina.



ging occurred during a climbout several hundred feet in the air. Temperature undoubtedly has some effect, but exactly what effect is not known. Fogging appears to be more prevalent during winter mornings when a high humidity condition exists.

The following interim measures may help to eliminate this problem until further study can solve it.

(1) The fogging of your car's windshield during your early morning drive to the airfield may alert you to expect possible fogging conditions that morning.

(2) The utilization of the cabin heater and blowers in the H-13 has been reported as a solution, and is well worth trying even though it may become uncomfortably warm in the cockpit.

(3) Alert your passengers that fogging can possibly occur and to be prepared to open his door. This can give you an outside reference and will in some cases clear your bubble.

(4) In helicopters equipped with side windows, open one or both of these windows while hovering and during climbout when fogging is suspected.

In conclusion, the above suggestions may or may not always work. However, the knowledge that a dangerous condition may exist is half the battle. You have a fighting chance if you are prepared with a plan of action for a possible emergency situation.

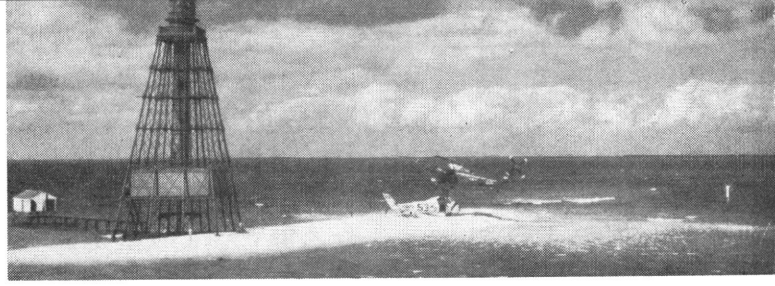
NEAR MISS

"I had been operating for several days in the field with an Infantry battle group. My landing pad was lighted each night with three flare pots and I had been using it both day and night without difficulty.

"On this occasion, I was returning to the pad with the group CO as my passenger. The night was very dark, but there was a horizon. I spotted what I thought were the three flare pots around the pad and began my approach. During the descent, I flipped on my landing light to spot the trees around the clearing. They weren't there! I let down some more, and trees began appearing much too close and in all the wrong places. As I poured on the coal and pulled up, I noticed troops around three camp fires. The ground crew had not lighted the flares at the pad and I had made an approach to a company bivouac."

Island Hopping

Captain Theo C. Watkins, TC



A PROFESSIONAL attitude toward mission accomplishment, which involved coordination between all three services, was recently demonstrated when an Army and a Navy helicopter were rescued from precarious locations on the Florida Keys.

"Operation THEKW" — Transportation Helicopter Evacuation Key West — began when the Transportation Aviation Field Maintenance Shop, Fort Benning, received word that a Fort Rucker H-21 was down on Howe Key, 17 Nautical miles east of Key West. The Shawnee had experienced engine failure while transporting Department of Agriculture personnel on a plant life expedition.

An eleven-man task force left Benning in an H-34 Choctaw and H-37 Mojave, carrying special tools, jacks, engine slings, and other items which might be used while changing an engine on an island.

After stops at Rucker — where an engine quick change assembly (QCA) was dispatched by commercial truck to Key West — the rescue team arrived at Homestead AFB. Here they were briefed on overwater flight and issued survival equipment, including a shark chaser which the Air Force briefing officer said was only 50 percent effective!

A base of operations was established at Naval Air Station, Key West. A recon of the rescue site revealed the H-21 pilot had made a beautiful autorotation on the highest part of the key. But the problem of engine changeout was going to be complicated by tide changes which left the aircraft sitting in three inches of water and mud at high tides.

The first move was to sling load a 1,400-pound engine A-frame to the small island with the H-34. Back at Key West, it was discovered that the QCA was too large to fit into the H-37. The idea of sling loading it to the island was dismissed after learning that it was the only QCA in the southeastern United States, and it might be damaged in the operation. Finally the QCA was removed from its container, bolted to two 2- by 6-inch boards planed into runners. The H-37 Mojave was parked in a slight nose-down attitude and the assembly was pushed on board.

Out on the island, it was another problem to unload the 2,200-pound QCA while standing in mud. The engine A-frame, on wheels, proved useless except to lift the engine out of reach of the daily high tide. Finally, with back breaking labor, the assembly was manhandled off the Mojave.

Using the organic Shawnee engine slings (a beautiful maintenance feature), the old engine was lowered onto a support of sandbags. Another knotty problem now arose. The engine was too tall to come out from under the side of the engine compartment. Digging a hole and lowering the nose gear into it and fully extending the main gear struts failed to give sufficient room. Only after a quick trip to Key West for timbers which supported the jack was the old engine removed, and the new one installed. A job well done considering that it was the first time the crew had ever been called upon to change an engine on a small island.

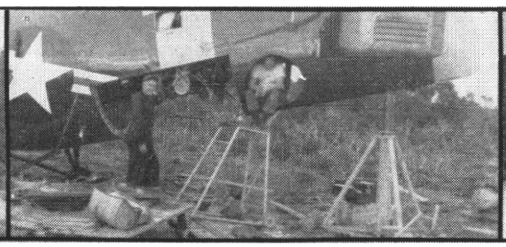
While cleaning up operations were in progress, word of a new emergency was received from the Naval Base Commander. A Navy HSS-1 (ARMY H-34) was down on Sand Key due to engine failure. Could the Army crew sling load the helicopter back to the Naval Base?

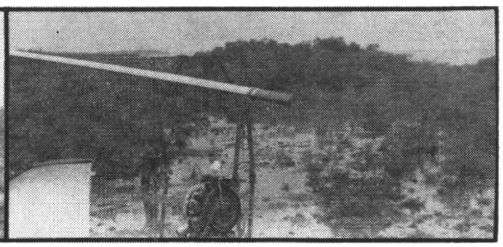
This was a job of operations — not maintenance — so permission to perform the mission was obtained from the 3rd Army Aviation Officer.

The HSS-1, while almost identical to the H-34, is considerably heavier because of sonar gear. After removing some of this gear, main and tail rotor blades, the weight was scaled down to 7,740 pounds. A 65-pound tool box was placed in the aft section for balance. Ideal weather conditions for the lift prevailed: elevation, 2 feet; temperature, 72°F; wind, 22 knots. The Mojave easily airlifted the HSS-1 for the 10 miles back to the naval base.

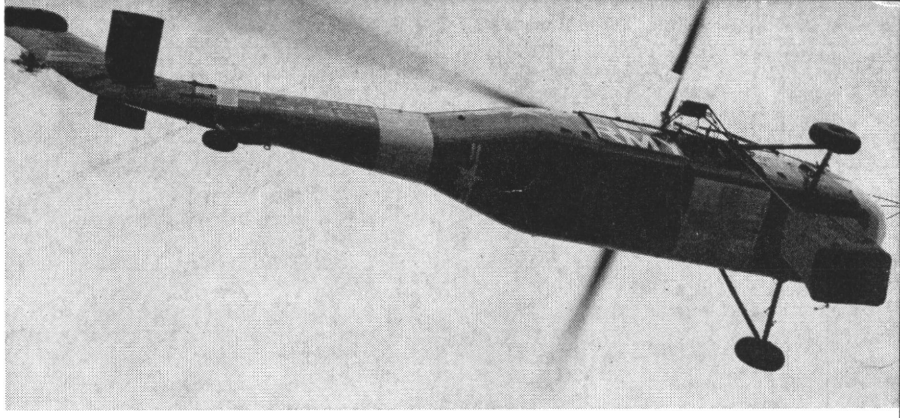
Back at the Army's H-21 a routine operation of ground runup and a hovering test assured the crew that their mission had been successfully accomplished.

Captain Watkins is the Field Maintenance Officer at Fort Benning, Ga.



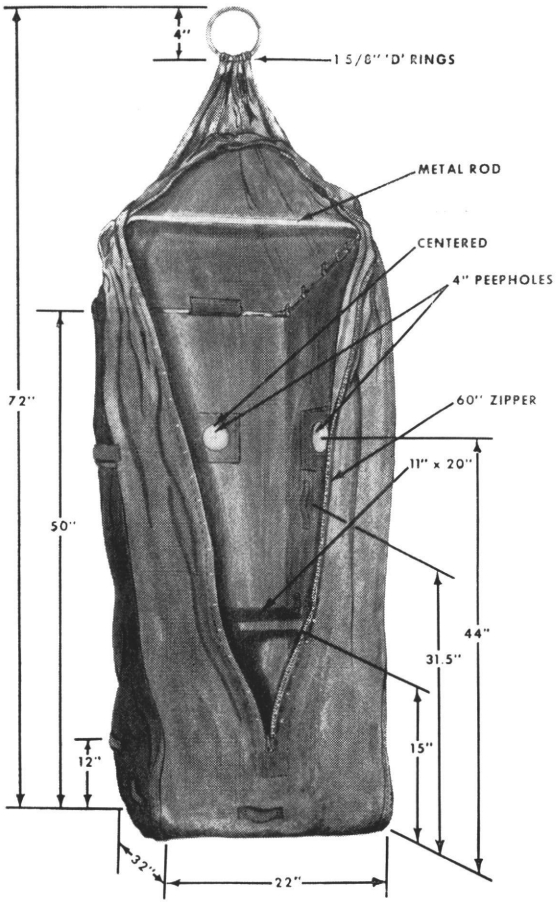


Air Rescue Bag



ANOTHER PAGE in the story of rescue operations was written recently at Fort Rucker when Maj Gen Ernest F. Easterbrook stepped into an overgrown duffel bag, zipped it up like a modern day Houdini, and was whisked skyward to the open door of a Crash Rescue helicopter.

As the bag climbed toward a winch near the open door, the hovering helicopter bucked 20-30 knot gusts of wind. Safely inclosed within the bag, the General simulated the rescue of a downed, perhaps injured, Army Aviator. This device may well prove to be a lifeline in future evacuations, both military and civilian.



The idea for this new escape device was conceived by General Easterbrook, commanding general of the U. S. Army Aviation Center and commandant of the U. S. Army Aviation School. Final design and fabrication were completed by Center personnel.

It is a simple canvas bag with a folding seat, peepholes, hand supports, and a zipper. For stability and balance, the bottom is a piece of wood. The overall size is approximately 22″ wide, 32″ deep, and 72″ high; it can be folded flat for ease in handling and storage. The bag can be fabricated for a cost of less than $10.

Although the rescue system at Fort Rucker is geared for efficient, rapid rescue, the rescue bag will fill a need. Here at Fort Rucker there are many spots of heavy vegetation where a helicopter cannot land. In such cases, the helicopter can hover overhead while the bag is lowered for evacuation of the stranded or injured.

This rescue bag will become a part of the equipment carried aboard the Crash Rescue helicopter which stands on duty around-the-clock at Cairns AAF. It can be airborne in seconds and arrive at any crash site on the reservation within minutes. With the bag aboard, only minutes more will suffice to make the rescue and carry the patient to the landing pad at the U. S. Army Hospital.

The bag can be used for two-way traffic. In cases of severe injury, a medic can be lowered in the bag to render immediate aid, determine whether evacuation is desirable, and assist in loading the patient for lifting into the hovering helicopter. A radio intercom system will be used for communication between the medic and pilot.

World - wide this escape device offers rescue capabilities for both civilians and soldiers. It can be used to rescue flood victims, people from burning buildings, mountain climbers, and pilots who might go down behind enemy lines. In any disaster where time is important or rescue is difficult, even if a landing could be made, the rescue bag will save the minutes that might save a life. Its design will simplify the rescue of those injured personnel for whom previous lift devices have been unsuitable.

After his test ride in the bag, General Easterbrook remarked that he was very pleased with the way it had worked. He discussed the possibilities of making it more comfortable for injured personnel and working out better communications between the man on the ground and the pilot. But these are minor technicalities, he added, the big job has been accomplished.

This escape bag may prove to be one of the most important aids to crash-rescue work since the advent of the helicopter.