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UNITED STATES ARMY AVIATION DIGEST

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

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LETTERS

Sir:

My writing on the values of a preflight is only a comment on a subject that is obvious to all, yet, at times and by some, is mocked or shrugged off as being nothing more than a tedious preliminary of flight.

Because we all realize the safety factors involved and what well could hang in the balance in a thorough preflight opposed to one that is haphazard, my main interest is to suggest other important factors, which although secondary to determining the airworthiness of an aircraft, relative to inspection, are still or should be of vital importance to a qualified aviator.

I arrived at Rucker after completing the primary phase of training in the OH-23 with an unfounded impression that maintenance problems were of no concern to me as a prospective aviator. If I were assigned an aircraft I concluded it to be worthy of flight for no better reason than mere fact that it was on the flight line and assigned. For me a preflight consisted of a quick visual scan of the controls and rotor system that was nothing more than formality. Because of this, although I supposedly qualified to fly the OH-23, I left it and Wolters knowing relatively little about the capabilities, limitations, idiosyncrasies, and general problems of this, the aircraft that I spent some 90 hours in flying.

I think I've learned more about flying and about the machines that get us off the ground since I've been here at Rucker than I ever did at Wolters and in only about one-fifth of the flying time. The reason for this is that my introduction to the UH-19 and to the preflighting of it was not only in respect to how to fly it, but also, and equally if not of greater importance, why it flies and its limitations of flight.

Parallel to this I've learned the importance of knowing why a component of the aircraft malfunctions, corrective action in coping with relative problems, and in many cases what caused the component to fail, not simply to recognize a discrepancy and to let it go at that.

This has been a valuable lesson for many reasons. It has taught me that the world of aviation is a much greater vista than I had assumed and that all related areas of the field are directly related to the man in the cockpit and of equal importance to the safe and successful completion of any given mission, as his personal ability to coordinate his cyclic, collective and pedal controls.

As a result of my brief experiences here at Rucker in preflighting aircraft I've gained knowledge that could never be had in flight experiences alone. This has given me not only confidence in myself, but a working knowledge of the aircraft which is a vital prerequisite for an aviator if he is to have confidence in his aircraft.

TIMOTHY P. COUSENS
WORWAC 65-1W-1

Sir:

Another aviator has recognized one of the biggest boners of Army Aviation and has had the courage to put it in print. I have reference to Captain G. F. Christensen's article "Ideals and Realities" in the December issue of the AVIATION DIGEST. Since such articles concerning the sideline feature of Army Aviation keep cropping up, maybe there is something to them. I believe there is.

The fellows who keep yelling that their branch comes first and that they would give up flying before giving up their branch are merely parroting military oriented views. The reasoning behind this loyalty is pure and simple: "Don't bite the hand that feeds you."

The young officer must make a choice: pursue a career or a profession. And it is this path he must take to get good efficiency reports and to get those promotions regularly. Make no mistake, there is no career program for aviators as such. It is from his branch that he must carve a career. You have riflemen in the infantry branch and tankers in the armor branch, etc., and then you have aviators, where? They're not really aviators at all; they're riflemen and tankers who have been given the additional duty of piloting a flying machine for two out of three years.

Do not be deceived, for in the event of an out and out war with the enemy, it will be armed helicopter against armed helicopter and armed aircraft against armed aircraft, etc., down the line. All the branch schooling and good efficiency reports and fancy patches sewn on our flight suits won't deter the enemy one bit in his attempt to kill us. If the equipment is comparable, only one thing will determine who shall survive, and that is the skill level of the participants. Skill level is determined by one thing — FLIGHT EXPERIENCE. You get this experience from flying, not by sitting behind a desk, or laying off every third year. A few thousand hours doesn't make the experienced pilot. It takes much training followed by more intensive training.

You can't have first class aviation as long as you give it second class citizenship.

CAPT WILLIAM R. HOLLIS
Mineral Wells, Texas

Army Aviation TACTICAL Landing Areas

Captain Richard V. Coulter

FROM THE jungles of Southeast Asia to the plains of Europe, Army Aviation is being employed to perform an ever-increasing number of tasks which require greater effectiveness than ever before. As is true with any undertaking of this magnitude, problems develop which affect the overall efficiency of operations. One of the major problems encountered is a lack of standardization in terminology and in methods of marking and lighting tactical landing areas. Not only aviators but ground commanders as well must have a common understanding in this area if effective responsive aviation support is to be expected.

TERMS

Ask any soldier to define a tactical landing area. Read any exercise or test report. Refer to any field manual on the subject. Note the erroneous terms used to represent and describe tactical landing areas. What a conglomeration of erroneous and ambiguous information! Not only do these sources contradict each other, they are not even uniform within any one source.

In the past few years many terms have evolved along with the development of Army Aviation. Most of the terms, such as helipad, base airfield, artillery strip, flight strip, etc., hold-overs from the old triangular and ROCID eras, are no longer acceptable but are still being used. As a result, a great deal of misunderstanding is associated with tactical landing areas. A definite need exists for standardization of useable existing terms and elimination of antiquated terms from our vocabulary.

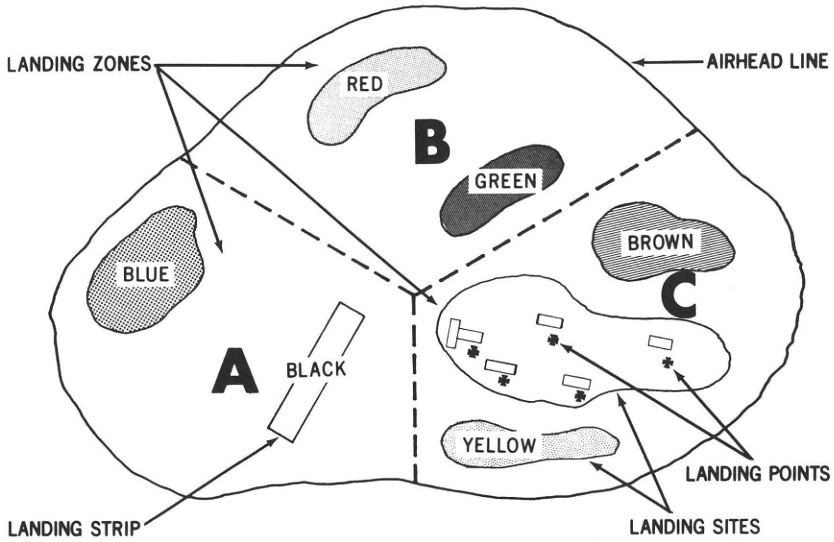
Basically Army Aviation is concerned with two types of tactical landing areas: the airfield and the heliport. Airfields are used primarily for fixed wing aircraft, but can normally accept helicopter traffic because of their configuration. However, heliports, because of their relatively small size, are normally useable for helicopters only.

Airfields and heliports are further classified according to their degree of improvement, based on surface conditions and hazards to flight safety, into the following categories.

• *Pioneer.* This landing area normally has an unimproved surface and usually is located in the forward areas to help support the combat arms elements. Seldom will aviation elements larger than sections or platoons operate from such areas. The pioneer landing area is usually operational only under fair weather conditions.

• *Hasty.* Ordinarily the hasty landing area is improved but is not usually surfaced. The degree

Figure 1. Landing zones designated phonetically (ALPHA, BRAVO, etc). Landing sites and landing strips designated by color code (red, blue, etc). Landing points designated numerically (1, 2, 3, 4, etc).



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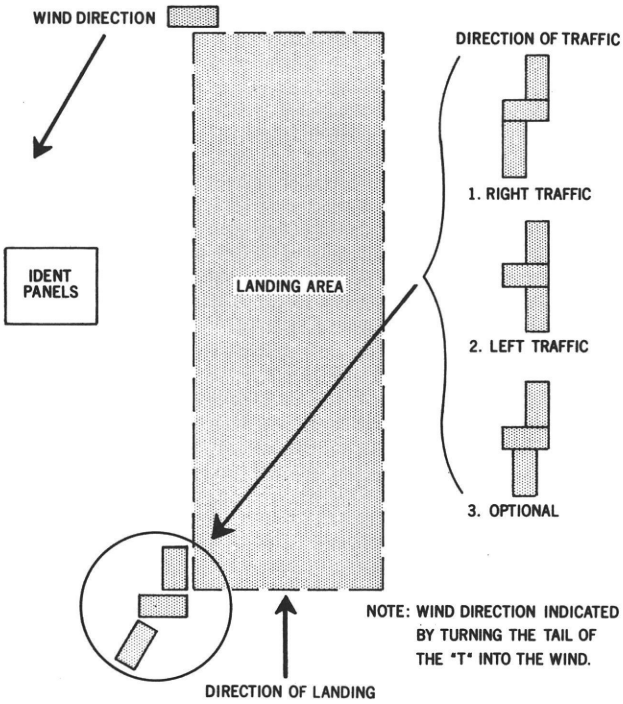
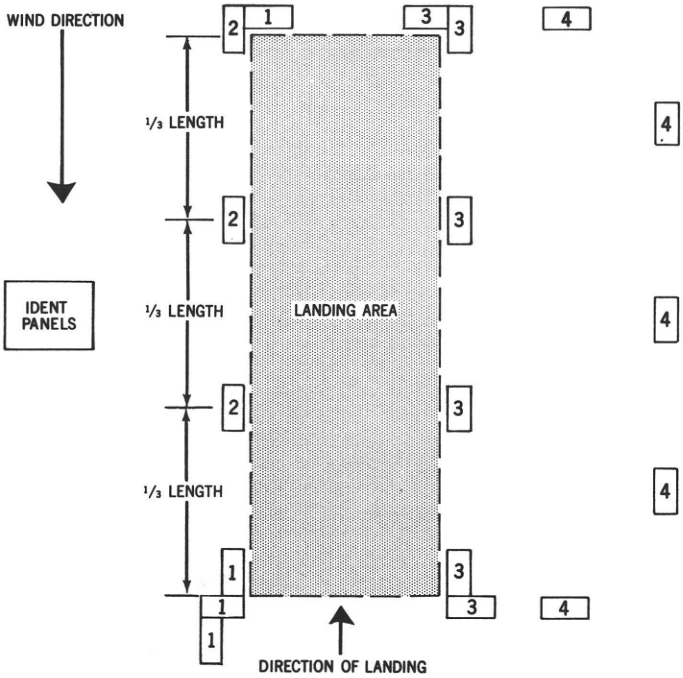


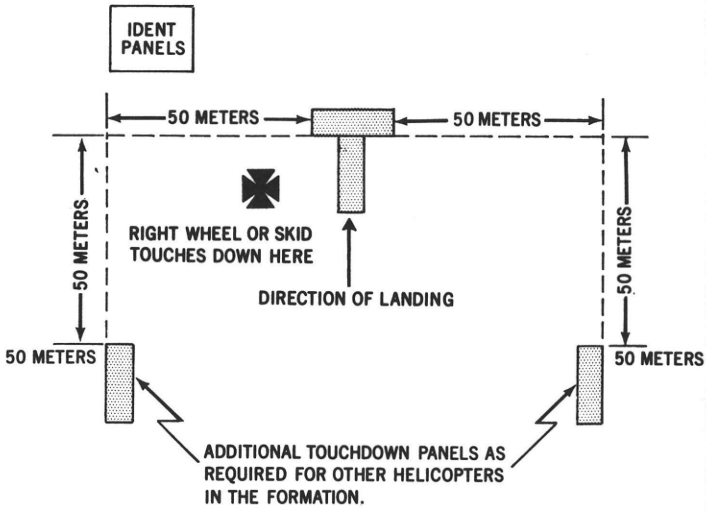
Figure 2. Minimum airfield markings for fixed wing landing area

Figure 3. Optimum airfield markings for fixed wing landing area

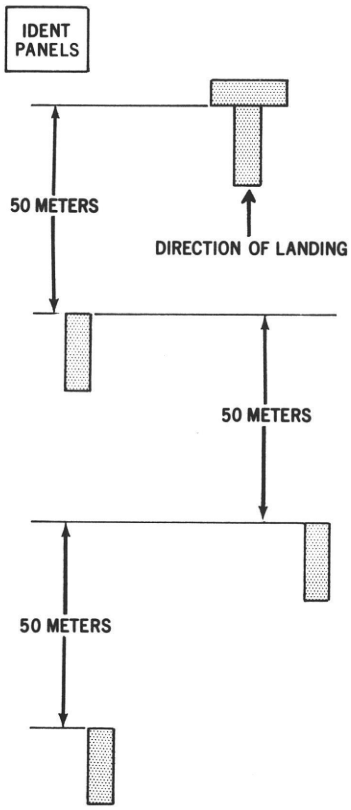


NOTE: THE NUMBERS ON THE PANELS INDICATE THE PRIORITY OF EMPLACEMENT.

Figure 4. Helicopter landing area



NOTE: "T" INDICATES LANDING DIRECTION.



NOTE: EXAMPLE OF STAGGERED TRAIL FORMATION PANEL LAYOUT. MAY BE MODIFIED FOR ANY LANDING FORMATION.

of improvement required will depend on the type of aviation unit operating from it. We will normally find the hasty landing area used by the brigade and division artillery aviation section, and sometimes even by the aviation battalion at the division's instrumented airfield. Since the hasty landing area is not useable under prolonged adverse weather conditions, a division operating in an area over a prolonged period of time will continually improve the instrumented airfield to such an extent that it will progress to a deliberate landing area.

• *Deliberate.* The deliberate landing area is normally found at corps and field army level. Because of the degree of improvement required, it is usually capable of handling all types of aircraft within the Army inventory and possesses a capability for all-weather operations.

Although these are the basic definitions of types of tactical landing areas and their three classifications, there are still other terms with which we must be familiar.

Aircraft parking areas should be located near the landing surface, but positioned to permit dispersion and concealment of aircraft.

Aircraft dispersal areas provide further aircraft dispersion and an area for maintenance. These areas are normally located farther away from the landing surface than the parking areas. In a tactical situation, if the enemy possesses air superiority or a nuclear capability, dispersal areas must be used to a maximum extent.

Satellite landing areas serve as an auxiliary to the landing area occupied by the parent unit. Besides being used to accept overflow traffic, they are

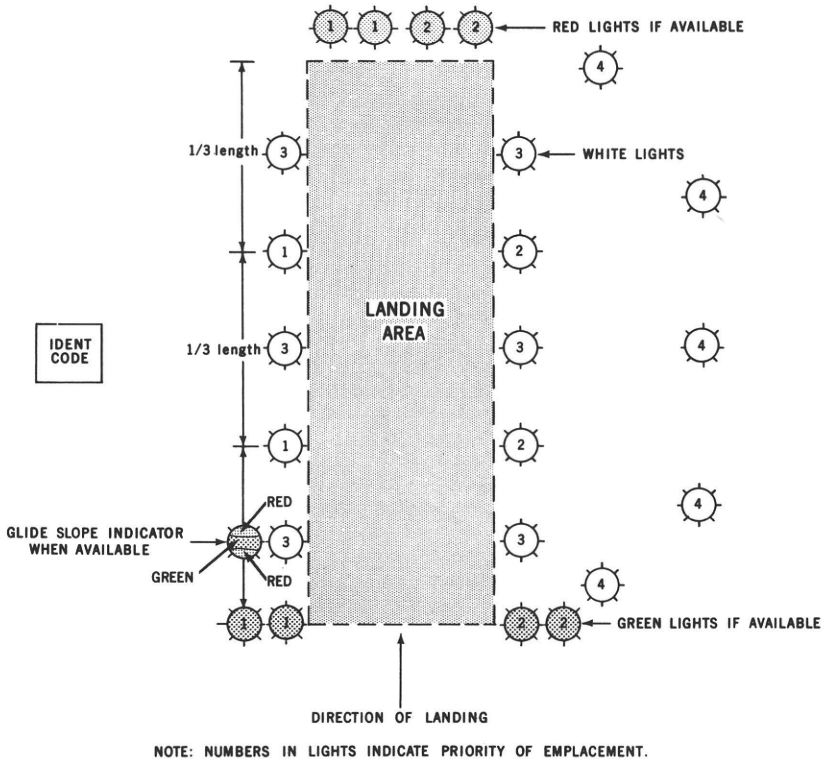
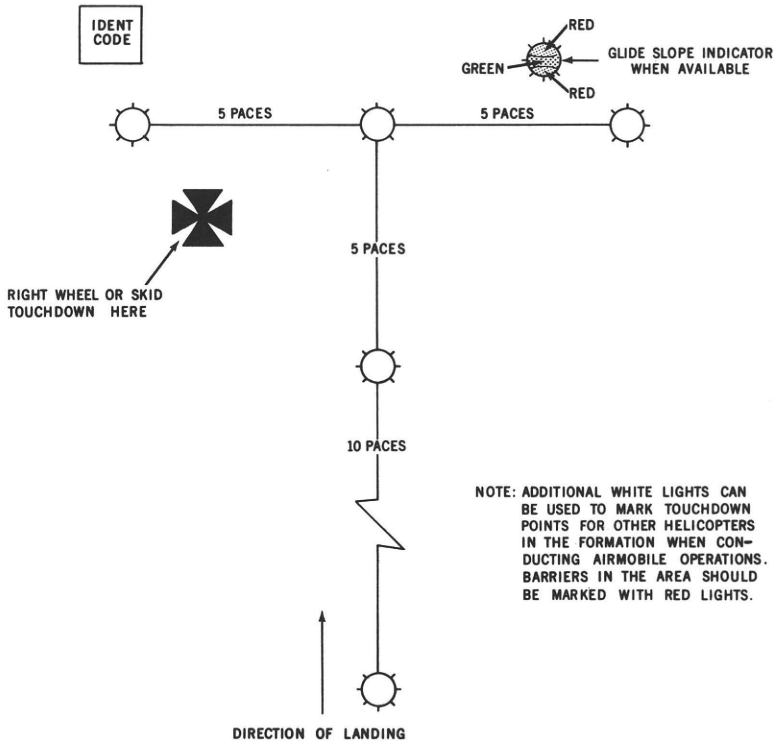


Figure 5. Night markings for fixed wing landing area

Figure 6. Lighting system for helicopter landing area



also used as additional dispersal areas. Within a ROAD division area, a satellite airfield or heliport is normally located not more than 6 kilometers (or not more than 15 minutes by ground vehicle) to facilitate command and control, and administrative and logistical support between the parent unit and its subordinate element(s).

An *alternate landing area* must be selected in anticipation of moving from the primary location, should it become untenable for any reason. The alternate should have the same facilities and provide the same capabilities as the primary to allow continuous aviation support to the supported unit.

Besides these major terms we have discussed, others associated with airmobile operations must be fully understood to complete the landing area glossary.

The terms discussed thus far pertain to those landing areas normally found within the field army area of operation. The remaining terms to be discussed pertain to airmobile operations or areas used only for brief periods of time to accomplish a specific mission.

A *landing zone* is selected on or near the objective of an airmobile force, and should be capable of handling traffic for a complete airmobile unit. The landing zone contains any number of landing strips and/or landing sites. The *landing strip* is a predesignated area which will accommodate any fixed wing aircraft that the airmobile force might have. The *landing site* is selected to accommodate helicopter traffic. Within the landing site *landing points* are marked to indicate individual touchdown points for helicopters landing within the site (fig. 1).

As you would guess, terminology association with loading closely parallel those for landing in conjunction with airmobile operations and include *loading zone, loading site,* etc.

MARKING AND LIGHTING

As is true with the terms encountered concerning tactical landing areas, many methods of marking and lighting landing areas have been used throughout the Army. The Air Assault Division uses one method, pathfinder detachments use another, and TOE divisions in the field use another. Though mission requirements for the various units differ, requirements for landing areas remain substantially the same.

A short time ago a group of the more experienced instructors assigned to the Department of Tactics of the United States Army Aviation School discussed this problem in a series of free discussion seminars. After discussing the methods of marking and lighting presently in use and citing some excellent examples of incidents which had been observed as a result of these methods, certain basic facts were generally agreed upon.

- A definite need exists for standardization in the method of marking and lighting tactical landing areas.
- Another "new" method would not solve the problem but would only tend to complicate it further. Instead, the best features of all those methods presently in use should be evaluated and consolidated.
- Any method developed should be of a progressive type, capable of being used on any landing area. The exact degree of development would naturally depend on the type and size of the aviation element operating from it.

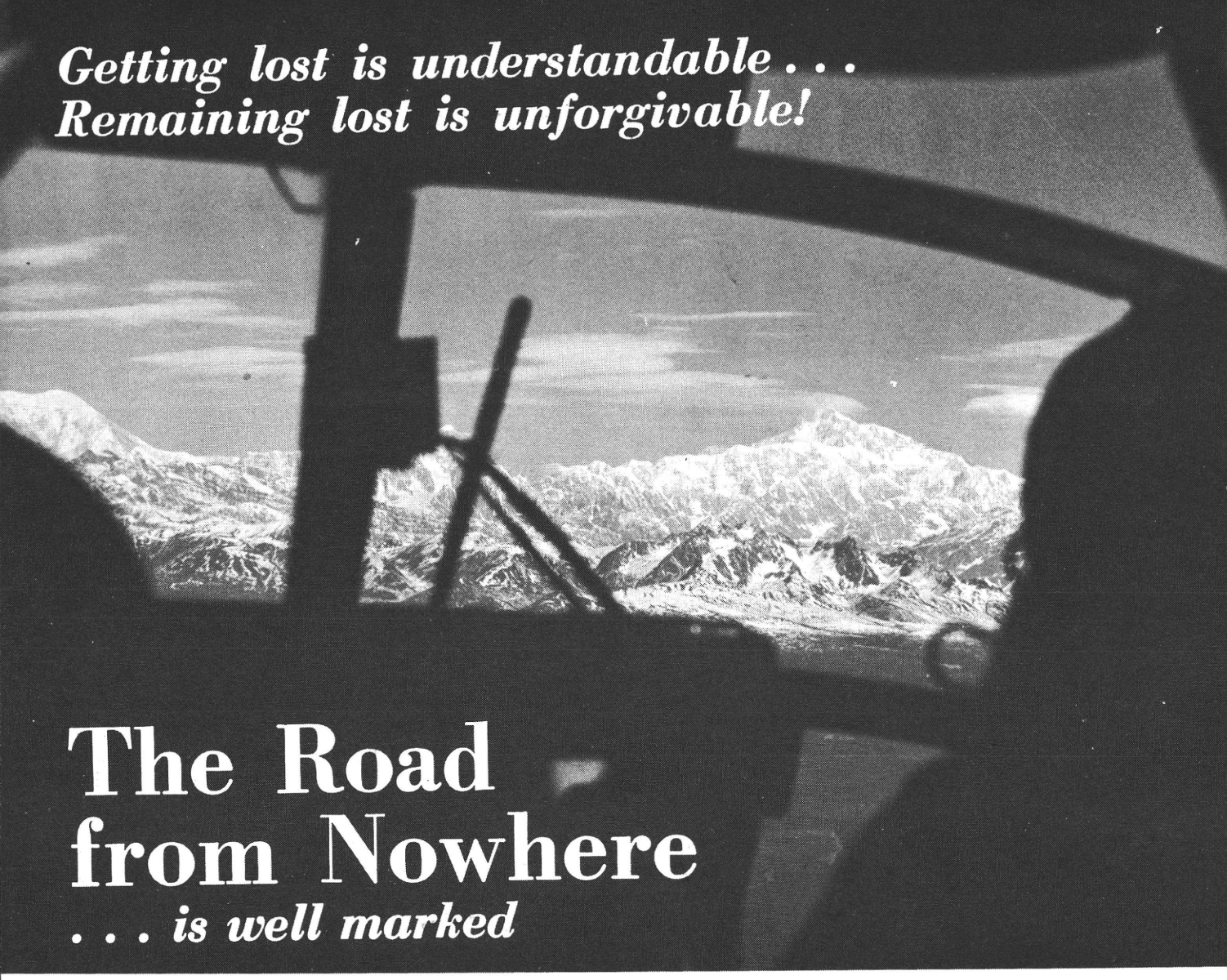
The method of marking and lighting proposed herein takes into consideration these three facts and will encompass the needs of all elements operating in the aviation environment.

Airfields are marked to identify the landing area and to aid the aviator in landing. This should be accomplished by using ground-to-air signal panels, which are issued to all units of company size or larger. Even though marking of airfields should be standardized, it can vary from minimum requirements (fig. 2) to optimum marking (fig. 3). Minimum required markings for airfields should always indicate the length of the useable runway and direction of landing.

Markings for a heliport should indicate the point of landing as well as the direction of landing. This system of marking is depicted in figure 4.

The methods of lighting landing areas are similar to those of marking the areas in that the lights are used primarily, with minor exceptions, to replace each panel during the hours of darkness to provide sufficient illumination for landing and ground handling. Further explanation is depicted by figures 5 and 6.

As Army Aviation continues to grow, we must constantly develop associated techniques to facilitate operations. But, at the same time, these techniques must be standardized if the operations are to be efficiently accomplished. The recent standardization of terms pertaining to Army Aviation's tactical landing areas is a step in the right direction. Perhaps the method of marking and lighting, as outlined here, will be another.



Getting lost is understandable . . .
Remaining lost is unforgivable!

The Road from Nowhere

. . . *is well marked*

S/Sergeant Stanley F. Guthrie

MOTHER NATURE'S a good ol' gal! If you find yourself plunked down in the Elsewhere Area unequipped, disoriented and disconsolate, don't fret — rely on her. Of course in average survival situations, with compass and map for assistance, you may not be close to the corner store, but you're not lost. All you need is a ride. Without these manmade aids, you must depend on Mother Nature's guides to lead you to safety.

In combat situations and various unforeseeable circumstances, almost anyone connected with Army Aviation could find himself lost and unequipped. Imagine yourself in such a situation, with one added condition — you must move out immediately on foot.

First determine a direction to travel. Common sense will help you decide. Will you have to live off the land? What about shelter? Is there a chance you will encounter hostile groups of people and/or animals? Will you be traveling by day or night, or both? Such questions must be considered carefully before striking out.

After deciding on a direction to travel you must turn to nature's guides to ensure that what you think is north *actually is*

north. Also to stay on course while walking out, you must depend on these guides. This is important. Those who feel they can travel in a straight line by instinct are making a big mistake. At least two universities have conducted experiments which prove that by instinct man will travel in a circle *every time.*

Fortunately, many of nature's guides can be used in most situations one might encounter. These will be emphasized here — the guides that can be used almost worldwide.

TEMPERATE ZONES

You're lost in a temperate zone. After considering the situation, you decide to travel north. Now, seek out nature's guides.

First, the sun. It can be a fairly accurate guide and send you on your way within a few degrees of a true heading. You can use the sun at any time of day to ensure that you're traveling in the right direction by following these three steps:

1. Drive a stick into the ground so that it stands up vertically about 4 or 5 feet. Mark the tip of the shadow cast by the stick and then relax for about half an hour.

2. After your break you'll notice the shadow has moved. Make another mark at the tip of the shadow.

3. Draw a straight line from the first to the second mark and you will be drawing a line in an *easterly* direction. Of course, if you stand and face east, north will be to your left and south to your right.

But what if the sun is hidden behind clouds? Find some shallow water, such as near the bank of a stream. Even though the sun's not shining, a shadow probably will be reflected on the water. Then mentally repeat the three steps discussed above.

No water, no sun? There's always the quick fingernail method. Wet your fingernail and hold a small, slender object perpendicular to it. The shadow will point in the general direction of east or west, depending on the time of day.

Other guides exist to help determine or confirm direction. Ridgelines usually follow a set pattern. Most will parallel each other and run pretty much north and south (in Asia and Southern Europe they tend to run east and west). Obviously ridgelines must not be used as a guarantee of direction. Other guides should be checked before saddling up and cantering out. With all the guides available, it's foolish to use just one or two.

Air currents offer another method of determining direction, especially in open, flat country where the winds are constant. In broken country the winds are not always stable. However, at higher altitudes prevailing winds remain constant for extended periods. If you know from which direction the prevailing winds blow you can easily determine direction. Cloud driftage can be associated with distant landmarks and thus afford an excellent method to pick and follow a direction to travel.

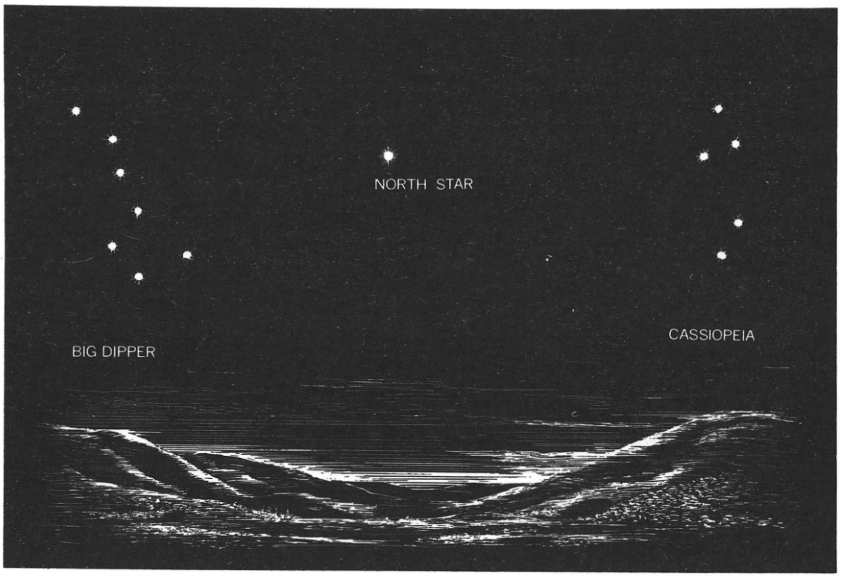
What if there are no clouds? You can still use high altitude air currents to help determine direction. Keep an eye peeled for soaring birds. It is not too difficult to tell whether they're flying downwind, hovering into the wind, or bucking a crosswind.

Now let's take a look at the night shift. Combat situations or desert heat are a couple of good reasons why travel at night may be necessary.

While traveling at night is hazardous due to limited visibility, there are nevertheless excellent guides to keep you on course.

In the Northern Hemisphere the Big Dipper and the North Star (Polaris) guarantee that you can locate true north. Most of us have known since child-

Figure 1



Sgt Guthrie is an instructor with the Dept of Maintenance, USAAVNS, Ft Rucker, Ala.

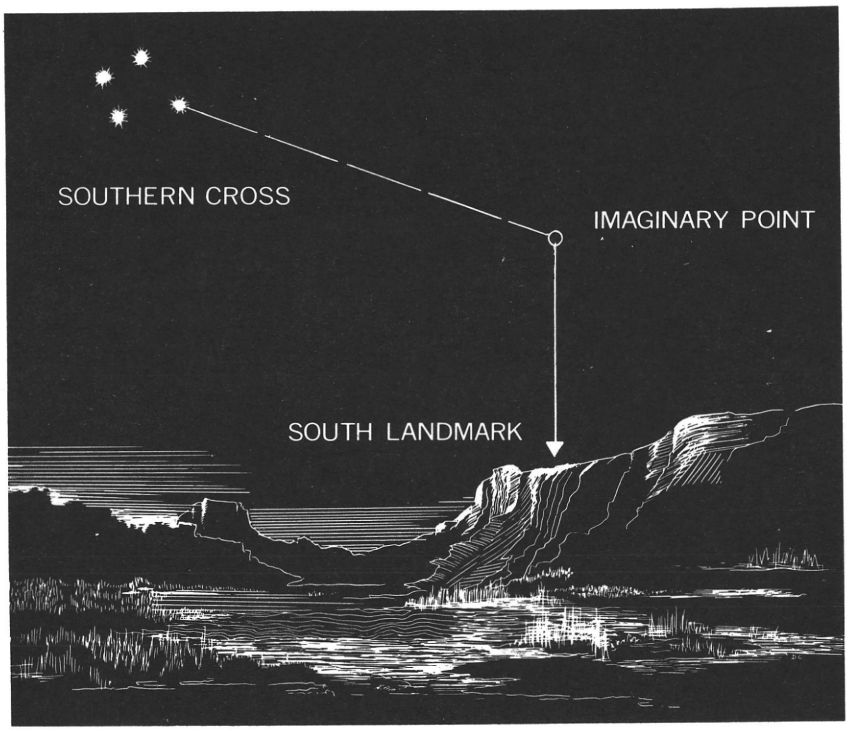


Figure 2

hood where to look for the Big Dipper. It consists of seven stars, three for the handle and four for the cup.

We know the Big Dipper is located in the northern skies, but how many know exactly how to locate the North Star and true north by using the Big Dipper? I've picked five aviators at random and asked them if they knew. They all knew generally, but only one knew exactly.

To locate true north, simply draw a line in the direction the dipper is facing and through the two stars that form the lower edge or spout of the dipper (fig. 1). The North Star is about five times the distance between the two stars. This method is never more than 1° off true north.

In the Southern Hemisphere an approximate direction of south can be found by locating the Southern Cross (fig. 2). Notice that this group of stars resembles a kite. Extend an imaginary line from the tip of the tail 4½ times the length of the kite. The end of the line is approximately south.

The planet Venus also can be used to determine direction at night. It is the largest, brightest "star" in the sky. It rises in the east and "travels" across the sky in a westerly direction. When looking for Venus, just remember part of the time it rises after midnight. At other times it rises and actually becomes visible before dark — shining brilliantly in the eastern skies.

The moon can be used both during the day and at night (depending on the time of the month) to determine direction. It also offers the added advantage of "pointing" out directions. For example, the new crescent moon follows close behind the sun with the crescent tips pointing eastward. The old crescent moon precedes the sun, with the crescent pointing westward (fig. 3).

DESERT

The desert is one place where day travel should be avoided if possible. Heat and dehydration are big problems, so remain as quiet as a mouse on tranquilizers during the daytime. At night, the moon and stars can be used as discussed above. The sun and stake method can be used effectively in the daytime.

While the desert isn't as friendly as the more lush parts of the country, it does offer one big advantage: landmarks are more pronounced. For instance a mountain, lone cactus, tree, or vegetation along a stream is visible for miles.

Another desert guide is the sand dune formed by the rather constant prevailing wind usually found in deserts. The wind builds the sand up into a gradual slope which drops off abruptly on the lee side (away from the wind) of the sand dune. Also, a crescent will build out on each side of a small dune. Remember the gentle long slope is to the windward side.

Discovering a dry stream bed is next best to finding a wet one in the desert. While it often yields moisture if one digs, it also points to high ground and the possible source of more water. It is easy to determine the direction of flow by the way the banks are washed out and by the debris deposited from flash floods (fig. 4).

The desert also is a good area in which to make use of cloud driftage. If you have any knowledge of the country, this can help determine your route. For instance, in western North America weather clouds move in from the northwest toward the southeast. Consequently, plenty of water is on the west side of the mountains.

As a rule of thumb, it is wisest in desert country to travel in the direction of increasing elevation. A dry stream bed offers a good route up. But be careful! If your stream bed appears to be diminishing, the odds are that you are heading down into the desert and it would be wisest to turn around and head in the other direction. Of course, if you're sure you are close to help or the edge of the desert that's another story. But be as sure as possible that you're headed out of the desert and not into it.

Another desert guide that can be used to advantage is cactus and other vegetation. Due to good visibility you may be able to note in the distance an increase in size and quantity of vegetation. This generally means the edge of the desert. Take a heading by any or several of the methods described above and *move out.*

Figure 4

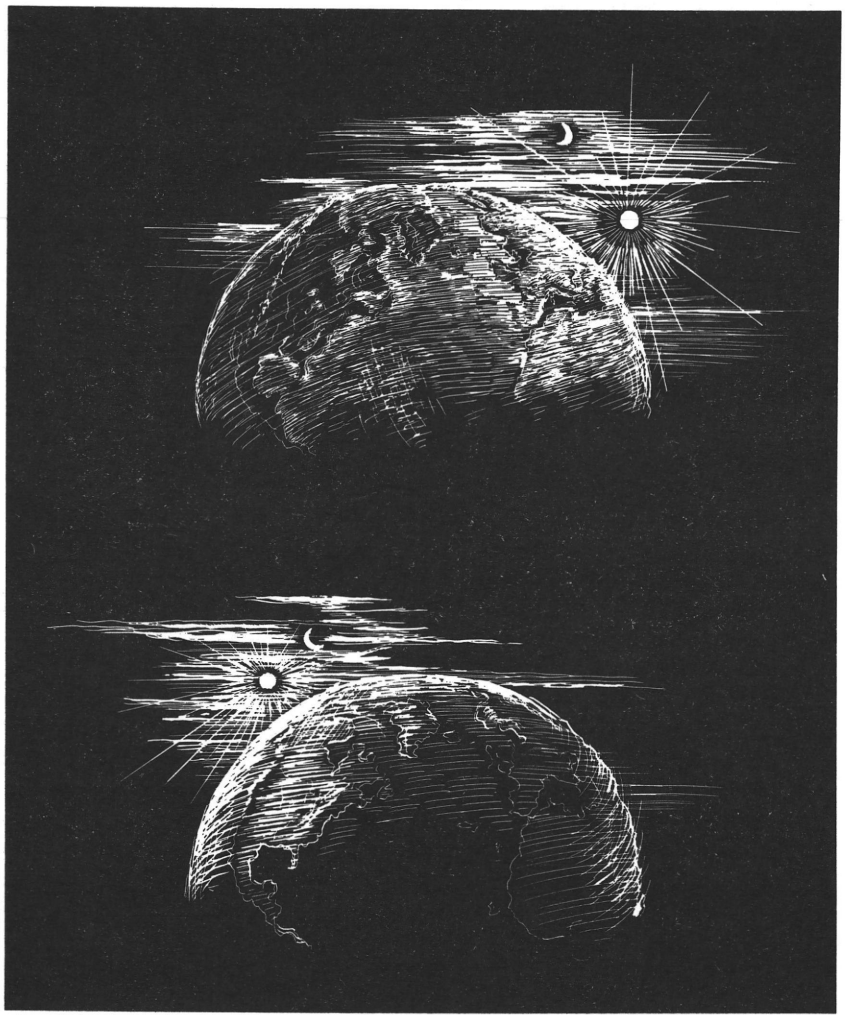


Figure 3

Incidentally, at the risk of being blamed for departing from the main subject a bit, I would like to stress a point on the proper rationing of water in desert survival situations. Too many people have the erroneous idea that they must stretch out their water supply as much as possible by taking only small sips or just dampening their tongues. But a dangerous pitfall lurks in this thought. The water in your canteen isn't doing your body a bit of good.

The body and mind require a certain amount of water to function properly. Without it, both become incapacitated. Therefore to remain rational — and physically able — one should sip small amounts of water, but he should *drink what he needs* (TF 1-4991). A sip now and a sip later never catches up with

the water lost through perspiration. Since dehydration is the enemy at hand, drink all you *need,* travel during the coolest hours of the day, and exert yourself as little as possible. *Don't* let searchers find your dehydrated body alongside a canteen half full of water.

ISLANDS

Well, here we are among the swaying palms. Quite a change, isn't it? I don't see any girls though, and I thought all isolated islands were supposed to be full of beautiful maidens swimming out to capture the shipwrecked. Well no matter. There are islands and islands, but no matter how big or small, nature's guides are present.

If you should find yourself on an island with no apparent ridge, it is pretty certain that the island is fairly round. Pick a direction with the best reference points to use as guides. Because it's an island don't be overconfident. You could wander for days and end up almost where you started out if you do not maintain a close check on your reference points. There is one little item you can count on almost every time. If you find a stream, it's almost certain to be heading for the coast without too much meandering.

Various types of vegetation offer clues to your location on an island. For example, if you see palms (in tropical areas) it's a good bet that you're near the coast. Palms in the immediate vicinity of the coast tend to lean toward the shoreline, while those farther inland lean toward the morning sun. Lone trees on high ground will lean with the prevailing wind, which blows for days from the same direction off the ocean (fig. 5).

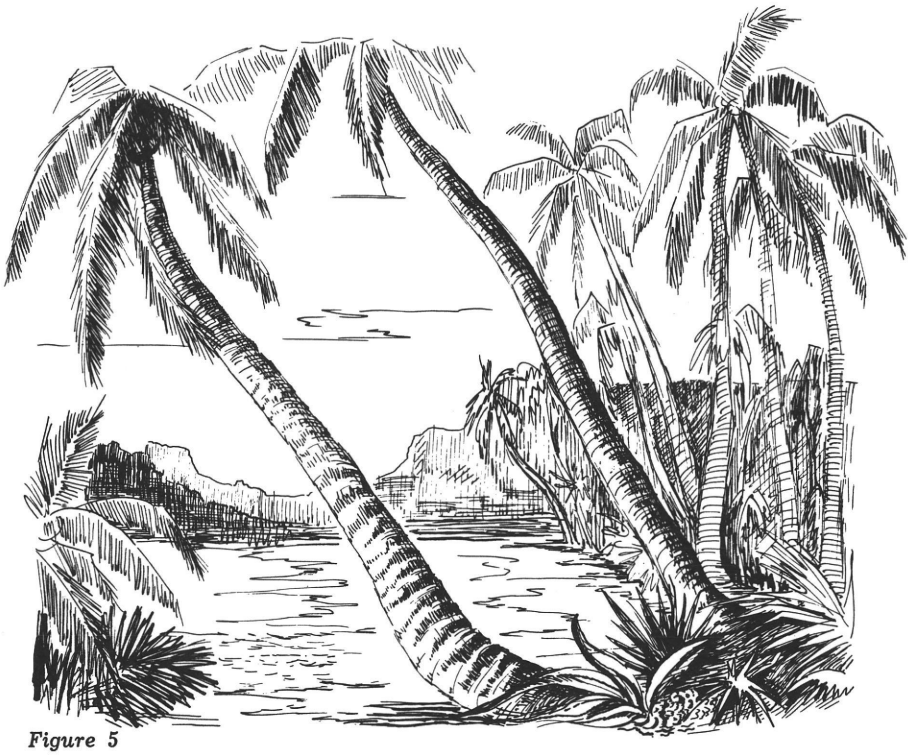


Figure 5

Inland, vegetation varies from banyan to hardwood, depending on rainfall and the rise of the ground away from the shoreline. Foliage on islands not having barren or volcanic centers is usually dense inland and tends to thin out somewhat near the coast. In colder areas, forests taper out to brush and weeds along the shoreline. But there's always that exception — on small tropical islands vegetation is usually dense throughout.

While on the subject of exceptions, it is appropriate to reemphasize that COMMON SENSE IS YOUR BEST GUIDE. Use it before you decide.

MOUNTAINS

Lost in the mountains! This sounds like trouble — real trouble. But actually every guide we have discussed so far also can be used in the mountains.

A little study in botany should be useful and can be applied if one is lost in mountains. In rough mountain areas, trees and lesser vegetation are sometimes completely separated by species merely by being at one altitude or on one side of a mountain.

Many softwood trees and those that shed leaves each fall grow on the south or sheltered side of a ridge while evergreens are found on the cold side.

Moving up from valleys, one would first find softwoods, then larger red oaks and chestnut oaks and then white oaks, hickory, ash, and finally the evergreens. Going higher, the latter gradually gives way to scrub cedars, oaks, junipers, conifers, and finally even these fade out into barren soil or snow.

It might be well to remember, too, that lone trees will grow away from the prevailing wind, with their branches bending in the same direction. A tipoff on direction in the North American mountains is the bark on older trees. It is usually thicker on the north and northeast sides. Also, one can determine direction by

cutting a tree and observing its rings. Over 90 percent of the time they will be farther apart on the north side (fig. 6).

Years ago the New York State Forest Commission ran a test on 700 black spruce trees and found that 94 percent showed greater trunk growth toward the north.

Climate pretty much determines at which altitude various trees can be found. Consequently timberlines do not necessarily show accurate altitude. However they are good guides to use getting to or from high ground or remaining at the same level.

A stream is one of the best guides to use in mountains. It is certain to lead out of the mountains and usually flows past inhabited areas.

To find a stream, climb to high ground and look for winding brush or trees in open ground. Such winding vegetation usually is a dead giveaway for the banks of a stream. If no such line of vegetation is visible one stands a good chance of finding a stream or brook at the bottom of a canyon or ravine.

When following a stream be prepared to wind around a bit and to travel a short distance from the stream's banks, which generally are characterized by dense growth and numerous mosquitos and other insects.

A word of warning is appropriate here. A stream is *not* necessarily the easy or best way out. One could travel along a stream for days — even weeks — and wind up even farther from habitation. Use common sense! If you know there may be a highway, for example, 30 or 40 miles to the east, then head for it using other guides already discussed.

You may not be gifted with the instincts of a native warrior, but nature has provided you with everything you need to find your way out of any situation. If these guides are applied with common sense, you will never be lost.

Remember the old saying "I may not know where I am, but I dang sure ain't lost"? It's a lot more sensible than it sounds.

RANDOM THOUGHTS THAT MAY SAVE YOUR LIFE

Emergency snowshoes can be made by attaching evergreen branches to your feet.

If you are not sure you are heading in the right direction, the human tendency is to give up and turn back too soon, only to have to cover the same ground again later.

In friendly areas blaze your trail — two blazes on the side of the tree toward your starting point and one on the side away. Also measure the distance you travel. For an average person walking over fairly flat country, a 30-inch pace results in a speed of 3 mph.

Once you have found a highway, powerline or similar aid, stick with it. Don't plunge back into the wilderness.

In cold weather look for signs of animal life. They almost always gather on the warm sides of the hills (southern side in the Northern Hemisphere).

Watch bird migrations. They go north in the spring and south in the fall.

Watch morning flowers; they point east.

Rainfall can be used for a quick check of wind direction. It slants with the wind.

Game trails are ideal to follow. Animals pick the easiest route.

Moss does not always grow on the north sides of trees. Do not trust it as a direction indicator.

Of Lumps Bumps And Landing Loads

Captain Rufus R. Hart

IT WAS ANOTHER sunny day in central California. "Big Ugly," the affectionate Otter, was stretching its feet, in 3-point fashion, toward the rolling turf of a little known field strip called Martinus Corners. In a typically friendly way the U-1A rounded out and nudged the crest of a first mound of the strip. It seemed to spread its wings a little farther as it floated across the low point of the field and settled onto the upslope of the next mound.

CRUNCH — the right strut pushed into its fuselage and Big Ugly winced with pain. CRUNCHELCRUNK — CRUNCH, portions of the bulkhead gave way and the right wing settled lower as it came to rest.

The Accident Investigation Board appeared on the scene a short time later. Its findings:

- The instructor pilot was qualified for the mission (with 4000+ hours total time and 1700+ hours in this model).
- The pilot and instructor pilot executed an acceptable landing within the design limitations of the aircraft (based on witness testimony, markings on the tires, and imprint of wheel tracks on the ground).
- Metallurgical analysis revealed no fatigue (but that a disparity existed in the strength of two of the failed members).

It was like watching a Perry Mason TV program; none of the clues seemed to point to the culprit. So the board returned to the scene of the crime. Standing on the end of the runway pondering Big Ugly's fate, I suddenly realized that the point of touchdown, which we had marked, could not be seen from my position. From where I stood I could see just how uneven the strip really was. Could this be the missing clue? Several hours and many computations later, the board had a fourth finding to add to the list:

- THE LANDING LOAD FACTOR WAS SIGNIFICANTLY INCREASED BY THE SLOPED CONFIGURATION OF THE RUNWAY.

What effect does the slope of the runway have on the landing loads incurred? An example of a ski jumper may be used to illustrate the answer. Picture the Olympic event of a ski jumper flying 270 feet through the air and making contact with the snow at a rate of descent greater than 1,000 feet per minute. Two things account for his successful landing: the absorption of energy by his landing gear

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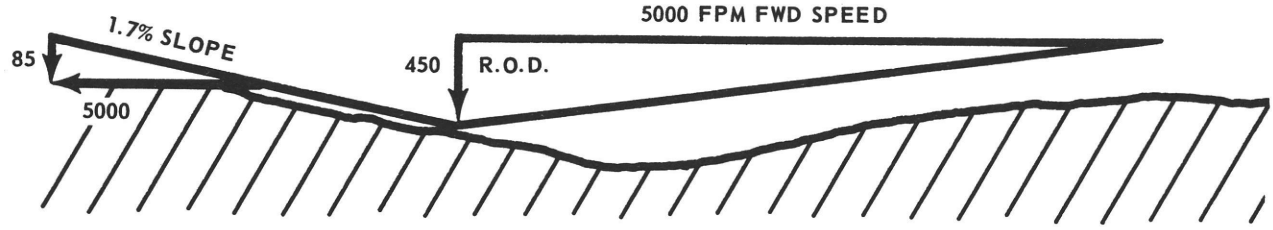
Capt Hart is Aviation Safety Officer, Army Aviation Section, Fort Ord, Calif.



(legs) and the slope of the runway on which he is landing. Particularly important is the slope, which is probably at an angle of 50° to 60° downhill. You can imagine the result if he landed on flat terrain, or worse yet, on an upsloping hill.

The same is true when an aircraft lands, but because slopes are far more gradual and rate of descent much less, the effect is not as dramatically illustrated. However, by reducing facts to figures we can compute the exact effect.

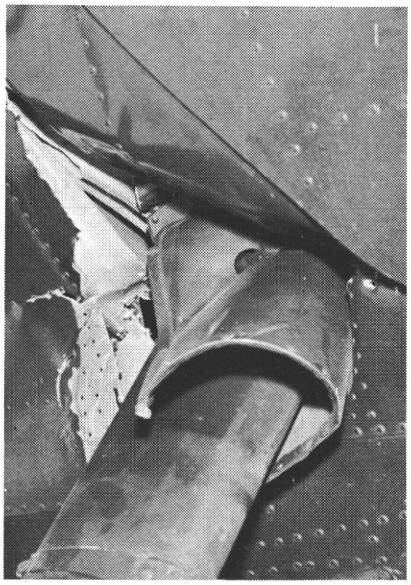
Let's take Big Ugly on this particular landing and say that the upslope on which he landed was 4 feet of rise in 240 feet of distance ($4/240 = 1.7\%$ slope), not really perceptible until roundout. On this day (considering flaps, load, density altitude, 2 knot tailwind) his stalling groundspeed was 49 knots (which equates to a forward speed of approximately 5,000 fpm).

Before the aircraft will come to rest, the energy of this forward speed must be absorbed by: aerodynamic braking (wind resistance), wheel braking, and the effect of gravity resisting the aircraft from going up the slope. When the aircraft initially touches down these three forces will be at their greatest.

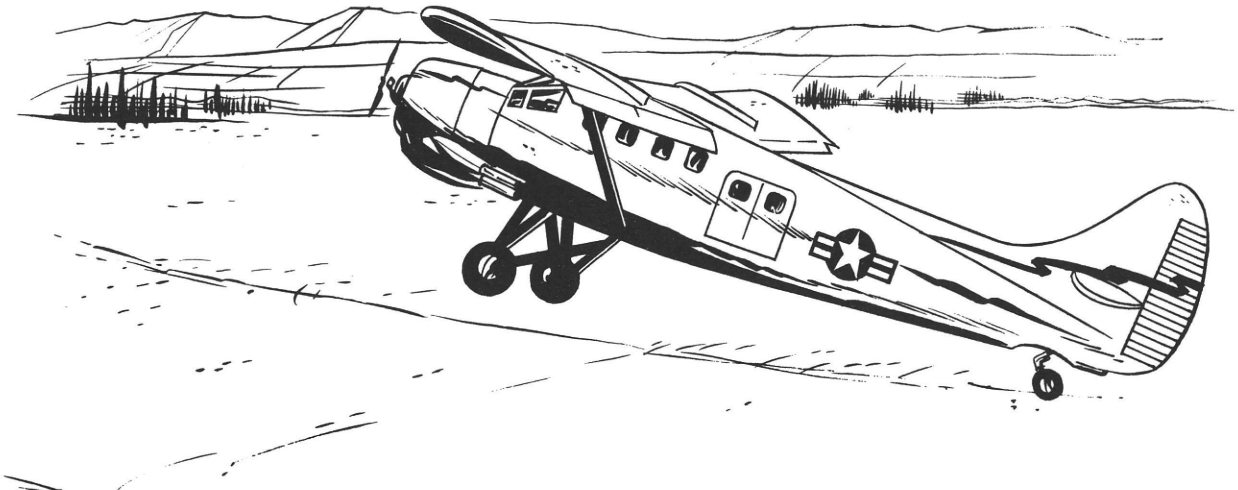
Gravity resistance is directly dependent on the slope of the hill, and is proportional to the square of the aircraft's speed (deceleration) at touchdown. This force then can be expressed in terms of the forward speed of the aircraft by knowing the degree of the slope. In this case it would be 2 percent times 5,000 fpm, which gives us an effective rate of descent of 100 fpm (i.e., the vertical component of its forward velocity).

The Otter is designed to withstand landing loads from rates of descents up to and including 500 fpm. Therefore, the additional effective rate of descent incurred from a slope landing is only significant when the aircraft approaches its critical limitation of 500 fpm ROD (rate of descent). In the case at point, let us assume that Big Ugly was touching down with an ROD of 450 and 100, the resultant of which would exceed the design limitations of the aircraft.

It is of particular interest to note that the force absorbed by the landing gears (landing load factor) varies as the square of the rate of descent. Therefore, a 20 percent increase in the rate of descent increases the landing load factor by 44 percent. No wonder poor Ugly's bulkhead had to be replaced!



A 20 percent increase in the rate of descent resulted in hard landing, bashed Otter



Lieutenant Robert L. Hammond

It's A Picnic

YES, IT IS a picnic flying with Automatic Stabilization Equipment (ASE) . . . if the pilot has a basic understanding of the operation of ASE and the system is properly maintained.

ASE is a proven piece of equipment, and the CH-34C and CH-37B pilots who are familiar with it think it is great. However, many aviators who are qualified in these two types of aircraft do not use this expensive piece of equipment. The main reason they don't use it is that they do not have a basic understanding of ASE and think that it does not work.

The majority of so-called malfunctions of ASE are caused by improper procedure by the pilot or by the system being improperly maintained.

One of the most important cases of ASE being unjustly criticized is caused when the auxiliary servo is improperly rigged. It is possible for the pilot to experience a complete loss of control under this condition. When the ASE motor is in the center position the roller should be in the center of the cam or sloppy link. If the roller is not centered and the ASE motor moves to the hardover condition, the roller could hit the side of the cam. If this happens, mechanical follow-up in the servo assembly is eliminated.

This means that the pilot valve cannot close and the power piston will move until it hits the stop. This would cause the flight control associated with this servo to move to its extreme position and the pilot would be unable to override it. The immediate action would be to turn off the auxiliary hydraulic pressure. This places the roller in the manual position of the cam and opens the auxiliary servo bypass valve, thus giving the pilot full control of the aircraft again.

As a result of a fatal accident in Greenland, the override check switch is no longer used by the pilot to check for this condition (see "Crash Sense," DIGEST, Nov 61). No check was substituted for the override check in the -10, but Sikorsky suggests a "stick jump" check as a ground check to detect this condition.

To make this check, engage rotor, engage ASE, place ASE in standby, and *check all motors centered.* Now with controls approximately centered and the collective raised 2 inches, turn off the auxiliary hydraulic pressure. If the rollers were centered in their cams, the flight controls in the cockpit will not move or jump. The maximum allowable movement of the cyclic stick is 1/8 inch, measured at the top. Although no figures are available for the limits on the movement of the pedals and collective, very little "jump" should be felt. On a properly adjusted system no movement will be felt in any of the controls when turning the auxiliary hydraulic pressure off or on.

ASE was designed to aid the pilot by stabilizing the helicopter so that he would not have to devote his full attention to flying the helicopter. ASE can do this only when it and its associated systems (aux servo, flight controls, generator, inverter, etc.) are properly maintained and when the pilot uses ASE properly.

Using ASE properly includes an adequate ground check to ensure satisfactory operation of ASE and its associated systems. With this, the CH-34 or CH-37 pilot can take his lunch along and relax, knowing that he always has complete control of his aircraft. Otherwise, he might lose his appetite.

Lt Hammond is an instructor with the Dept of Maintenance, USAAVNS, Ft Rucker, Ala.

Double Double Double Double CROSS TRAINING

J. D. Wood

INTAKE, compression, power, exhaust, two-stroke cycle, four-stroke cycle — BOY! Just wait until I arrive at that aviation company. If the CO thinks I need retraining in aircraft engines because I have been on recruiting duty for the past three years, is he going to be surprised!

Those manuals I've been studying sure were easy to understand. Let's see now — afterfire, backfire, valve overlap. Maybe I should throw in a few terms to really impress that CO when I go in for an interview — hp, fhp, BMEP, thermal efficiency. Ha, bet he'll think I designed those old powerplants.

Now, if I could take over as maintenance sergeant, there would be flight pay, pro pay, and just maybe I might slide right into an E-7 slot. What a tour of duty this is going to be! (Dreams go on - and on - and on.)

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THE IMPRESSIVE MOMENT

NCOIC: "Sergeant Ferventness, the captain will see you now. Captain Scrutinizer, Sergeant Ferventness. Sergeant Ferventness, Captain Scrutinizer."

After a spit and polish, heel and toe ceremony, the two forces squared off and jockeyed for positions. Sergeant Ferventness sits erect in a straight back chair furnished by the captain, who is now sitting at a highly polished desk, shuffling papers and intermittently tapping the table top with a pencil.

The boom is lowered. Without looking up, Captain Scrutinizer shot a question at Sergeant Ferventness. "Sergeant, what do you think of a HUNG START?"

The blood started slowly draining from Sergeant Ferventness' face, which was covered immediately by beads of sweat that caused the retaining bolt which held the lower jaw to snap. The flapping action of the lower jaw could not overcome dissymmetry of lift. A disk slipped and the tip-plane of the body tilted forward, causing a droop in the cranium assembly.

"W-e-l-l, Sir, a hung start is always hard to overcome. I have always said start fair and square and everything else will fall in place."

"No! No! Sergeant, I mean a hung start on a gas turbine."

"Gas turbines, Sir, are a little out of my line. I have worked in aviation most of my Army career, except for the last few years which were spent on recruiting duty."

"Gas turbines, Sergeant, are derived from jet engines and are the powerplant for all our late-model aircraft. The old four-stroke cycle, reciprocating engines are on their way to the salvage yard. Sometimes when you attempt to start a gas turbine, it won't light off due to some malfunction. This is known as a hung start.

"Another result of either a malfunction or an improper starting procedure is an extreme high EGT, known as a hot start.

"Sir, high E-G-T? H-o-t--start?"

"Yes Sergeant, EGT is a term used for Exhaust Gas Temperature. When the EGT is exceeded, a special hot section inspection should be performed with close emphasis on metal fatigue, burns, cracks, warpage and turbine blade creep."

"Blade creep, Sir?"

"Yes, with turbines turning several thousand rpm, the centrifugal force is tremendous and will only withstand a certain amount of temperature without the blades stretching or growing, and this is known as blade creep.

"Sergeant, equipment and terms have changed at a fast rate in the last few years. A lot more is expected of a mechanic today. His job demands a highly skilled technician who is cross-trained in many very complicated components. Only the mechanic with foresight can keep up with this fast change of pace. One MOS will no longer suffice in aviation. Studying, schooling, cross-training, and know-how is the new concept today.

"Well, enough of this for the time being. Let's get back to your qualification and new assignment. What did you have in mind?"

"Sir, if it's possible, I would like to get an advanced maintenance school to help me catch up on the things I have been missing out on while on special duties."

"OK Sergeant, I'll try to get you on the next levy. In the meantime, just browse around and get acquainted with some of the aircraft and equipment you will be working on."

Sergeant Ferventness snaps to heel and toe, salutes, "Thank you, Sir." As he leaves he mumbles under his breath, "EGT, blade creep, hot start. I wonder what else."

Advice to the fledgling mechanic which, if followed, can improve chances for personal advancement.

Steps to EM Promotion

Major James E. Kennedy

PROMOTION IS a subject near and dear to all enlisted men participating in the aviation mechanic training program. Of those now graduating a course of instruction, many will join their first troop unit. Others will take another course before joining a unit. In any event, each individual will soon have an opportunity to *earn* a promotion. Note I said *earn.*

When you arrive at your unit, little will be known about you. *You* and *you* alone will determine your own promotion opportunities by your appearance and, even more important, your actions and deeds. And you must do this within the first few weeks after your arrival.

One of the first things to determine is who promotes you. The answer: the company commander. But the CO will ask many others for opinions. He will ask his 1st sergeant, who in

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Maj Kennedy is chief of the Studies Branch, Dept of Tactics, USAAVNS, Ft Rucker, Ala.

turn will ask the platoon sergeants. He will ask his platoon leaders. One of these platoon leaders is the service platoon commander who doubles as the aircraft maintenance officer, and he in turn will ask his NCO supervisors and tech inspectors for their recommendations.

Yes, you will indeed be in an unenviable position while competing for a promotion. You will have many bosses to work for. If you are assigned to crew a particular aircraft, you will work for many people. Although your primary allegiance and loyalty must be to your NCO section supervisor, you'll find yourself working under the supervision of the company radio repairman, the aircraft tech inspector, the platoon sergeant, individual pilots, and the platoon leader. When you go on guard, KP, or CQ, you will work under many NCOs throughout the company. And every one of them will form an opinion of you — some will even take the trouble to let your supervisor know what kind of man he thinks you are.

What characteristics will these people look for? Naturally, each man will look for something different, so I can only tell you what three characteristics I looked for when I was an aircraft maintenance officer.

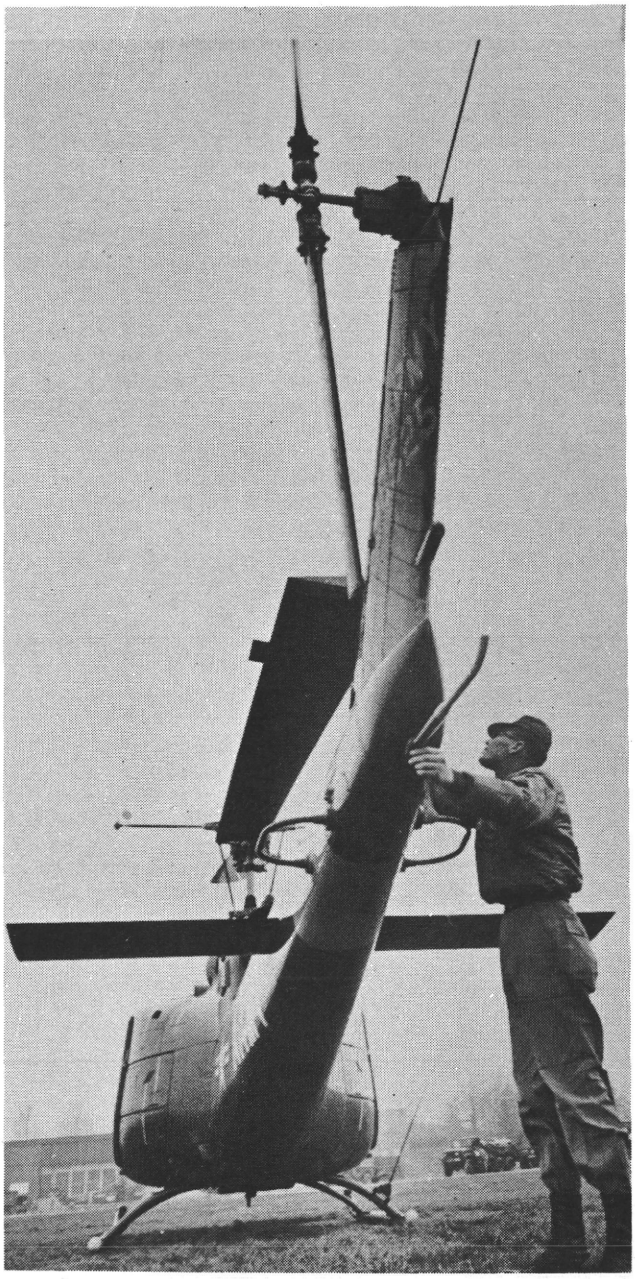
First of all is the matter of *pride*. I didn't particularly care to see a new man who was *too* proud — one who was too proud to sweep the floor of the hangar at the end of the day. I didn't particularly care to see a man who was too proud to clean vomit out of an airplane, clean the latrine, or clean the grease trap when on KP. Remember, you're on the bottom of the totem pole. There isn't anyone else to perform these functions except you.

On the other hand, I liked to see a man who took pride in his work. One who wanted every nut which he safetied to look perfect. Remember, if you aren't proud of your work, your supervisor will not be proud of having you work for him. And if he isn't, why should he recommend you for promotion?

Take pride in the condition of your work area and your tools. Stay overtime to clean up your area and your tools when necessary. Take pride in the men you work with — your fellow mechanics. Speak well of them. You may notice some of them have some bad characteristics, but don't discuss these with others — it's none of your business or other people's.

Take pride in your supervisor. Of course he'll have some faults; everyone does. After all, he's human, and there haven't been many perfect humans made. Try to seek out his good points; talk only about these, and ignore the others. If you don't like him, don't tell others about it. Brainwash yourself. Make yourself believe that you do like him for his many good points. There are times — and this is one of them — when an ounce of loyalty is worth a pound of cleverness. Be loyal to your supervisor and when the chips are down, he'll be loyal to you.

Rotary wing tie-down. Take pride in your work — no matter how insignificant it appears — like checking the rotor blade tie-down or seeing that every nut is safetied correctly.



The second characteristic I looked for in all new mechanics, and particularly the "short-timers," was their *attitude towards the Army.* Many of the new men that arrived in our unit were "short-timers." They were in the Army for two years, and many months of that time had already been spent in basic training and aircraft mechanics courses. I suspect that many will fit that description when they arrive in a unit.

Some of these men became infected with what I'll call terminal psychosis. They spent their time wishing their lives away. They carried calendars around with them and pasted additional calendars in their toolboxes or footlockers. Don't become infected with terminal psychosis. It is a mental disease that starts in early childhood. At the age of four this type of person probably wished he were in school. When he got in school he wished he were a teenager and in high school. When he reached that stage he wished he were out of school.

Tracking the OH-13 blade. Learn to overcome the disease "terminal psychosis." Use your Army service to advantage. Learn as much as you can about your job. Have an "old pro" attitude toward Army life.

Learn to lick this disease. Don't waste your time telling others how you dislike the Army way or Army barracks life. Use your 2 years of Army service life to your own advantage. Learn as much as you can about your present job. Two years is too much time to waste wishing you were doing something else. And wishing won't change facts.

The third characteristic I looked for was a sense of *responsibility.* When you see that something needs to be done on your aircraft, to your tools, or in your work area, don't wait to be told to do it. Recognize the problem, realize your responsibility, and take care of the work immediately. If you have never developed a sense of responsibility, now is the time to do it. Unless you develop a sense of responsibility, you will always be working for someone else. Someone else will always be telling you what to do, and it's unlikely that your boss will ever trust you enough to supervise others. So once again, why should he promote you?

I've told you of three characteristics I looked for — pride, attitude, and responsibility. Now I want to tell you of two things I required each of my mechanics to do — and if they always did them, their promotional opportunities were almost assured as far as I was concerned.

The first requirement was the method of conducting an inspection. Each new mechanic was required to use the manual as he performed an inspection. Very few people can remember all the steps in the various types of inspections. And even the oldtimers were required to always use a checklist as they performed an inspection.

The second item — each man was always required to have his work checked by a tech inspector before the aircraft could be flown. In fact, our mechanics were instructed to put a big red X on the status today box until the aircraft was checked by the tech inspector. *It's true that this caused more work for the tech inspector than actually required by regulation, but it also prevented accidents caused by faulty maintenance.*

Sometimes an aviator who was under extreme pressure from his platoon leader to fly a mission would demand that a mechanic roll his aircraft out of the hangar immediately. When this happened, our mechanics complied quickly — because they were always told to follow their last order. But when the aviator saw that big red X, he had two alternatives: he could go find the tech inspector to remove it, or he could request he be assigned a different aircraft.

By the book. Section chief uses manual to check OH-13 repairs made by mechanic. Don't be afraid to use a manual on every inspection.

This technique saved our mechanics from the ever present problem of clashes with officers. And remember, you can't afford to argue with officers if you are looking for a promotion.

I've covered three characteristics I looked for, pride, attitude, and responsibility, and two things I required of every mechanic — using a checklist on inspection, and having a tech inspector check the work before flight.

Lastly, I want to tell you of two techniques you may find helpful.

The first technique is observation. Take a close look at the oldtimers in your outfit who seem to be respected by everyone. Analyze why they are successful, and attempt to follow their examples. (Ignore the wise guy, the loud mouth, the guardhouse lawyer, and know-it-all. Don't follow their examples.)

At this point you might say to me, "Well, when do I have time for all this introspective observation and analyzation?" If you make it a *habit* to *think* and *reflect* while you are cleaning your tools, sweeping the floor, or cleaning the mess hall grease trap, you'll have lots of time to mentally compare yourself to the oldtimer and see where you failed to measure up to his standards. And at the same time, you will find that your clean-up job will seem to go faster.

The second technique evolves around a favorite expression which I picked up many years ago: *Things never stay the same, they either get better, or they get worse.* You can apply this to anything in your life. Take your personal appearance, for example — your shoes, your belt buckle, your uniform. Apply it to your physical condition. Apply it to your knowledge about your job. Apply it to the personal plan you have for your life — Which way are you going?

I've talked about seven items. If listed in slightly different order, they will spell the word *patriot.* If you follow these seven steps you will be a *patriot* in a very real sense. Once again they were —

Pride — but not too much of it.
Attitude — toward the Army.
Tech Inspector — get one to check your work.
Responsibility — develop a sense of it immediately.
Inspections — follow a checklist.
Observation — observe the oldtimers and yourself and compare the two.
Things never stay the same.

[*The author discusses certain maintenance procedures which worked in his unit. Their applicability to other units will vary with the organization and experience level of personnel involved. — Editor*]

A new method for fast, accurate target location has been developed for the Artillery. Called the Visual Airborne Target Locator System (VATLS), this electronic device has completed engineering-service tests and is now in advanced tests.

Visual Airborne Target Locator System

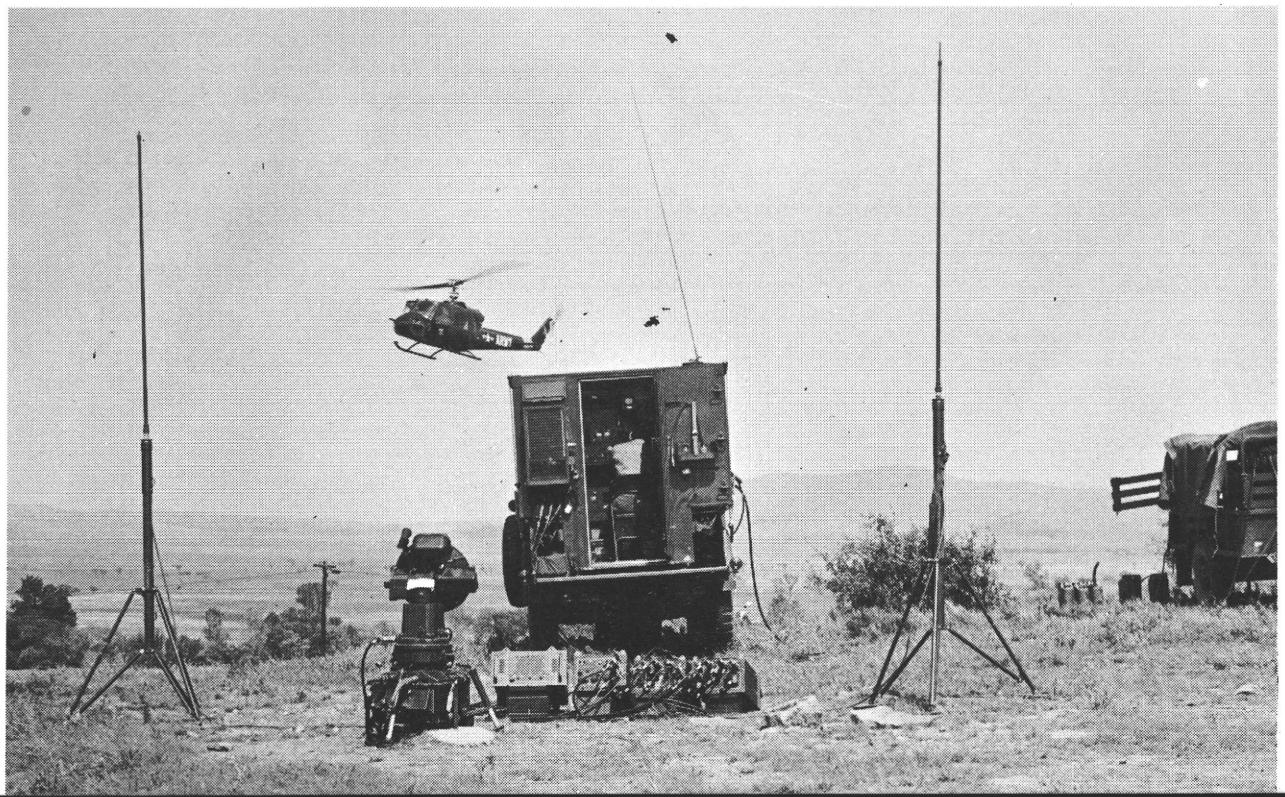
Major Donald A. Van Matre

THE ROLE of Army Aviation in support of the ground gaining arms has been expanded recently by the development of the Visual Airborne Target Locator System (VATLS). This fully integrated mobile system, which consists of airborne and ground equipment, provides the aerial observer with the capability for extremely accurate target locations. Hence, it enables the artillery to place very effective predicted fires. The aerial observer's primary role remains unchanged, but his capabilities will be greatly enhanced.

Key to the system is the precision gyro mounted in the aircraft. This gyro constantly senses the aircraft attitude in yaw, pitch, and roll. At the time the observer sights the aerial telescope on a target and makes a "mark" (depression of a contact button), the azimuth, depression angle, and aircraft attitude are automatically transmitted to the ground station.

The mobile ground station

Ground station control equipment including shelter-mounted computer, tracker, distance measurement equipment, and power generator. Airborne station shown mounted in copilot's door of Iroquois UH-1A.



continually tracks the aircraft during flight in azimuth and elevation, and maintains a constant distance measurement, ground to aircraft. At the time of the mark, airborne data and ground data are fed into a digital computer located at the ground station. The observer sights and marks a second time establishing an aerial base line and two lines to the target. This procedure is called the "two-sight" technique.

The target is fixed by two intersecting lines of sight from the base in a manner similar to triangulation survey. The target coordinates and altitude are output in a visual display or on punched, printed paper tape. These coordinates can be used for further target analysis or in fire direction procedures.

In anticipated tactical employment, one VATLS ground subsystem will be used with two airborne subsystems. Each airborne subsystem will be mounted in a helicopter. These two airborne stations will permit alternating surveillance along the FEBA. Only minor modifications, if any, will be required to ready the air vehicle for the VATLS airborne subsystem.

Service tests were conducted by the U. S. Army Artillery Board in the U-6A and UH-1A. In the future the airborne station will be mounted in the UH-1B. The light observation helicopter will assume the airborne station role in the future.

When using the two-sight technique in less maneuverable fixed wing aircraft, the aircraft was required to maintain reasonably level flight between sightings. Hence, it was exposed to enemy surveillance for an extended period of time. With rotary-wing craft, the "pop-up" technique used allowed the aircraft to be exposed for only a short time, make a mark, then disappear below the terrain mask.

Future systems will be enhanced by including a LASER in the airborne subsystem for distance measurement. An accurate one-sight technique then will be possible, with the ground station fixing the aircraft and the aircraft fixing the target with only one mark.

Major advantages offered by the LASER are reduced aircraft vulnerability and requirement that the observer sight the target only one time. This eliminates confusion encountered by observers sighting a difficult target from one location and then acquiring the target from another aspect with a varied target background and contrast.

Observers who have received normal forward observer training with the U. S. Army Artillery and Missile School can make accurate target locations with as little as 1 hour of specialized training. No specialized training is required for pilots. However, during initial tests at the Artillery Board, a pilot with some VATLS experience could aid the observer in the initial search for targets. He could also advise the aerial observer on the relationship of target location to aircraft attitude during sighting.

Using the two-sight technique, a target could be sighted and coordinates computed in 1-5 minutes. With the one-sight technique, this time can be reduced to ½ minute.

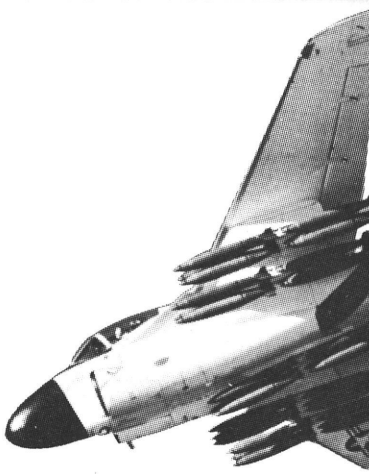
An additional capability of VATLS is internal survey. Fire units of a battalion or division artillery can be connected by survey in a fraction of the time now required when using laborious ground techniques. Position and direction control can be based on real or assumed data.

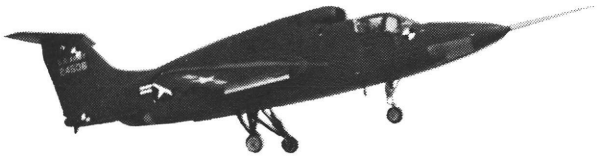
Aerial observer sighting on target

When target coordinates from VATLS are integrated with the outputs of the gyro-azimuth orientor, the chronograph for muzzle velocity measurement, and up-to-date meteorological and weapon-ammunition information, very effective fire control is possible. This can be accomplished with the Army standard M-18 gun direction computer. The way is open to first round hit accuracy. Bonus effects accrue with reduced ammunition expenditure and improved ability to attack targets by predicted fire techniques.

The Visual Airborne Target Locator System is a giant step toward long needed improvement in target acquisition capability. Potential value can be realized only after the equipment is employed with tactical units. The benefits will be great — the first round hit a reality.

Maj Van Matre is Chief Project Officer, Fire Direction Branch, Gunnery Division, U. S. Army Artillery Board, Ft Sill, Okla.





Airspace Utilization In Combat

Lieutenant Colonel Morris G. Rawlings (Ret)

THE PRIMARY objective of airspace utilization in combat is to minimize collisions while maximizing intercept. To utilize something means only to make it useful or profitable. Airspace is useful as it furnishes an avenue by which friendly objects advance the land battle. It is profitable when the gains from its use exceed the cost.

Profitability, then, can be measured on a sliding scale wherein the cost of achieving a goal is weighed against the gains inherent in its achievement. Something must be pinned down in such an equation, or the balance point can never be recognized. Let us do some pinning:

We want assurance that the collision hazard will not exceed 1 in 2,000.

We want assurance that the failure of planned intercept will not exceed 1 in 1,000.

The cost of achieving these gains must not exceed the existing supervisor/worker ratio: 1 in 10.

These, then, represent our goals. We have yet to determine the magnitude of the task. How many objects will attempt simultaneous use of how large an airspace? From unclassified and easily-obtainable sources, anyone may learn that in a 12-division type field army there can be on the order of

82 surface-to-surface launchers, firing missiles;

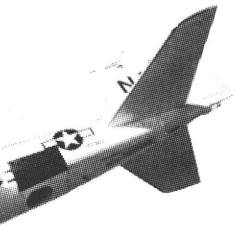
360 surface-to-air launchers also firing missiles;

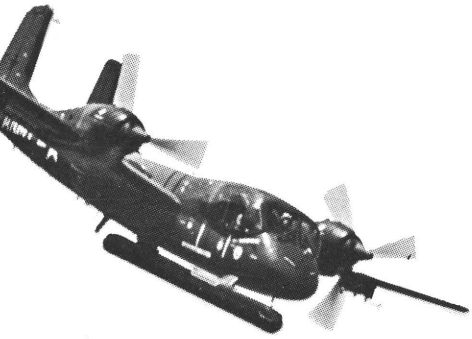
2,728 Army air vehicles, with 70 percent of them expected to fly two missions per day;

15 unmanned air vehicles, with 70 percent of them expected to fly 3 missions per day; and

48 preplanned reconnaissance, 576 close air support, 845 "wholesale delivery" logistical missions — all flown by Air Force aircraft.

An analysis of these figures indicates that some 1,000 flying objects will attempt to share the available airspace at the same time. Additionally, 20 and 40 mm weaponry, mortars, conventional artillery, and enemy objects will compound the clutter. Let us, to be safe, double the computed use and anticipate a maximum of 2,000. Let us assign each an average size, say 300 square feet (heaven forbid!). If grocery store arithmetic is correct, we have a demand for 600,000 square feet of airspace





— and we have been generous.

Although the altitude of some of these space users may be nothing short of fantastic, let us reduce our figures on available airspace to that just above the ground over an area from the disputed terrain at the line of contact to a line 20 miles rearward. Again, using unclassified sources, we can define this area as being a rectangle, 528,000 feet long and 105,600 feet wide, containing over 55 million square feet of airspace in the first foot above the ground. If every flying object intruded into that airspace just above the surface, with no altitude separation at all, each object could still be surrounded by a nothingness 90 times its own size! Every foot of

additional altitude used by such objects would further increase the area of nothingness, and decrease the odds against collision.

We can safely reach one conclusion: the congestion in the airspace will not even approximate that of any big-city freeway during the rush hour! No one has yet demanded that each automobile driver notify a central agency of his intent to take the road; nor has anyone suggested that counting the cars will enable any agency to compute the individual collision hazard.

This is exactly what would, and will, be required of any military agency designed to furnish air traffic control during combat. Partial control will not suffice, for the addition of a single missile, artillery round, helicopter or bouncing jeep will make invalid all earlier computations affecting the collision hazard. The statement "There are no known hazards to your flight path" is as meaningless as is "You never hear the round that kills you." And each offers the same degree of assurance to the unfortunate listener. We are left with three options:

Enforce full control, at any cost, under all conditions.

Establish no control.

Enforce full control, at a lesser cost, under certain conditions.

Our goals, in each case, have already been stated. We want assurance that mission completion, as affected solely by the collision hazard, carry odds of 2,000 to 1. We want odds in favor of planned intercept of 1,000 to 1. Cost, to play a minor part, should not exceed 10 percent of those assets using airspace.

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Surface-to-air launchers will add flying missiles to the type field army airspace. And don't forget VTOL aircraft!

What is the control necessary to achieve these goals? What variables can be made constant?

Let's talk first about the assurance of intercept. Two things are required: properly emplaced, alertly manned weaponry and a means for identifying targets. The first is not a part of airspace utilization; nor is it capable of resolution at any level short of top command. It must be assumed that the tools are present; it is only their use which concerns us here. Intercept is possible if friendly flying objects (particularly, manned air vehicles) are recognized, and enemy flying objects are identified.

Since the enemy can hardly be expected to cooperate in identification, it is necessary, if we are to reduce the variables, to fire at everything not recognized as friendly. What must be done to assure recognition? Two things:

Manned air vehicles, operating under visual flight conditions, must be visually seen before engagement. They will be presumed friendly until identified.

Manned air vehicles, operating under nonvisual flight conditions, will be electronically challenged before engagement. They will be presumed enemy until recognized.

Implementation of this concept — this command decision — will offer minimum assurance of target engagement while offering the maximum practicable reassurance to friendly aviators. The only controls required are trained air defense personnel and an electronic IFF link between air and ground for use during nonvisual flight conditions.

Variables which relate to recognition can be reduced to near-

constants, and the odds of 1,000 to 1 in favor of intercept can be achieved without the formation of any air traffic control agencies.

How about the variables which relate to collision-avoidance? Can they be economically stabilized to assure the commander of a 2,000 to 1 chance for mission completion, considering only unplanned collision as a deterrent? If so, what air traffic controls must be exercised to achieve this goal?

During visual flight conditions, we anticipate 2,000 flying objects competing for the available airspace. By defining available airspace as that one foot above the ground from 20 miles in the rear to the line of contact, we have shown that each object can be surrounded by empty airspace up to 90 times its own size. It is only necessary for the commander to determine three things:

Can the collision hazard be computed in a continuous manner, alerting each manned air vehicle in sufficient time for the pilot to take the necessary action to avoid collision with other objects?

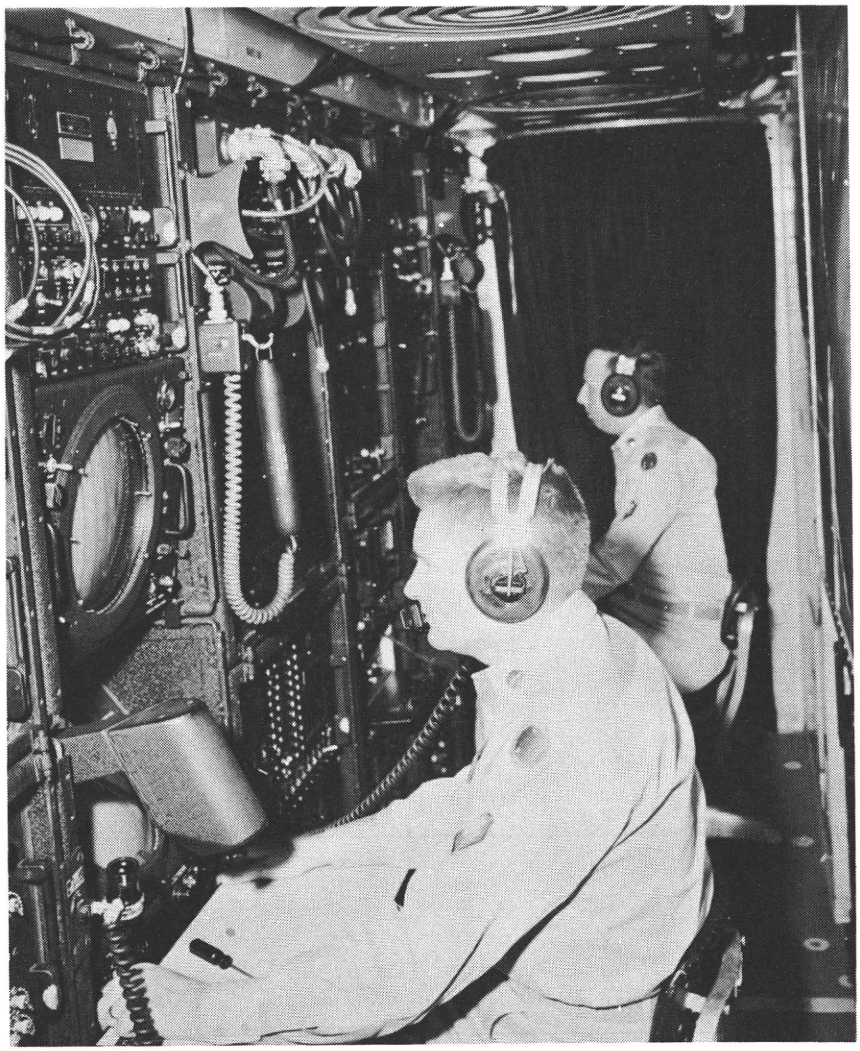
What will it cost in terms of men and material to make this computation?

At what point does the cost outweigh the possible gain?

The collision hazard can be computed; if not by man, then by machine. It must, however, be done at a central location, and the time of takeoff, direction of flight, time en route, and destination of every flying object must be known in advance. The addition of a single missile, or the flight of a single helicopter not known to the central location, and all bets are off. Because pilots cannot maintain time to the second, direction to the degree, or altitude to the foot, we require a verification system, preferably visual, to see that all is as programmed. Finally, we must maintain communications between a central location and all manned air vehicles throughout the affected area as well as to the launching site of all unmanned airspace users.

What will it cost? Let's see. One man (FAA trained controller) can compute the collision hazard of, and maintain separation for, 49 aircraft per hour over a given sector control point. Since we propose airspace utilization approximating this many objects per minute, we must anticipate a requirement for 60 controllers per 8-hour shift. We will need an equal number of communicators, 30 repairmen, 12 supervisory personnel, and another 12 for administration. Simple addition now indicates 522 personnel. For equipment, we will need radio and telephone with each battalion-sized unit (sole user circuitry) and a block of mandatory frequencies to be used in contacting airborne aircraft. We

Full control of all flying objects is necessary only during a specific time element and under certain conditions



need also transportation, administration, and fighting gear.

With all this, can we compute collision hazard and ensure mission completion? No.

We must establish and maintain a verification system — a means to ensure that objects are at their projected locations and are following their programmed flight paths. This will cost us 200 additional radar installations, emplaced to cover the entire area from treetop to the ionosphere, from army rear to enemy reserve locations. These must have crews for 24-hour operations, attached maintenance and repair personnel, communications, transportation, et al. This requires a minimum of 500 additional personnel.

If furnished, can we now guarantee that there will be no unplanned meetings in the air? No.

The enemy refuses to cooperate. His equipment is not on a flight plan known in advance to our central memory bank. Enemy objects, appearing at random on our radar screens, must be identified, their paths computed, and their effects on friendly flight transmitted, leaving sufficient time for the pilot of a manned air vehicle to take remedial action.

The commander's third question relates to the point at which the cost outweighs the possible gain. Based solely upon the relationship of supervisor to worker, that point is reached when the ratio exceeds 1 in 10 — in this case, when more than 200 men are assigned the task of controlling 2,000 flying objects. Our computations indicate that approximately 1,000 men are required to implement a centralized control concept, which will, even then, be unable to assure us that there will be no unplanned mid-air collisions.

Let's stop beating a dead horse. Full control under all conditions is not only infeasible, it is impossible.

Our second option is that of no control. We have determined that no central flight control facility is necessary to assure intercept, and we, therefore, require control only to avoid collision. We are willing (at least, the commander is) to accept odds of 2,000 to 1 that a mission will not fail because of mid-air smashups. Do we have that assurance without establishing any control? Frankly, yes. Then where's the problem? The problem is that we're dealing with men and not mathematics. The absence of control is unacceptable for several good reasons.

During nonvisual flight conditions, a blinded pilot draws reassurance from a friendly radio voice which tells him he is only alone in space — not in the world. He draws comfort from the knowledge that someone on the ground has his interests at heart and will warn him of extraordinary hazards to aerial flight, hazards not always recognized by nonairminded warriors.

Local commanders, having dispatched organic aircraft, are not always able to maintain contact with them. They welcome the presence of a facility which can relay information throughout the entire area without requiring recourse to an always busy command circuit.

Senior commanders, having a great disregard for some of their own regulations, do not always have the time nor the inclination to await results transmitted through the chain of command. They have been known to use more direct methods — one of which is an air traffic control facility — to obtain information or give orders directly to airspace users.

A congestion over juicy target areas and over designated holding areas; a backup means of identification for stricken air vehicles unable to answer the roll call of air defense weapons; a disparity in the speed of manned air vehicles which makes more difficult the see and be seen recognition — all of these have some degree of validity and cause some requirement for control.

Our final option, as expressed, is to apply full control under specified conditions. Partial control exists only in theory. The conditions which call for full control are those in which the probability of collision so jeopardize mission completion as to make the use of airspace unprofitable. Mathematically, this condition may never be reached. Practically, it is reached when pilots can no longer see where they are going, have no idea of the location and amount of other traffic, and have the feeling of having been totally deserted.

This weather condition exists, for manned Army aircraft, less than 15 percent of the time. Not unexpectedly, it is this particular time which commanders of all echelons consider the most appropriate for air movement. The much publicized and eagerly sought after 24-hour capability for air vehicles is an overstatement of the real requirement. The actual need is for continued airspace utilization during that small portion of the time in which air traffic is now either greatly reduced or completely stopped. To operate during these periods, control of flying objects is mandatory.

Greater progress toward the goal of proper airspace utilization will be achieved by simplifying the problem rather than by increasing the complexity of the solution.

Quality or Quantity

Lieutenant Andrew L. Bergeron

"LOOKS AS IF I'll get my ulcers cured this class," drawled the spectacled civilian flight instructor, his patent leather boots gleaming in the light. He glanced at the resume of his students' flying experience. "I've been instructing in the Caribou for three years now, and I have never had two students who both had more than 6,000 hours."

Across the table sat another civilian instructor. Rather than the patent leather boots, it was his head that shone in the light, as if to indicate that he had lost a tuft of hair for each difficult student. Soon he was heard to say in a deep authoritative voice, "Well! I'm in pretty good shape. I have one student with 2,000 hours, 400 fixed wing in the past year. The other one has 1,700 hours, only 85 of which were flown last year, and mostly in rotary wing aircraft at that. I have doubts about him."

At the end of the same table sat Lt Tom

Smoot, recently returned from a Caribou unit in the field. He had logged 600 Caribou hours in the past year since graduation. Upon his reassignment to Fort Rucker, Lieutenant Smoot requested a Caribou IP rating. After completing MOI the previous week he was now anticipating his first class.

"This data sheet looks like mumble jumble to me, Mr. Ben," stated Tom, looking at the man with little hair.

"We don't prejudge a student by his previous experience," replied Mr. Ben, "but the historical data sheet does indicate possible problem areas. I've been here since the course began, so I sort of inherited the job as historian. You'd be surprised at the conclusions that I am able to draw simply by looking at these slips of paper."

Mr. Ben continued, giving the young lieutenant a history of the course. It was apparent to Lieutenant Smoot that he was the second party of an "Old Guy" and a "New Guy" discussion. However, in this case the Old Guy appeared to have complaints as well as constructive criticism. It was as if Mr. Ben just had to make this lieutenant aware of the situation as he saw it. He talked on . . .

It is difficult to maintain standards as they were when the course began in 1960. We had more experienced pilots going through the course then, and even with high standards, very few people washed out. Now the student experience level is lower, but we must continue to keep our elimination rate at the barest minimum. Granted, many are qualified to become good Caribou pilots, but we know that many whom we put through the course are going to have difficulty in the field. We should have the prerogative to eliminate these definite cases. Of course, there are borderline cases. These people should be handled very carefully and given every opportunity to complete the course.

We can ordinarily predict from the historical sheets which students will fall into the borderline and the well qualified categories. There is *not* a possible elimination category. The borderline category consists of people who are immediate graduates of C phase, or who have less than 500 hours of flying time, and those who have less than 100 hours in the past year. Many of these people do quite well; however, 20 percent of them will flunk a checkflight. Found in this 20 percent is a small percentage of students who should be eliminated because of lack of proficiency.

Remember the Caribou is a unique aircraft. And it is capable of carrying 32 passengers under most conditions. Therefore, the crew is responsible for a half-million dollar aircraft plus whatever value you set on 35 lives.

The turn-around C phase student, one who has just received his wings, provides a unique problem. Because of lack of air-sense due to inexperience, he has difficulty in planning and judgment, aggravated sometimes by poor control. Poor judgment is very noticeable in shortfield work. It should be noted that the reason the Army has the Caribou is its shortfield capability. Through repetition many inexperienced students finally catch on, but always a few do not.

It is necessary that the proper glide slope be found as quickly as possible and maintained until touchdown. Again his inexperience makes it difficult for the student to stay on the glide slope due to his poor control technique.

A student who has less than 500 hours total time, although he may have been rated for a short while, generally has the same problems as the turn-around student. His proficiency is usually on a higher level, but he too has difficulty with aircraft control and judgment. His deficiencies

Poor judgment is very noticeable in shortfield work — experience is definitely the best teacher for the aviator transitioning into the CV-2

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The Army needs Caribou pilots in quantity, but quality must be maintained.

are not as acute, however, when compared to the average new aviator. Experience definitely is the best teacher for an aviator.

Students who have been on a ground tour, who have been flying rotary wing aircraft, or who have just been flying their minimum time in the recent past sometimes have difficulty with the course. Lack of proficiency is their basic problem. As the course progresses many of them gradually catch on. However, a few never seem to get the idea, and they have extreme difficulty with the course.

A very unpredictable trouble area occurs when the instrument stage is presented. As a prerequisite, all students must be fixed-wing instrument qualified with a current instrument card. This portion of the course is 9 hours long and is designed only to familiarize a person with Caribou instrument procedure and to teach him how to properly use the instruments. It is not designed to teach basic instrument flying.

In actual practice, flying instruments in the Caribou is easier than in many other Army aircraft. A second omni, which makes en route work quite easy, a radio magnetic indicator, which is always used for ADF work and sometimes for VOR procedure, and a glide slope receiver are the only navigational radios not found in the average Beaver. Even with this simple system many students have great difficulty learning to fly instruments in the Caribou.

Approximately half the students' problem is slow acceptance of Caribou procedure and instruments. However, the other half just have difficulty flying instruments.

No definite trend seems to be established to determine who might have problems. A recent returnee from an overseas area which has ADF as its primary navigational aid, an aviator who has just been meeting his annual minimums, or a turn-around student — all of these may anticipate trouble in the instrument portion of their instruction.

This particular stage of the course quite often involves teaching a person how to fly instruments in general, as well as how to fly instruments in the Caribou. Those who have difficulty learning Caribou procedure should be given additional time if they need it. Those who need instruction pertaining to instruments in general shouldn't be here in the first place.

We always have those who are weak both in flying the Caribou and in flying instruments. Flown separately a fair job is done on each. When combined, almost anything is liable to happen. It is like teaching a child to walk and later to chew gum. Done separately the mission is completed; combined, the child either falls down or bites his tongue.

We realize that a certain percentage of students in any course is going to have a reasonable amount of difficulty. We also believe, however, that the present percentage in the Caribou Transition Course could be greatly reduced. We may appear to be striving for an ideal of perfection. We are! After all Caribou pilots carry many people on their missions, and what is more precious than a human life?

The newest source of Caribou students is recent graduates from C phase, both from the Officer and the Warrant Officer Candidate courses. Because of the present demand for Army Aviators, this particular source should continue to be used.

Until now no discrimination has been made in selecting probable students. The C phase student receives his orders before graduation from flight school. If he is slated for a Caribou unit, a space is reserved for him in the next class after graduation.

Continued on page 41

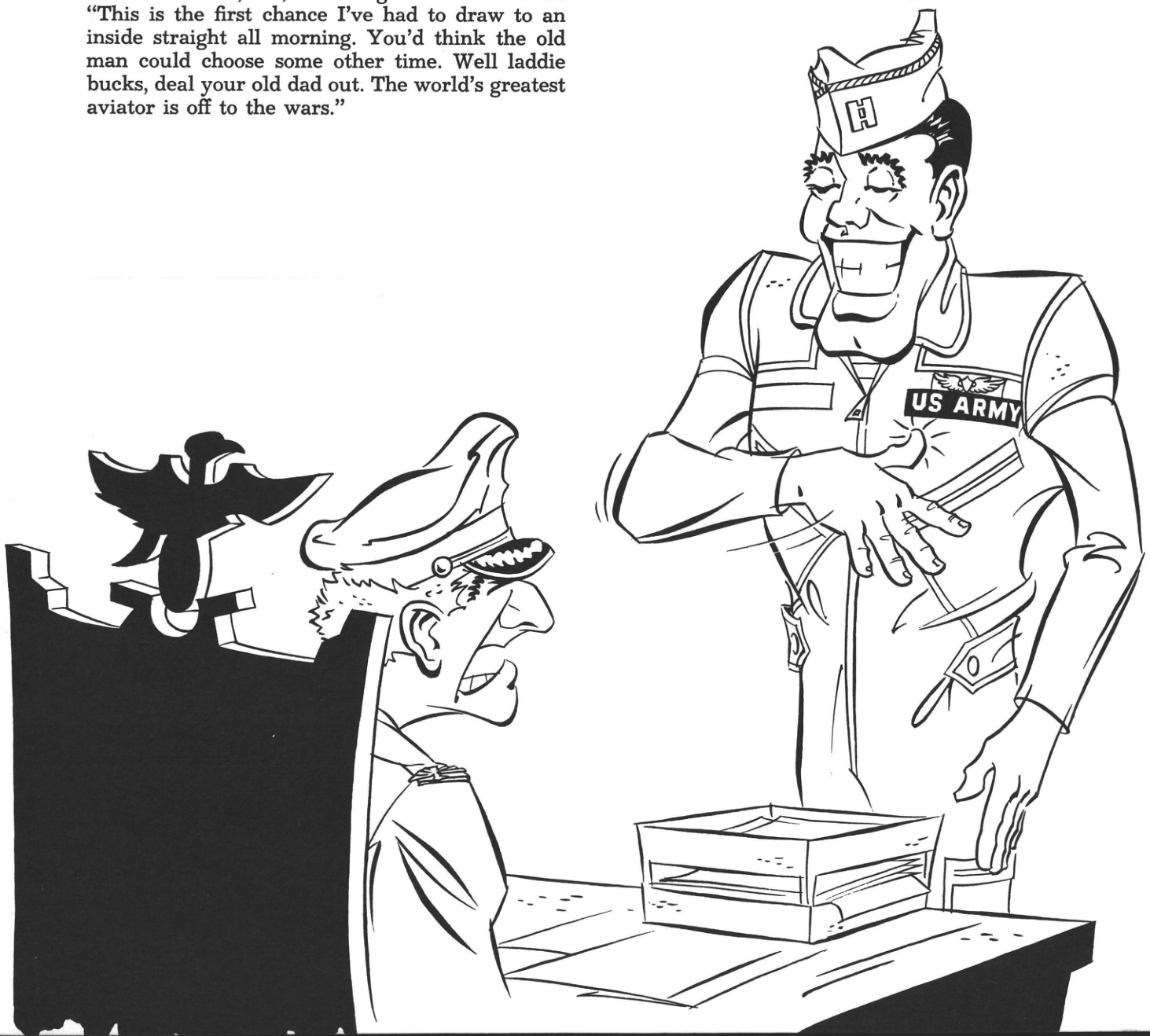
FROZZLEFORTH

Captain Lawrence F. Beyer

CAPTAIN Frozzleforth, Colonel Blapp would like to see you at the command post immediately, sir."

"Aw for crying out loud!" replied Capt Horatio Z. Frozzleforth, III, throwing down his cards. "This is the first chance I've had to draw to an inside straight all morning. You'd think the old man could choose some other time. Well laddie bucks, deal your old dad out. The world's greatest aviator is off to the wars."

"Yes siree, Colonel, I'll give the old boy the best cook's tour anyone ever had in a helicopter"



& THE SENATOR

Grabbing his cap, Frozzleforth strolled out, noting mentally that it was a beautiful day for flying. The sun was shining and the air was crisp and clear. It was a relief from the constant cold drizzle that had plagued SWIFT BANYAN FREEZE IV for the past week. Why was it that field maneuvers always seemed to be scheduled during the worst weather of the year?

"You wanted to see me, Colonel?" asked Frozzleforth as he entered the CP tent.

The aviation officer looked up. His jaw hardened and his eyes gathered frost as he stared at the slouching figure before his desk. "Frozzleforth, straighten up! At least try to look like an officer!"

Frozzleforth snapped to attention and the heels of his unpolished boots slapped together. He saluted smartly. "Yes sir! Captain Frozzleforth reporting as ordered, sir!"

"Now listen to me carefully. Senator Beauregard Waspshot is due here in 30 minutes and he wants a helicopter tour of the maneuver area. I just found out about it, and you . . ." the colonel winced, " . . . you're the only pilot available. The senator is a member of the Armed Services Committee and would like to get a good look at the scope of a corps exercise from the air."

"Yes siree, Colonel, I understand perfectly. I'll give the old boy the best cook's tour anyone has ever had in a helicopter. Why, when I'm through—"

"That's just what I don't want, Captain. All that's required is that you fly the senator quickly and safely around the area. The inherent advantages of mobility and flexibility of the helicopter will be adequately evident without any of your — and I use the word advisedly — *help*. Now remember, no hanky-panky with the senator!"

"Why, Colonel, you wound me deeply. If you think for a moment that I'd—"

"Captain, where is your .45? Aren't you aware that you are supposed to carry your side arm at all times during these maneuvers?"

"Oh yes sir, I - ah - left it on my bunk. Didn't think we had to lug those things around the CP area."

"Just go, Frozzleforth. Please go."

Frozzleforth left the tent with a fine feeling of well being. What could be better than this? Flying a U. S. Senator from the Armed Services Committee around certainly couldn't hurt his chance for promotion any. He imagined how that gold leaf on his collar would feel. Why if he were lucky—

"Good morning, sir. Your bird is all ready to go."

"Thank you, Sergeant," replied Frozzleforth as he returned the mechanic's salute. "But let's go over her once again just to be sure. I'm flying a real VIP today and I want everything perfect."

"Yes sir. Excuse me, sir, but did - ah - you forget your .45 this morning? I'll go back to your tent for it while you preflight if you'd like."

"No need for that my boy. This is an administrative adventure today. No need for a .45 when you're carrying a U. S. Senator."

For a change Frozzleforth made a thorough preflight. He dusted the instruments and even checked the gas tank. It was a sight to behold and the mechanic watched in wonder, for it was not often that Captain Frozzleforth was seen to preflight an aircraft.

Senator Waspshot's U-8F arrived on schedule. After a few words with Colonel Blapp, the senator walked briskly to Frozzleforth's running OH-13. "Good morning, Captain. Are you all ready to go? I hope so because I have to leave for Washington in 2 hours.

"You bet, Senator. Just strap yourself in and we'll be off into the blue before you can say filibuster. By the way have you ever ridden in a light helicopter before?"

"No, I've never been in a small helicopter before. I can't seem to find the other end of this seat belt. Could you give me a hand—"

At that instant, Frozzleforth, who was not listening to the senator, pulled pitch, eased back

the cyclic, and jammed in left rudder. "Might as well give the old boy a thrill," thought the intrepid aviator, as the Sioux rose and backed off the pad in a hard left turn.

Frozzleforth glanced at the senator for his reaction and was most surprised to see his passenger 90 percent outside of the helicopter. The only thing preventing him from being 100 percent outside was the death grip in which he held the inboard half of his seat belt. Frozzleforth also noticed that the senator's knuckles were quite white.

Quickly, Frozzleforth transferred his left hand to the cyclic and dragged the senator back into the cockpit with his right. "Sorry about that," he apologized. "I thought you were all strapped in."

The senator was too shaken to reply.

Frozzleforth leveled the helicopter at 500 and headed out across the countryside. He noticed the carburetor air temperature gauge in the icing range, reached up, and pulled on some carburetor heat. "That ought to fix things up," he thought.

On they flew, with Frozzleforth pointing out the features of the maneuver area to the senator. Suddenly, he felt a twitch in the pedals — the kind he'd learned to associate with carburetor ice. Automatically, he reached up and pulled on more carburetor heat. Again the twitch. This time it was far more severe. "No time for half measures, old bean," he thought to himself. "It's time for full carb heat before this quits on me." With that, he pulled on full carburetor heat, and the engine promptly failed.

"What's wrong?" asked Waspshot, his voice quavering and his face ashen.

"No sweat, dad. It's just a little engine failure. I'll autorotate us down into that open field."

"What open field?"

Now that was a good question. Frozzleforth was sure there had been an open field down there a moment ago. but now there was nothing but pine trees. Resigned to a tree landing, he looked at the console and reached to pull the mixture to idle cut off and turn off the ignition.

He couldn't believe his eyes. There was the mixture already in idle cutoff, while the carburetor heat level was in the full cold position. Rapidly, he jammed the mixture to full rich. After what seemed like hours, the engine roared back to life and Frozzleforth was able to check his descent. The skids were inches from the trees.

"I've seen enough, Captain! Let's go back now!"

Reluctantly, Frozzleforth headed for home. Soon the airfield came into view. "Will you be staying a while, Senator, or leaving immediately?"

"I'll be departing as soon as possible, Captain!"

"Very well," thought Frozzleforth. "I'll give him a real demonstration of precise helicopter flying. I'll set this machine down not 10 steps from his U-8."

Frozzleforth notified the control unit what he intended to do and began maneuvering for a landing. As the U-8F was parked with its left wing upwind, Frozzleforth decided on a crosswind landing so as to let his passenger off as close as possible to the airplane's entrance door. He approached the parked U-8F from the left rear with the reported 7-knot wind from his left. He brought the Sioux to a hover and allowed the wind to drift him right, towards the open door of the Seminole. At exactly the spot where he planned to stop his drift and land, he eased in left cyclic. The Sioux continued to drift. Suddenly, realizing that he was getting too close to the parked aircraft, he pulled pitch and increased power. It was too late.

As the rotor blades slashed into the vertical stabilizer of the U-8, the air was filled with the sounds of tearing metal. The helicopter lurched on its right skid. Slowly, ever so slowly, it tipped forward onto its back. The still spinning tail rotor took great hungry bites at the forward cabin of the U-8.

Later, Frozzleforth stood, his heels locked together, body rigid, in front of Colonel Blapp's desk.

"Never in my life, Captain, have I seen such a display of poor judgment and airmanship as it was my misfortune to observe during your fiasco with Senator Waspshot. I can understand the incident with the carburetor heat, but I can't excuse it. And I find your actions in not adequately preparing your passenger for this flight and your attempt to execute a landing that was beyond the capabilities of both yourself and your aircraft totally inexcusable!

"Not only did you cause major damage to two Army aircraft — you risked the lives of yourself and your passenger in an attempt to show off!

"Pack your gear and clear out — by Jeep! You're being reassigned to the furthest, most isolated post I can find!

"You are dismissed, Captain!"

Despite Frozzleforth's tribulations, things didn't turn out too bad for him. After his exile, he was returned to flight duty and is now winging his way cheerfully and full of confidence back into his role as the world's greatest aviator. Is he, by any chance, assigned to your unit?

accurate information is needed from all crash facts messages . . .

You Can Help

TWX FORCED LANDING MESSAGE:

1. 2 NOV 64, 0935 8½ MILES SOUTHWEST OF FT XXXX HQ
2. OH-13E, 51-XXXXX, AVIATION SECTION, FT XXXX
3. FORCED LANDING, NO DAMAGE
4. PILOT, SERVICE, XXXXXX, XXXX X., XXXXXX, MAJOR, AVIATION SECTION, FT XXXX, SHOULDER HARNESS, SAFETY BELT, AND PROTECTIVE HELMET USED. NO INJURIES.
5. N/A
6. N/A
7. ENGINE FAILED AT 300 FT. PILOT MADE 90 DEGREE LEFT TURN INTO WIND AND LANDED IN FIELD.
8. WEATHER NOT A FACTOR.
9. UNKNOWN
10. UNKNOWN
11. ENGINE MODEL AND SERIES O-335-5B, SERIAL NUMBER XXXXXX, TOTAL TIME 1124:20, TIME SINCE LAST OVERHAUL 153 HOURS, DEPOT AND DATE OF LAST OVERHAUL - XXXXXXX 13 AUG 62, PREVIOUS STORAGE HISTORY - 14 AUG 62 UNTIL 11 JUN 63 INSTALLED IN AIRCRAFT, CAUSE OF FAILURE UNKNOWN, POWER SETTING 3100 RPM 20 IN. HG, ALL ENGINE INDICATIONS IN THE GREEN.

HEADQUARTERS
Fort XXXX

AJGAV 17 November 1964
SUBJECT: Engine Failure, OH-13E, 51-XXXXX
TO: Director
U. S. Army Board for Aviation Accident Research
Fort Rucker, Alabama

1. Reference Fort XXXX crash facts message, dated 2 November 1964, the aircraft was inspected and run up at the forced landing site. It was determined that there was no damage to the aircraft and it was loaded on a flat bed truck and returned to the Aviation Section, Fort XXXX.

2. The following inspections were performed:

a. Oil screen was pulled and no metal particles found.

b. Fuel strainer was pulled and nothing found in strainer.

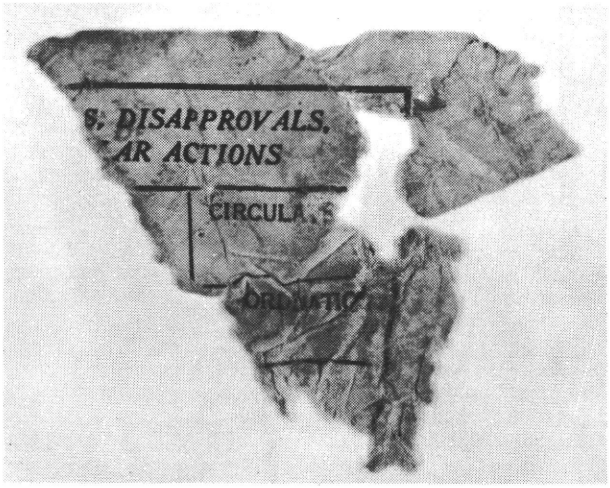
c. Carburetor finger screen was pulled and found clean.

d. All spark plugs were pulled, checked on tester, and found okay.

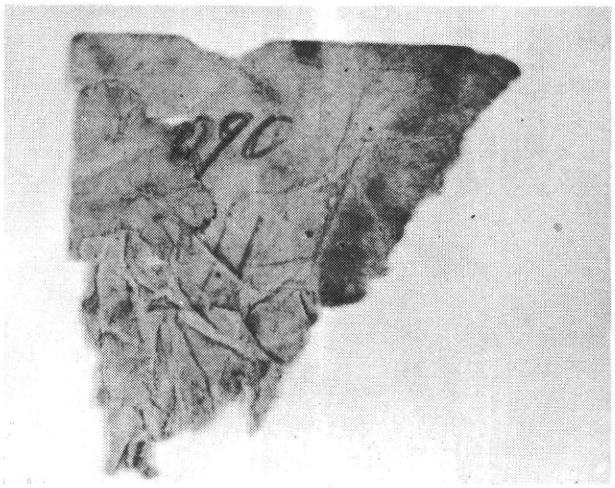
e. Fuel tank was pulled and the contents shown in photographs 1, 2, and 3 were found in the tank. Tank was flushed with hot soapy water and steamed out as outlined in TM 55-405-3,

crash sense

PREPARED BY THE U. S. ARMY BOARD FOR AVIATION ACCIDENT RESEARCH



DD Form 95 — never use for approvals, disapprovals, concurrences, similar actions, or filling fuel tanks



Paper shuffle invades fuel

page 98, para 150 b and c.

f. Carburetor was removed and gas resistant grease (photo 4) was found in the throat at the location shown in photo 5.

g. Drain plug was removed from the carburetor and an excessive amount of unidentified sediment was drained from it. A new carburetor was installed.

h. All hoses were removed and flushed, and all components reinstalled. The engine was started and operated on the ground for one hour. The engine ran smoothly with all instruments in the green.

The above message and followup actions illustrate how well the Army aircraft accident reporting and prevention system works when everyone does his part. The cause of engine failure was definitely established and reported with substantiating evidence (photographs). The reporting unit recommended inspection of the fuel system be included in a special inspection with a frequency of 600 hours. It also recommended that information about the dangers of using gas resistant grease on fuel cells, fittings, and carburetor mounting gaskets be published.

Unfortunately, this is not always the case. For example, here is item 4 from a recent crash facts message:

"Pilot, training, [name], captain, instructor pilot, [name], captain, [serial number]: safety belts, shoulder harnesses, protective helmets used: both sustained fatal injuries."

This was followed the same day by:

"2. Paragraph 4 should read: Pilot, training, SY RPT, [name], captain, [serial number], copilot, [name], captain, [serial number]; safety belts, shoulder harnesses, and protective helmets used; both sustained injuries."

Then came:

"2. Paragraph 4 should read: Pilot, training, [name], captain, [serial number], captain, [serial number]; safety belts, shoulder harnesses, and protective helmets used; both sustained little injuries."

At this point, everyone was confused and the following TWX message was sent to the reporting unit:

"Request confirmation of crew positions and/or duties and extent of injuries."

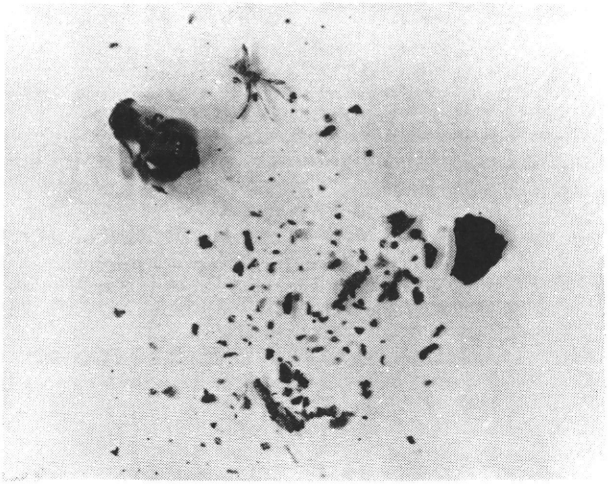
This was the answer:

"Mission was training. Pilot was Captain [name], copilot was Captain [name]. Pilot was at the controls of the aircraft when accident occurred. Pilot and copilot killed on impact."

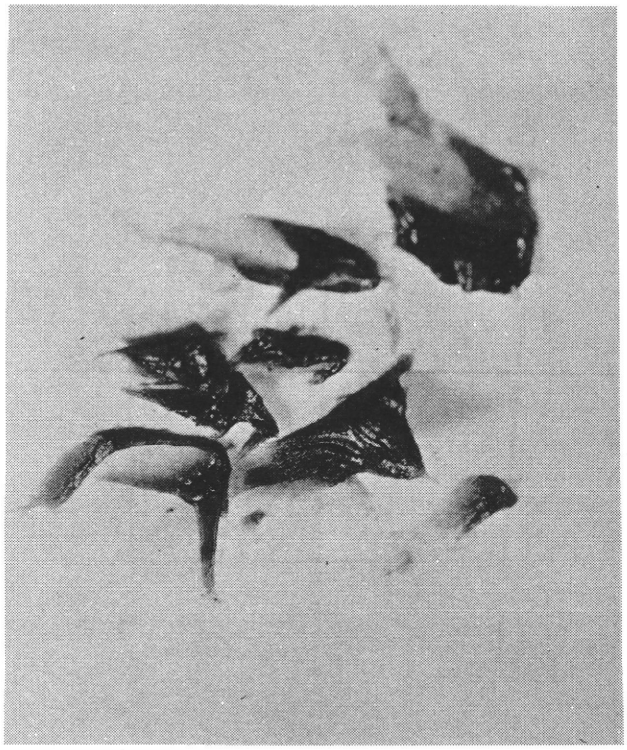
These examples only serve to illustrate how confusing inaccurate reporting can be. Other examples represent a more serious problem.

Any time items 3 (classification and damage) and 7 (description) report any type of mechanical malfunction or failure, items 9 (description of maintenance deficiency, materiel failure, or malfunction), 10 (stock list number of failed part), and 11 (engine data) should identify components and parts and give the cause of failure or malfunction.

When this information is not known at the time of the original message, these items should

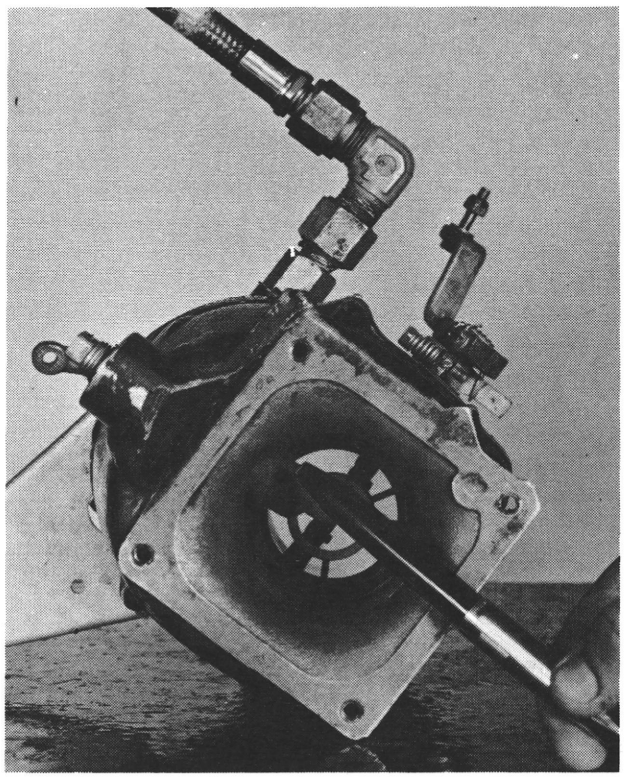


Honeycomb manufacturer sought new plant



Gas resistant grease

Pen points to location grease was found in carburetor



state "unknown" and supplemental information should be reported as it becomes available. Some crash facts messages are on file which report a forced landing in item 3, engine failure in item 7, and N/A for items 9-11. This type of reporting is of little value to the prevention program.

When TWX messages are received by USABAAR, all information about cause factors is coded to IBM cards where it can quickly be retrieved and collated with similar cause factors in support of prevention proposals.

Accident experience indicated that the TBO (time between overhaul) for one of our newer engines was excessive. During a 5-year period, 214 failures of this particular engine were reported. Twelve of the failures resulted in destroyed aircraft and four fatalities. The dollar loss for aircraft damaged and destroyed exceeded $5 million.

When an attempt was made to determine the average time of the 214 failed engines from the information coded to the IBM system, it was found that TWX messages had reported the engine time for only 133 failures. For one series of this engine, the engine time at failure was reported for only 3 of 40 failures; another series showed that engine time had only been reported for 42 of 95 failures. Eight percent of the reports failed to even list the engine series.

To adequately support prevention proposals, such as a reduction in TBO, accurate and complete information is needed from all crash facts messages. You can help.

This discussion has centered around two drugs which offer potential danger to flying. Each aviator should be aware of these dangers and should consult his "friendly" flight surgeon before undertaking treatment.

the following two articles appeared in the October—November issue of the 11th Air Assault Division Sky Soldier Aviation Safety Bulletin:

Drugs and the Aviator

Captain William S. Bost, Jr., MC
228th Aslt Spt Hel Bn

Miracle workers employed by the various drug firms have made tremendous strides in discovering chemicals which supposedly allay all suffering. However, what they do not advertise is the harmful effect these drugs have on various body functions, including the ability to think clearly.

Perhaps the medications most readily used are the antihistamines, the highly advertised cure of colds. For the aviator these drugs must be reviewed with a jaundiced eye, for they almost universally produce drowsiness. In addition, they accomplish little if anything toward effecting a cure for this malady. The most dangerous aspect of the drug is that it can be bought at the corner pharmacy without a prescription. And an aviator obtains the undesired effect practically every time he takes a pill for his cold.

All cold remedies including the one which "restores free breathing again" and the one "with the tiny time release capsules" contain the undesired antihistamines. For this reason the aviator should consult his flight surgeon before taking cold remedies, and he should be aware of the harmful effects these drugs produce.

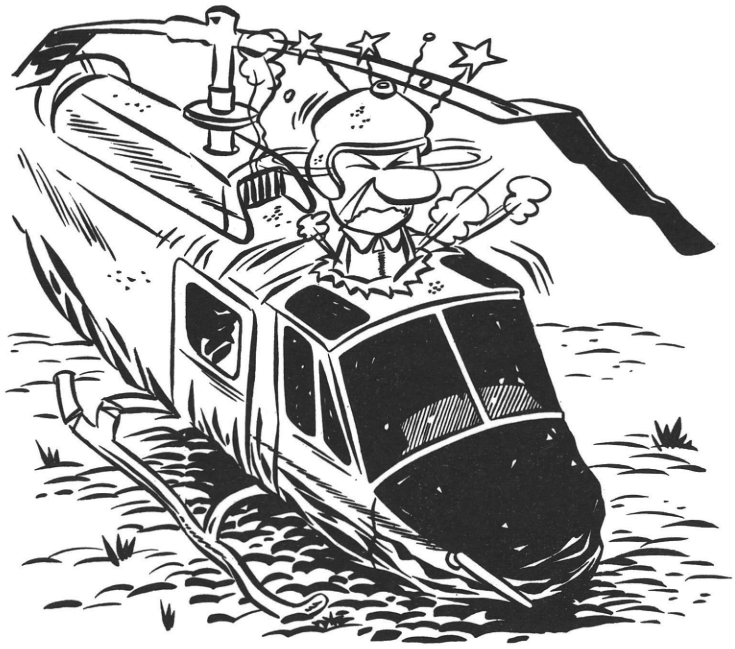
There are many medications on the market which definitely preclude flying, but the majority of these can be obtained only by prescription. These include tranquilizers, barbiturates and narcotics, but here the effect on body functions is quite obvious and therefore these are shunned by almost all aviators.

This discussion leads to one last group of drugs which surprisingly are used quite readily by aviators. The amphetamines, as in common language the "pep pills," are taken with alarming regularity by flying personnel. True this medicine wards off fatigue during the long hours demanded by a field problem. It also brightens one's outlook and brings about a false sense of security, a feeling that no task is too formidable.

Here again the drug is a double-edged sword for the aviator. Evidence shows that it brings about little or no increase in one's reaction time, but only makes one *think* his reactions are faster. We can see that if a flier experiences fatigue, his reflex actions are also fatigued. The only effect the amphetamines have in this situation is to promote the false illusion that the aviator can accomplish the mission as well as if no fatigue existed. However, his reaction time in combination with this false sense of security could lead to the loss of valuable seconds in an emergency situation.

Aside from this undesirable effect on aviators, the drug affects the heart rate and blood pressure, elevating both for a variable period of time. The worst danger accompanying the use of this drug is the development of a psychological dependence. Everyone thinks this cannot happen to him, but one never knows. Case reports appear quite frequently of someone who began taking the medication to allay fatigue and quickly the dependence developed.

For these reasons everyone should consider carefully the effects of the drug and the possible consequences before taking it. For the aviator this is a particularly delicate decision because the false sense of security may prompt unsafe acts with a resultant accident.



Engine Failures

any rotary wing pilot should be able to autorotate his bird in such a manner as to walk away from it . . .

Lieutenant Mike Mayville
3/17 Cavalry

There you are, flying along at 1,500 feet above the ground, everything in the green and nothing to think about except keeping right side up in such a manner that your passengers think that that's the Huey's normal attitude.

Then, rapidly, things begin to happen which, when over, will have ruined your whole, beautiful day. I had mentioned that the day was beautiful, hadn't I? Sure it was: clear and 15, with a 10-knot steady wind quartering off the nose. Temperature cool, but not uncomfortable, density altitude way down. A truly lovely day, until the exhaust gas temperature started its rapid climb, the oil pressure its fluctuations, and the high-pitched turbine whine changed to a nasty clanking sound. No sweat though. There is a big open field off to the right and impossible to miss. Just remember techniques and you've got it made. Pitch full down, 60 knot attitude; now there's almost a minute to look things over before pitch-pull.

How about that! Engine rpm is still right up there! EGT is down now and the oil pressure is

zero, but the engine is still running. No sweat now. Just terminate with power.

Down to 50 feet, and up comes the nose to dissipate airspeed. Throttle checked full open, begin pitch pull at about 30 feet, no sweat, terminating with power in a big open field.

Then falls the ax. The pitch is somewhere in the vicinity of the armpit, the helicopter is falling like a rock, and a quick glance shows the engine and rotor rpm passing down through 4000. Now who would have thought the engine would fail right at that point? The truth is, everyone should have. In this case, the engine had done everything it could to tell the pilot that it was no good any more, but still he elected to depend on it at the most crucial point of his approach. The results were broken skids, cracked longerons, and a scraped bottom, caused not by an engine failure but by pilot technique.

Now take the case of a pilot who had an engine which cut back to flight idle in flight. Wham — down on the pitch; zip — 180° turn into the wind; nice field just ahead, rotor in the green, airspeed 60 knots, gas producer 60 percent. Ground looks soft so the aircraft must be completely stopped in the air, if possible. Up with the nose — sneak in a little pitch to keep the rotor rpm green — cushion the heels on, now the toes — sinking in a little but this looks like a good one.

Just at this point the malfunctioning fuel control that caused all this decided to meet the demands placed upon it by the collective pitch position. With low rotor rpm and the skids sunk in the soft dirt, this had somewhat the effect of twisting the skids to the left and the aircraft to the right. Fortunately, in this case, the aircraft was still sliding forward a little and the movement allowed it to turn 45° to the right, but the pilot had to do some quick moving to keep it on the ground, after being presented with a whole bunch of power that he didn't need.

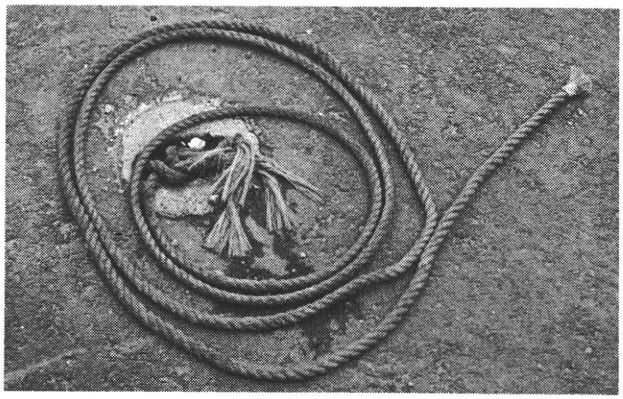
From these and other hairy stories, I have evolved an opinion and subsequently found that a lot of other people shared it with me. Simply stated it is: If something happens that requires you to go into autorotation you should carry the autorotation all the way to the ground whether you have power or not.

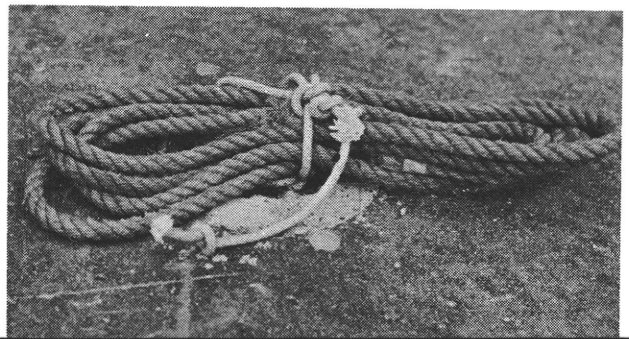
Any rotary wing pilot in the division should be able to autorotate his bird in such a manner as to walk away from it, even if he leaves it wrapped around a tree. How many of us, however, could handle that second power failure close to the ground, when we are really depending on power? And when the power comes back in when you are making an autorotation touchdown with the throttle full open, there isn't much to do but ride it out and hope.

The solution to all this is a fully closed throttle no matter what engine indications caused the need for autorotation. It all boils down to the point that you can't depend on getting power from a malfunctioning engine; but you can't depend on not getting it, either.

Better Mousetrap

When James C. Rosser, shop superintendent, Aircraft Maintenance Division, DOM, Fort Hood, saw a hazard on the parking ramp a few months back, he sat down with a suggestion form (DA Form 1045) and did something about it. Rosser saw the danger of loose aircraft mooring ropes in an area where they were likely to be drawn into turning propeller or rotor blades. He suggested coiling the ropes and tieing them to the mooring points as shown in the accompanying photos.





Foreign Object Damage

Much has been written about foreign object damage to turbine engines. We know it costs money, wastes manhours, and delays missions. But in spite of everything we know about it, the problem is still with us and threatens to increase as more Army aircraft are equipped with turbine engines.

Among some of the objects recently collected from an Army airfield, we find an assortment of nuts, bolts, screws, washers, clamps, worn brake pucks, a variety of gaskets, short lengths of chain, a match box, a paper cup, a plastic spoon, flashlight batteries, safety wire, rags, and even an oil tank filler cap. What makes this collection even more significant is that all of these items were collected immediately after the mechanical sweeper had made its rounds.

What can we do?

(1) We can make certain that we discard scraps and rubbish in containers, not on the ground.

(2) We can ensure that our work area is clean after we complete a job.

(3) We can make it a habit to frequently inspect and police areas where aircraft are run up and taxied. Your concern and assistance can go a long way toward eliminating this problem.

Quality or Quantity

Continued from page 31

Individuals should be more carefully screened before assignment to a Caribou unit. Sometime during B phase a transcript on each student's previous performance should be forwarded to Department of Army. This particular information, given at the latest moment, could be very influential. Possible nominees could be made for various assignments, and upon receipt of this set of records, a final decision could be made. Only the best should be nominated.

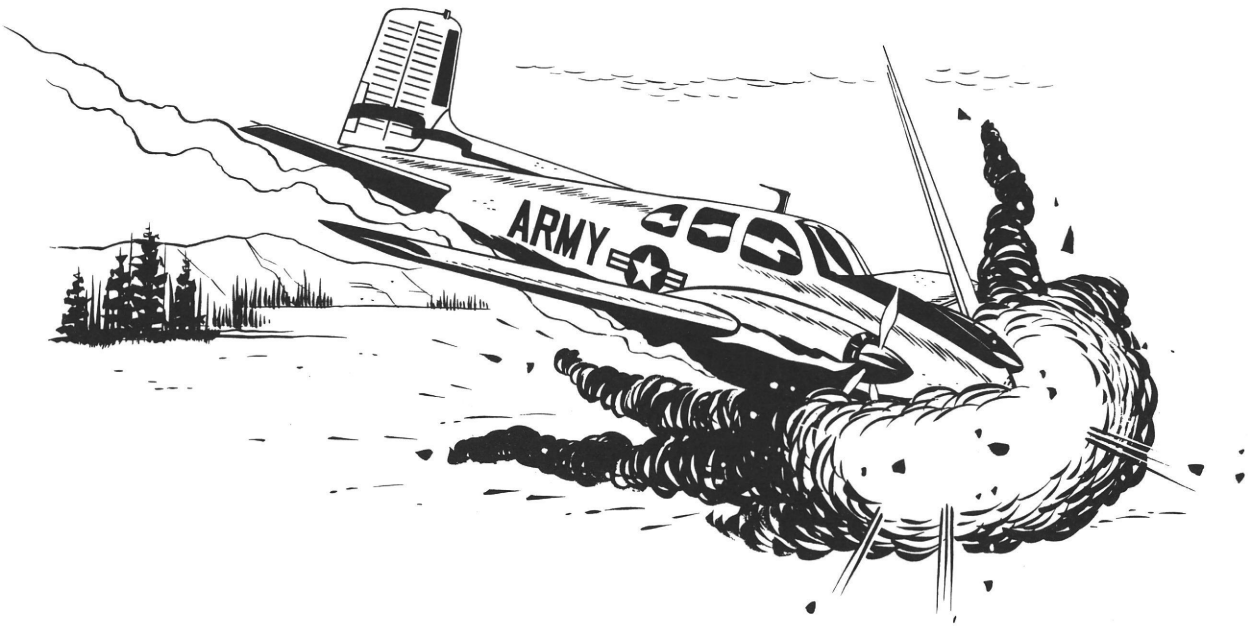
Those who are assigned directly to Caribou units from other points of duty should be selected with discretion. Records of previous performance which indicate proficiency should be admitted before final selection. Any haphazard method for nominating possible Caribou pilots should be discouraged.

In certain commands where the Caribou is only one of many different aircraft, the commander is charged with assigning personnel to Caribou units, and in effect to Caribou school. Again, his selection should be influenced by previous performance. When at all possible, a nominee should not be in any of the trouble-warning areas. If a candidate does lie in one of these zones, every effort should be made to overcome his deficiency before his arrival at Fort Rucker.

More rigid standards should be maintained to prevent renewal of instrument cards for those who do not maintain proficiency. Possibly upon receipt of orders to Caribou school, a thorough instrument flight check should be given to determine current proficiency. The resultant course of action would be dictated by the examiner's findings. Of course, maintaining a high degree of standards in C phase training will also eliminate many of our problem students.

We realize the Army needs quantity in Caribou pilots, but we must maintain quality as well. If the steps that I have mentioned were executed properly, the caliber of Caribou pilots leaving Fort Rucker now would compare to that of years past.

As Lieutenant Smoot walked down the hall to meet his new students he began to think, "I wonder if the Old Guy knew what he was talking about. If the caliber of some students is as low as he says it is, then my work is really cut out for me."



Personal Preaccident Plan

Captain Frank W. Ogden, Flight Surgeon

Figure 1

what to do until the doctor arrives . . .

A GOOD PREACCIDENT plan has as its prime objective crash rescue of survivors. When accidents happen where such plans have been established and frequently rehearsed, medical rescue personnel are usually on the scene in minutes to treat wounded survivors.

Unfortunately, many aircraft accidents happen far beyond the range of preaccident plans; emergency treatment for wounded survivors must be given by other crew members or passengers of the crashed aircraft, or by the first person to reach the scene. If you found yourself in this

position, would you know what actions to take? You should, because these actions may well determine whether the wounded live or die.

Your first consideration should be to prevent further injuries. If there is a danger of fire, explosion, or structural collapse, move the injured to a safe area (fig. 1). Do this promptly, but take care you do not become a casualty in the process. Make a conscious effort to remain as calm as possible.

If an injured person is suffering from asphyxiation or exposure to any type of toxic gas, move him into fresh air or give him oxygen. If he has been splashed with acid, liquid oxygen, or any other corrosive material, remove any clothing saturated with the harmful liquid and wash exposed areas with large amounts of water. If he has contacted live wires or conductive parts of the aircraft, as might well be the case in a wire strike accident, use some type of nonconductive material — wood, cloth, rubber, etc. — to move him away if the electrical current cannot be turned off.

Render first aid. The cardinal points of first aid should govern your actions. These are:

Establish an airway for breathing
Stop bleeding
Prevent or treat for shock or coma
Immobilize fractures

Check the mouth and throat and remove any obstructions. If the tongue is in the throat, reach in with your fingers and draw it out. Extend the head so the throat is not obstructed. If breathing has stopped, start mouth-to-mouth (fig. 2) artificial respiration immediately and keep it up until breathing is restored or until qualified medical personnel take over. Be careful not to give artificial respiration too rapidly. Twenty times per minute is fast enough.

Figure 2

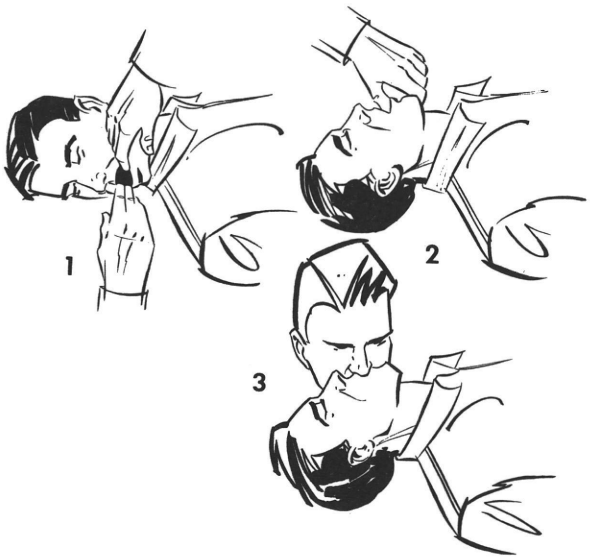


Figure 3

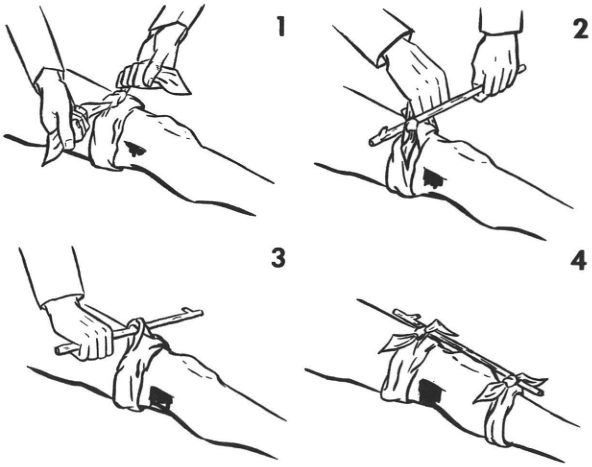


Figure 4

Oxygen, if available, may be given once breathing has been restored. This will help to reduce shock. Remember that standard Army aircraft oxygen equipment is no substitute for artificial respiration and should not be used in the attempt to restore breathing.

Use compresses, preferably dressing from a first-aid kit, to stop bleeding (fig. 3). If a first-aid kit is not available, use the cleanest cloth available, such as a handkerchief or shirt. Apply the compress to the wound with firm pressure. Use care to keep wounds clean and don't touch them.

If the compress fails to stop the bleeding, use a tourniquet (fig. 4). DO NOT USE IT OTHER-

WISE. Place the tourniquet between the wound and the heart and tighten it *only* enough to stop the blood from gushing. Keep it tight until medical help arrives. If help does not arrive within 30 minutes to an hour, the tourniquet should be loosened momentarily. At this point, you should try again to control the bleeding with a compress. If the bleeding continues, tighten the tourniquet again. Repeat this procedure until help arrives.

If the victim has a head wound, keep him lying flat with head raised or at least level with his body.

Wounded survivors should be kept quiet and warm to prevent or treat for shock. Loosen their clothing and remove any bulky or heavy items. Cover them with blankets, coats, parachute canopies, or any other material that's handy. Move them as little as possible.

If you must move them, remember there may be broken bones so use caution. Check for head wounds and broken legs. If there are none, lower the victims' heads and shoulders and raise their legs. This will cause more blood to flow to their heads. Broken legs should be splinted to immobilize the breaks before the injured are raised or moved.

Burn injuries often occur in aircraft accidents. Treat such survivors for shock and obtain medical assistance. Do not touch burns or try to remove pieces of fabric which stick to burn areas. If there is no evidence of internal injuries, survivors may be given lots of nonalcoholic liquids.

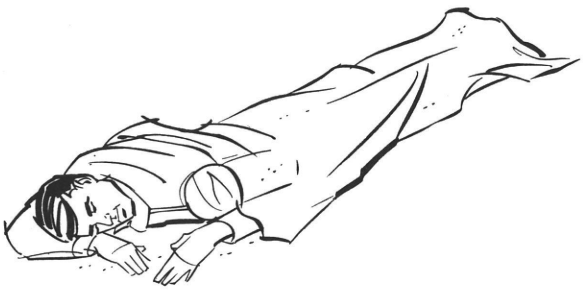


Figure 5

Minor burn injuries may be treated at a more convenient time, but *all* burn injuries should be given medical attention.

If a wounded survivor is unconscious place him face down with his head to one side to prevent choking should he vomit (fig. 5). Be very careful not to obstruct airways by cramping his neck. Do not try to give him a drink while he is unconscious.

Survivors with fractures must be handled carefully to prevent further injury and shock. While there may be no time to check for broken bones during or immediately following a crash, survivors should be moved as little as possible after they are in a safe location. Fractures may be suspected if:

1. Body parts have abnormal shapes.
2. There is pain during movement of body parts with extreme tenderness over injuries.
3. The wounded survivor cannot move a body part.
4. The skin changes color and there is swelling.

INTERNAL INJURY

If survivors appear to be injured internally, do not give them liquids. Treat them for shock and keep them as still as possible. Plasma and other intravenous fluids should be given only by medical personnel.

ASSISTANCE

Send for medical assistance as soon as possible after all necessary emergency first-aid measures have been taken. If someone else is available, send them for assistance while you render first aid. When medical personnel arrive, let them take over and stand by to help if needed.

EVACUATION

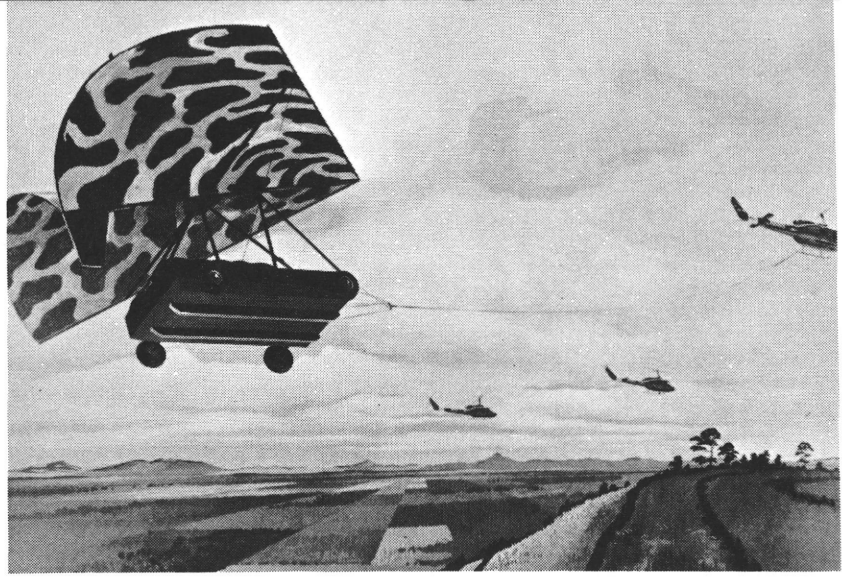
Evacuation of wounded survivors should be undertaken only when it is known medical help will not be soon available. Common sense should guide you if this becomes necessary. You would not grab a survivor with a broken leg by the ankle to drag him out of the woods. Instead, immobilize the broken leg with splints and improvise a litter or carry him over your shoulder.

If neck injuries are suspected, as they frequently should be in aircraft accidents, special precautions are necessary. *Do not attempt to evacuate a person with a suspected neck injury unless it is imperative for preservation of life!* If necessary, put his neck under stretch and avoid turning or tipping his head in any direction, especially backwards.

FIRST-AID KITS

If you aren't already familiar with the locations and contents of first-aid kits in the aircraft you fly, now is the time to learn. Ask your flight surgeon to explain and demonstrate the contents of these kits. Practice their use until you are completely familiar with every item.

We hope you will never have to use your personal preaccident plan. More than that, we hope you have such a plan. We hope you review it often and keep it up to date.



TUG

Towed Universal Glider

STRATEGIC delivery of fuel and high priority military cargo to remote areas will be further enhanced by flexible wing towed universal glider (TUG) systems currently being built by Ryan Aeronautical Company.

The TUG systems will be capable of carrying 500 gallons of fuel or 4,000 pounds of dry cargo, when towed by Army helicopters. Mixed loads of fuel and dry cargo would be transported by use of dividers within the cargo compartment.

After being towed to the predetermined site, the TUG body can be operated as a jeep trailer by removing the flexible plastic-coated wing and strut assembly. The cargo can thus be hauled to the specific ground locations where it is immediately needed.

The new TUG concept is applicable to local, limited brush-fire combat situations, in which mobility and instant reaction are essential. This system can multiply by several times the normal internal payload capacity of the towing aircraft, and reduce personnel hazard.

Army helicopters are called upon for short haul transport to expedite tactical operations and logistic support in forward areas, where fixed wing aircraft cannot operate, where surface transport is not practical, and where time is an important element. By nearly tripling helicopter payloads, the TUG system would obviate the requirement for a greatly increased number of helicopters to meet logistical needs.

Another major factor is increased survivability. If the TUG is hit and fire breaks out, it can be jettisoned with no danger to the helicopter crew.

Ryan engineers contend that the most practical and economical method to satisfy the requirement for a simple airborne fuel supply system under limited warfare conditions is the Flex Wing approach.

The Ryan Flex Wing system consists of a polyester-coated dacron base cloth membrane, a telescoped tubular aluminum alloy keel, leading edges, a jointed spreader bar, and various fittings for wing attachment and adjustment. All connections and joints are of standard sheet metal construction, and are designed to allow ease of disassembly and replacement.

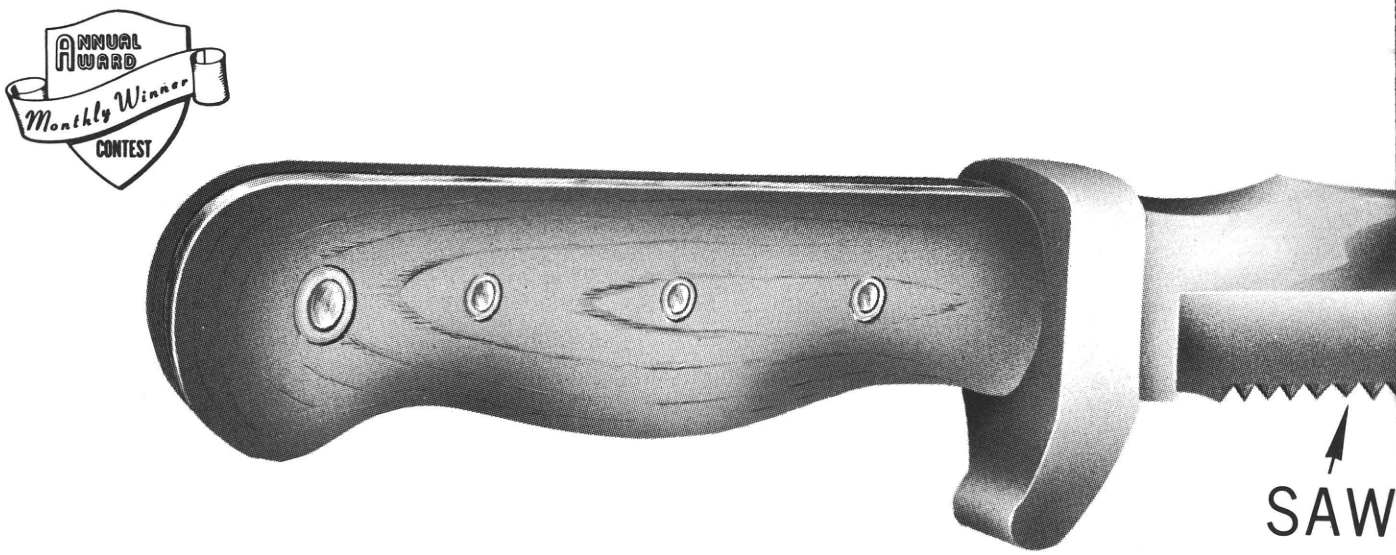
The glider body is similar in shape to that of a conventional pickup truck bed. It has a cargo deck with cargo tie-down fittings, a cargo divider with fixed sides and front, and a removable tail gate at the rear. Two dock boards are stowed on the sides of the body and are manually positioned on the aft end of the cargo deck for rolling wheeled cargo in and out of the body. A tow bar is attached to the front end of the body that mates with existing military tow hooks for ease in ground handling before and after flights.

The fuel cell is a flexible, collapsible container made of rubberized fabric in a convenient pillow design.

The body is supported by a rolling gear designed for ground handling and takeoff runs. Two longitudinal wooden skids, attached to the underside, absorb the major landing loads, and reduce tendency of the glider to bounce. Rolling gear springs made of fiberglass in the form of conventional single flat leaf springs, are similar to those developed and tested for the Fleep. Wheels and brakes are standard jeep equipment.

The 400-foot tow cable is a standard woven wire strain cable wrapped with electrical wires and covered with a neoprene jacket.

The TUG contract is being monitored by the U. S. Army Transportation Research Command, Fort Eustis, Va., an element of the U. S. Army Aviation Materiel Command, St. Louis, Mo.



Survival for Aviators

Lieutenant Robert C. Knight

IT WAS 0500 when I awoke to the shrill scream of a siren! Another alert — but was this the real thing or just another practice? I dressed quickly and grabbed my field gear.

As I drove from my quarters to the post and the arms room to pick up my weapon and bayonet, I scanned the sky in an effort to evaluate the unpredictable European weather. As usual, during the cooler months, there was a small amount of ground fog and haze. I couldn't begin to estimate the ceiling, but no stars were visible. Maybe it wasn't clear enough to get the radio relay aircraft into the air, but then again maybe it was.

When I reached the arms room a hurry and scurry of figures moved about in the half-darkness of dawn. I left the engine running in the car, hurriedly picked up my .45 and bayonet, and then sped off to the airfield. A fast check on the weather revealed that it was clear enough to get an aircraft up for radio relay.

As the crewchiefs rolled the "Alert O-1A" out from the hangar, I slipped into my field gear. On went my pistol belt with ammo pouch, pistol, bayonet, first-aid kit, and canteen. On my side hung my gas mask. I was combat ready — or was I?

I regretted being the first pilot at the airfield; I was new in the unit and wasn't as familiar with the present procedure as I would like to be. However, since I was the first one there, I could only do my best to get the O-1 into the air, check the radio net, and follow instructions.

Oh my gosh, the radio net! I rushed back into operations to get an SOI, and then fumbled around trying to figure out where I could put it and still be able to get to it if needed. As it was, I hardly had room left to hang my helmet. I thought of leaving it behind, but then I would have no means of communication. Oh well, one more item won't make that much difference — or so I thought.

I checked the oil and fuel in the Bird Dog and took out the parachute. It was then that I realized that one more item would make a difference. How can I get this #$%*! parachute on with all this field gear? Solution: take off the field gear and stow it in the rear of the plane. That worked much better, and after strapping into the

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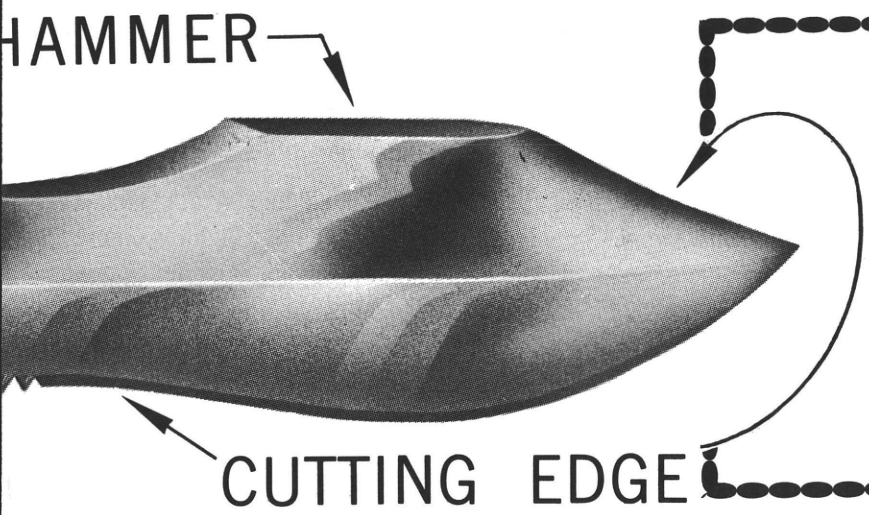
Lt Knight is with the Aviation Company, 14th Armored Cavalry, APO N. Y. 09026.



An aviation company in Germany has included these items in their survival kits. While incomplete, it's a start toward overcoming a difficult procurement and supply problem.

- **Pen type flare gun**
- **Small compact food items**
- **Salt** • **Water purification tablets** • **Gauze** • **Fishing gear**
- **Signal mirror** • **Knife**

(similar to one shown)

Bird Dog I taxied to the warm-up area. Everything checked out fine; I was ready to go and so was the O-1A. I received clearance for takeoff and was soon airborne.

As soon as I leveled off I requested permission to enter the radio net. The calmness of the operator assured me that this was just another readiness alert. All I had to do now was to fly around the local area and make commo checks every 15 or 20 minutes.

As I flew northward the clouds began to lower and ground fog began to cover the valleys. I thought of the day, a few weeks before, when I had left an airfield for my home station. The weather at destination was good, 3 to 4 miles visibility; the flight would take 1 hour. Within the hour visibility went down to half a mile. I had been lucky that time.

Being a 3-3 pilot I knew I couldn't last very long under IFR conditions. What then? The engine might quit at any time and should I elect to bail out, what would I do until I was located? Worse yet, if I became disoriented and flew too long in an easterly direction I'd be across the East German border. If I should crash in the fog and be fortunate enough to live, how would I survive until found?

Although each aircraft has a first-aid kit, it wouldn't do much good if the aircraft burned or if I bailed out. My present chain of thoughts were broken by, "Redleg 17, you have permission to leave the net at this time and return to home station."

Once on the ground and in the briefing room my thoughts returned to the possibility of being forced down in Germany. Talking over my experience that morning and the experiences of other aviators in the briefing room convinced us that an equipment change must be instituted if we are to continue our missions and retain a reasonably high degree of proficiency during flight.

Should a pilot have to exit the aircraft, what type survival equipment is available to him? His steel helmet, first-aid kit, bayonet, ammunition, and pistol would be in the aircraft. What if he were thrown clear of the aircraft and suffered injuries that prevented him from reaching the aircraft — if his equipment didn't burn along with the aircraft?

Field gear in itself creates a safety hazard if stowed unsecured in the rear of the aircraft. It is possible for a canteen or steel helmet to roll to the rear of an O-1A and into the tail section. Where do you put field gear in the OH-13? It is almost impossible to wear it when strapped in, and it is definitely uncomfortable. Accidents have occurred as a result of placing loose equipment forward of the instrument panel where it restricts movement of the rotor pedals.

Here, in my unit, we agree that it is possible to wear the field gear, but it also affects the pilot's proficiency, tires him out and creates a safety hazard. Have you ever tried to exit from an O-1A wearing field gear and a parachute? Try it on the ground; I doubt you would want

to do it in an emergency.

This leads to the question of what type uniform is needed to fit the combat and survival needs of an aviator. We have come up with the following variations and suggestions:

• Do away with the web belt, steel pot, first-aid kit, ammo pouch, bayonet, and .45. Add instead a small pocket type survival kit, including items that would assist a downed aviator. A few of the items included in ours are: a pen type flare gun, small compact food items, salt, water purification tablets, gauze, fishing tackle, and signal mirror. These items, and several others, can be placed in a Band-aid can and wrapped in tape to make it waterproof.

• Wear a flight jacket instead of a field jacket. The flight jacket was made for aviators and is fire resistant. Many pilots have been protected from severe burns because they wore a flight jacket. It is a more comfortable jacket plus being short waisted. The open cuffs on the field jacket can readily move levers on the quadrant of an O-1A and other aircraft. The field jacket is also extremely bulky.

• The bayonet is a fine weapon for its intended use. However, it is difficult to skin a rabbit with one, cut firewood, or use it for a saw. We have tested several knives here and the one we have chosen fits all the needs listed above. It can also be used as a weapon. Since we all carry .45s, we carry the bayonet as an extra piece of equipment. And you can't mount it on the end of your pistol!

• Replace the .45 with a .38 caliber pistol, which can be carried in a figure eight shoulder holster. It is much lighter than the .45, smaller, and more accurate. Since it is a revolver rather than an automatic the chances of misfire and malfunctions are reduced. Ammunition for the .38 as well as tracer ammunition is in military supply channels. It is less bulky and worn under the flight jacket, in a shoulder holster, and there is no chance it would become tangled in the risers of a parachute, if you are forced to bail out of an aircraft. A small ammo pouch can be attached to the strap on the shoulder holster doing away with the old ammo pouch. Here at the 14th, the interest was so great for the .38 over the .45 that the aviators are willing to buy their own, providing our survival kit and uniform are approved by the commander.

• The steel helmet is of little use to aviators, since you do not wear it in the aircraft. I doubt you would rummage through the wreckage looking for your helmet if you were forced down. Your main interest is to evade the enemy and get back to friendly forces.

Our kit is far from being complete; yet it is the start in the right direction. It is small, compact, and contains the basic necessities to help an average person to survive should the situation arise. The need for change in uniform is evident. What good is all this equipment if you can't bail out or get it?

The two most important items for survival that we couldn't fit in our kit are the WILL TO SURVIVE and PHYSICAL FITNESS. Many a good pilot has been lost because of lack of training, or because he did not have the proper equipment. If the equipment is there with you, you will have a fighting chance.

This is our start here in Germany. Possibly your unit has begun something similar. Although each unit, in each theater, has varied requirements, we are all working toward the same basic objective: survival of the aviator. No matter where you are, the need exists for a good basic survival kit. (See DIGEST, August 1964, for complete details on how to obtain approved survival kits.—Editor) Even though the need for this equipment may be remote in your minds, the possibility of having to use it is a reality. No one departs on a flight without first checking the weather along the route, checking NOTAMs, or without maps. Why should you go without proper survival equipment?

We would like very much to hear from other units, in other areas, who have ideas concerning survival. Maybe your ideas have been proved in combat or as a result of an actual survival situation. If so, let us hear about it.

Write to the
Survival Officer
14th Armored Cavalry
Aviation Company
APO N. Y. 09026

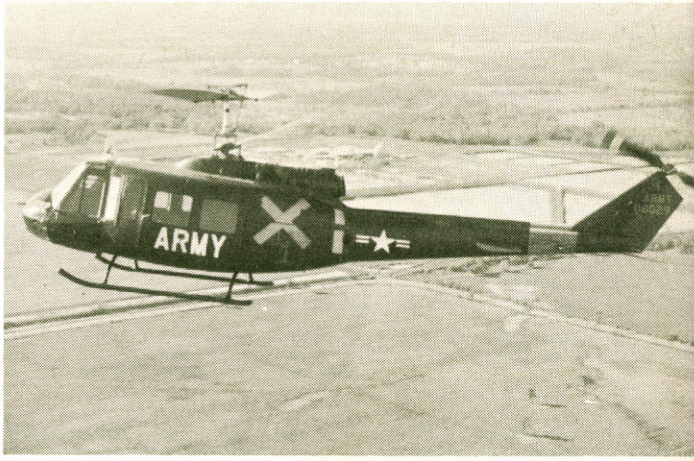
8 Million Miles in 6 Months

AIRCRAFT FROM the 11th Air Assault Division have flown over 8 million miles since 1 July 1964. This is equal to about 332 times around the world or 16 round trips to the moon.

Since last July the division's rotary and fixed wing aircraft have flown a total of 105,453 hours. The helicopters flew 75,223 hours while the fixed wing aircraft were in the air for 30,230 hours. Multiplying hours flown by an average speed of 140 mph for the fixed wing aircraft, this figures 1,551,500 miles. For the rotary wing aircraft — average speed 90 mph — the mileage totals 6,768,070.

During AIR ASSAULT II operations in the Carolinas the 11th Air Assault Division aircraft flew a total of 47,300 hours. The helicopters flew 42,217 hours; the fixed wing aircraft, 18,193 hours. Using the same miles per hour figures the distance flown totals 4,527,250 miles, or more than 180 times around the world.

Army Aviation Sets 11 More R/W Records



Maj E. F. Sampson at Huey controls as he sets 1,000-kilometer speed record of 164.07 mph

Photo by Bell

THE U. S. ARMY'S UH-1D Iroquois has claimed 11 more world helicopter records. Earlier this fall the Army claimed 10 world records in speed, distance and time-to-climb categories.

The latest assault on the record book was made by 7 pilots of the U. S. Army Aviation Test Activity of Edwards Air Force Base, Calif., a branch of the Army Test and Evaluation Command, and 1 from the U. S. Army Aviation Test Board, Fort Rucker, Ala.

The latest flights give the U. S. Army claims on 33 of the recognized 37 U. S. helicopter records. Flights were observed by officials of the National Aeronautic Association, U. S. representative group of the Federation Aeronautique Internationale of Paris, France, official certifying body for world aircraft records.

The record flights:

3-KILOMETER (1.86 miles) SPEED — 173.19 mph, flown by Capt D. P. Wray, 16 Nov. Class E-1,e. No previous record.

15/25-KILOMETER (9 to 15 miles) SPEED — 171.65 mph, flown by Capt D. P. Wray, 20 Nov. Class E-1,d. No previous record.

15/25-KILOMETER (9 to 15 miles) SPEED — 172.9 mph, flown by Maj L. R. Dennis, 20 Nov. Class E-1,e. No previous record.

100-KILOMETER (62.14 miles) SPEED — 164.12 mph, flown by Maj J. K. Foster, 20 Nov. Class E-1,e. No previous record.

100-KILOMETER (62.14 miles) SPEED — 168.98 mph, flown by Maj J. K. Foster, 21 Nov. Class E-1,d. Bettered record of 157.714 mph held by Russia.

500-KILOMETER (310.69 miles) SPEED — 170.75 mph, flown by Capt R. A. Chubboy, 23 Nov. Class E-1,e. No previous record.

500-KILOMETER (310.69 miles) SPEED — 176.8 mph, flown by Maj B. L. Odneal, 23 Nov. Class E-1,d. Bettered record of 148.449 mph held by Bell UH-1.

1,000-KILOMETER (621.37 miles) SPEED — 164.07 mph, flown by Maj E. F. Sampson, 24 Nov. Class E-1,e. No previous record.

3-KILOMETER (1.86 miles) SPEED — 180.14 mph, flown by Capt J. F. Comer, 25 Nov. Class E-1,d. Bettered record of 158.037 mph held by Bell UH-1.

ALTITUDE WITHOUT PAYLOAD — 25,418 feet, flown by Lt Col R. J. Kennedy, 14 Dec. Class E-1,e. No previous record.

ALTITUDE WITHOUT PAYLOAD — 35,150 feet, flown by Maj E. F. Sampson, 11 Dec. Class E-1,d. Bettered record of 32,840 feet set by Kaman H-43B.