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Captain Theodore E. Wasko

ASSISTANT EDITOR-IN-CHIEF
Lieutenant John E. Armstrong

EDITOR
William E. Vance

STAFF WRITER
John S. Maltrotti

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COMMANDANT
Brigadier General Bogardus S. Cairns, USA

ASSISTANT COMMANDANT
Colonel John J. Tolson

DIRECTOR OF INSTRUCTION
Colonel William R. Tuck

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

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

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NG: State AG.
USAR: None.

For explanation of abbreviations used, see AR 320-50.

UNITED STATES
ARMY AVIATION
DIGEST

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COVER

The first pilotless helicopter is shown on its initial flight at Kaman Aircraft on July 30, 1957.

Directed by radio signals from a control station on the ground, the robot helicopter took off vertically, hovered, flew forward, backward, sideward, and landed with the same precision and ease displayed by piloted helicopters.

Several hundred feet of rope attached to the robot, the other end of which was fastened to the ground, was used during the first pilotless flight to comply with CAA regulations.

Notes

FROM THE PENTAGON

Major General Hamilton H. Howze, *USA*
Director of Army Aviation, ODCSOPS

FOR SEVERAL YEARS NOW Army Aviators have been toying with the idea of arming our aircraft for special missions. During the peak of World War II, a few one-feather Indians were dreaming of "L-Fighters" to keep the enemy observation aircraft on the ground. During the Korean campaign, the Communists were launching their attacks spearheaded by one to three tanks, which made it rough on our doughboys.

As reports of these disagreeable practices reached the Artillery Center and the Army Aviation School (then the Air Training Department of the Artillery School), Neeley Brown and a few others started experimenting with 2.5-inch rockets, bazookas, and 75-mm recoilless rifles mounted on the L-19 as a tank killer. A gunnery sight was mounted just under the liquid compass, and in no time at all the aviators developed an accuracy with the 2.5-inch rockets that compared favorably with other antitank weapons.

Six-inch rockets were also fired from the L-19 with success. Tactics envisioned were for the pilot of the L-19, after spotting the tank, to descend to contour level until about 1,000 yards away from the tank, climb sharply until the target was again in view, ripple six to eight rockets into it and disappear again behind the trees or hills. But the Korean war ended before the idea could be sold to approving authority.

Since the Korean campaign, the idea of arming our aircraft keeps bobbing up as a possible solution for providing highly mobile weapons in operations in conjunction with light reconnaissance units and for increasing the survivability of troop-carrying helicopters.

The concept of operations on the atomic battlefield—requiring great fluidity—has created the need for reconnaissance units which have a mobility differential over our present tank and motorized infantry forces — a differential comparable to that which the horse cavalry in the old days had over foot troops. Out of this came the idea of aeroreconnaissance units.

But our ground reconnaissance people (as distinguished from the high performance reconnaissance airplane pilots, who zip in to have a look, and then zip out) habitually fight for their information when the mission is reconnaissance. When acting as covering or screening forces, they fight to stop enemy penetration into the area they protect. Fighting is their business, just as it is the business of other combat forces. And to fight means to shoot.

When some general, thousands of years ago, first lifted part of his force from the ground and put it on horses, he armed it, presumably with spears; as cavalry developed, it augmented its capability to do its missions by constantly improving its killing power (with constant effort, however, to avoid becoming too heavy and therefore too slow); mechanized reconnaissance, as it supplanted horse cavalry, carried along and improved horse cavalry type light weapons;—so! Here enters the helicopter. If light rotary-wing aircraft are integrated into reconnaissance units (to enable them to execute their classic missions better), it follows that it will be profitable to arm them.

In June 1956 a small test group was set up by CONARC at the U. S. Army Aviation Center at Fort Rucker, under command of Brigadier General Carl I. Hutton, and tests were begun.

To date, armament has been installed and preliminary tests made on the Sioux, Chickasaw, Shawnee and the Choctaw.* Armament used in these tests include the .30 and .50 caliber machine guns, various fixed fin and folding fin aerial rockets, recoilless rifles, and ordnance and chemical bombs.

It is too early to say what weapons or combination of weapons are best suited for each helicopter or the ideal number of such weapons by type which should be installed on each aircraft.

The tests have progressed sufficiently to enable us to say that

**For the unenlightened, these are the H-13, H-19, H-21 and H-34 respectively.*

the helicopter does provide a good firing platform for these weapons, and that the rounds delivered are accurate beyond our expectations at this stage of development. The efficacy of *area fire* has been excellent. The weapons are fired electrically and adjusted with aircraft optical reflecting sights.

Following are general comments on data obtained by the tests so far:

Because of its weight, the Sioux reacts most readily to the recoil of the weapons. It can be rotated rapidly by pedal pressure, and therefore, weapons traverse may not be essential. Elevation and depression of the weapons and the sighting system is essential to compensate for the vertical angle along the pitch axis with different load conditions and at speeds between the hover and V-max. Vibration causes an aim wander or tracking error of about seven mils (including pilot techniques).

The Shawnee and Choctaw, being heavier aircraft, offer a much more stable firing platform than the reconnaissance helicopter. Since the tactical function of these aircraft precludes excessive pedal traverse or deviation from course when in formation, both elevation and traverse of weapons are necessary. The tandem rotor of the Shawnee offers more stability along the pitch axis, and sighting straight ahead is simple. Deflection firing introduces problems common to fixed-wing aircraft with flexible guns.

The Chickasaw has a stability somewhere between the Sioux and the Shawnee. Elevation and depression of weapons appears to be essential. Traverse of forward firing weapons appears to be desirable but may not be essential unless the weapon is to be fired when the aircraft is flying in tight formation.

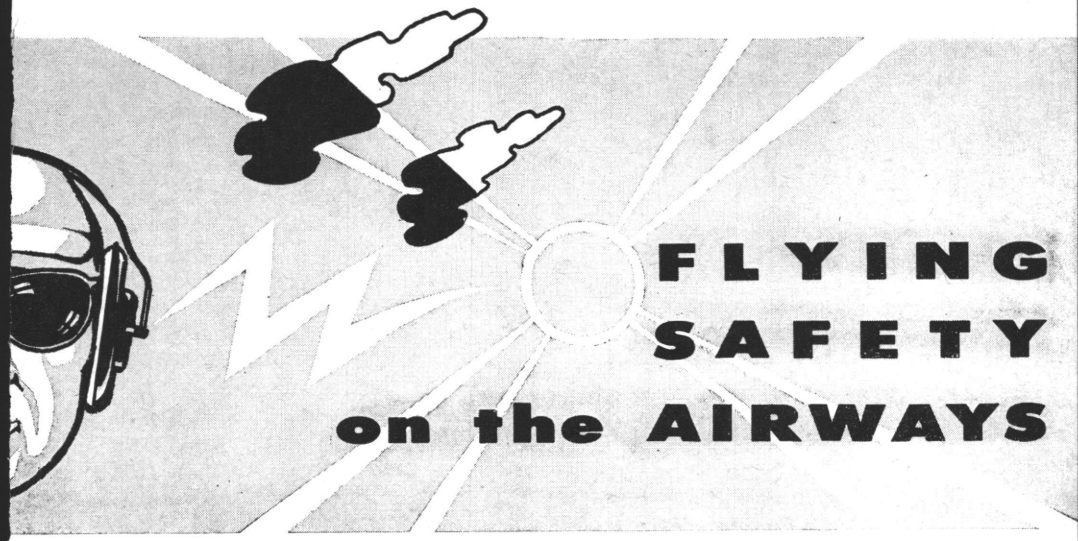
At the present time, this is my own thinking:

(1) The troop-carrying helicopter should have only a single light machine gun to deliver suppressive fire to "sanitize" the immediate area of its landing, if that is to be executed in hostile territory. The French found this to be very desirable in North Africa.

(2) The light reconnaissance helicopter should have a single light machine gun and limited ammunition, sufficient only to execute "reconnaissance by fire" —in the same manner as ground reconnaissance vehicles.

(3) We need some fire support helicopters of the utility size to carry heavier loads of armament for the execution of fire missions in support of reconnaissance operations. In effect, we will thus merely elevate the firing platform. *Neither these nor the reconnaissance helicopters will fly over enemy forces.* That is very important to the concept. They will always shoot *from* friendly or unoccupied territory *into* suspected or known hostile territory.

Extensive testing is yet to be conducted to determine the full extent of the helicopter's capability as a firing platform. Vulnerability factors must be arrived at; dependability must be established. But it is additionally apparent that the helicopter has a great potential in the highly mobile tactical situations envisioned in any future conflict.



FLYING SAFETY on the AIRWAYS

AIRWAYS ARE the highways of the air. An airway is a navigable airspace extending upward from 700 feet above the ground, stretching between designated points. The administrator of the Civil Aeronautics Administration establishes airways by designating definite points, such as radio ranges and omni-stations, and then connects these points by a line of definite width to be used by aircraft in flight.

Domestic IFR traffic each year amounts to thousands of flying hours. With so much air traffic, it is obvious that definite, predetermined flight paths and procedures are vital to safety and efficiency. Airways provide identified flight paths equipped with aids to air navigation. Aircraft flying IFR within these flight paths operate at altitudes and on schedules controlled by civil airway traffic control centers.

Airway procedures are safe procedures. They have been carefully evolved from years of flying experience. Every military pilot should understand and follow them.

You owe it to yourself to insure your own safety. In addition to that, you have a grave responsibility to the government, which has a large investment in you and the plane you fly. You are responsible to your crew members and passengers and to other pilots and planes in the air. You can protect this investment and carry out your responsibilities by learning how to fly the airways safely and by living what you have learned.

As a military pilot, you have an assigned mission. Your mission fits in with the overall Army mission in maintaining the desired state of operational readi-

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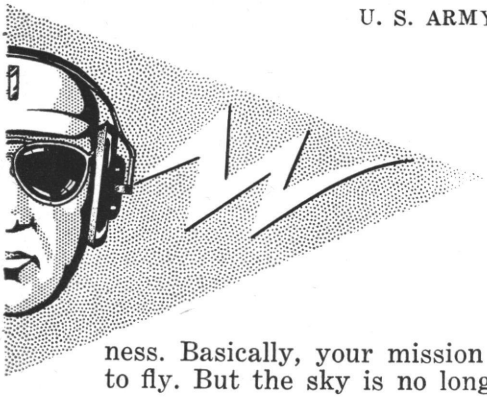
This article is based upon an article by the same name appearing in the April, 1957, issue of FLYING SAFETY magazine. Views expressed in this article are not necessarily those of the Department of the Army or of the U. S. Army Aviation School. —The Editor.



ness. Basically, your mission is to fly. But the sky is no longer your own.

ATC AND YOU

With the thousands of airplanes that are this moment in the sky, the problem of air traffic control becomes an increasingly complex one. Firm rules must be laid down. Firm procedures must be established and adhered to by all who fly. One agency must be designated to monitor and control all air traffic, whether it is civil or military. For pilots who fly the airways, these things have been done. The controlling agency is called Air Traffic Control. Its mission is to expedite the flow of traffic along and across civil airways during all weather conditions in a manner consistent with safety. The rules and procedures are complex and they can be confusing. They are written in many places and, generally speaking, all of them are available to the pilot in flight.

The intent here is to consolidate a lot of these points and to clarify some that have confused pilots in the past. The many traffic problems that might arise cannot all be covered here. If further study is desired, the following publications may be consulted:

Airman's Guide.
TM 11-2557, Vols. I, II, and III.
ANC Manual, "Procedures For The Control of Air Traffic."
ANC Manual, "Criteria for Standard Approach Procedures."
CAA Manual, "Flight Information Manual."

As ATC does not, in most cases, have direct communications with the pilot, Air Traffic Communications Stations (ATCS) relay the messages. Here, therefore, contact with ATC should be understood as radio contact with a CAA communications facility or an ATC Center.

When you're going to fly IFR on the airways, you'll be all right if you:

Obtain a good weather briefing.
Check NOTAMs carefully.
File your Flight Plan accurately.
Copy ATC clearances right.
Follow the takeoff and climb instructions.
Maintain prescribed altitudes and specified airspeed.
Report passing compulsory reporting points.
Use correct radio procedures.
Follow letdown instructions.
Know emergency procedures.
Close out your Flight Plan.

FLIGHT PLANNING

Section "C" data of DD Form 175 is transmitted to ATC and is the basis for control of the flight. The information must be

correct. It is important that no misunderstanding exists between you and ATC concerning the proposed route of flight specified in the flight plan. Your route may be adequately described by indicating the color abbreviation and number of the airways to be flown when on LF/MF airways.

Civil airways which cross or merge for short distances with the airway being flown need not be indicated. Intermediate reporting points along an airway need not be indicated; thus, "Green 5 to New York" can describe an entire flight from Los Angeles to New York.

All alternating portions of VFR or IFR flight along an airway must be accurately described, however, and great care must be taken to avoid confusion, especially when flying through congested areas. Compliance with ADIZ procedures is, of course, a *must*.

You can file a flight plan which incorporates both airways and direct off-airways routes, but you should define clearly an off-airways route.

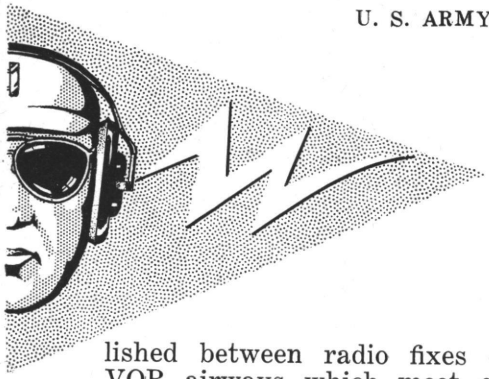
Generally speaking, you will find that following airways is the best procedure. Little distance will be saved by shortcuts off airways. It is always advisable to file an IFR flight plan if VFR conditions are not assured, but a flight plan can be filed that has both IFR and VFR portions. If the first portion of the flight is IFR and the latter portion VFR, an ATC clearance will be obtained only for the first portion.

If the latter portion of a flight is IFR, you will be instructed to contact a communications station to receive an ATC clearance before entering the IFR portion of the flight. Oftentimes, varying delays will occur in filing composite flight plans, the last portion of which is to be IFR. Delays can be caused by ATC's being unable to work you in immediately or by errors in transmissions from base operations, Flight Service, or others.

Estimated true airspeed is required on Form 175. ATC expects you to make good this airspeed, as it is used in computing the longitudinal separation between aircraft flying on the same airway at the same altitude. All speeds must be given in knots. Your flight plan should indicate the TAS you expect to make good. You must familiarize yourself with the procedures for maintaining this airspeed. Any deviation of true airspeed in excess of 10 knots constitutes a change in flight plan and ATC must be informed. If it becomes apparent during the flight that the original ETE is in error in excess of three minutes, it is usually easier to file a corrected ETE than to adjust the airspeed to make good the original estimate.

You must indicate the type of airways you intend to fly. Low frequency airways are identified by a color: red, green, amber and blue. VOR airways are identified as Victor airways by number. Aircraft on IFR flight plans must be flown at not less than the established minimum altitude for the airway over which the flight is conducted.

The one exception to this rule concerns operation along a VOR airway. Minimum obstruction clearance altitudes are estab-



lished between radio fixes on VOR airways which meet obstruction clearance requirements for the entire route segment but assure acceptable navigation coverage *only* within 25 miles of the VOR station. These altitudes are published, along with minimum reception altitudes, in the Avigation Charts of the "JEP" Manual. The flight plan must indicate the even or odd thousand-foot altitude above sea level that is appropriate for the direction of flight along civil airways.

EVEN-ODD RULES

ATC may and does clear aircraft to operate at altitudes different from that indicated on specific airways. For example, the Avigation Chart indicates that traffic flying northbound on Amber One will operate at "Odd" altitudes. When necessary, however, ATC may specify that certain aircraft will operate at an "Even" altitude northbound. Thus, a pilot flying in VFR conditions, following the "Even-Odd" altitude indicated in the chart, might find himself on a collision course with another aircraft legally operating at the same altitude, flying in the opposite direction.

Knowing that this can and does happen is especially important when flying the airways at night. The separation that is desired and implied by the "Even-Odd" rule cannot be assumed to exist in VFR conditions. It is your direct responsibility to avoid other traffic when flying under VFR conditions, even if your flight is being conducted on an IFR clearance at an assigned altitude.

Normally, on-top clearances will contain information on the reported tops. When aircraft capabilities will not permit climb to the top, an amended ATC clearance must be requested. All flights cleared to operate on-top must fly at or above the minimum en route altitude, which is 1,000 feet above the cloud layer.

Generally, on Green and Red airways and on even numbered VOR airways, eastbound flights should be conducted at odd thousand-foot altitudes, westbound at even thousand-foot altitudes. On Amber and Blue airways, and odd numbered VOR airways, northbound flights should be conducted at odd thousand-foot altitudes and southbound flights at even thousands.

The following rules apply on segments where color airways and VOR airways overlap:

Where a color airway coincides with a VOR airway, the odd or even rule for the appropriate color airway will apply.

Where no color airway is involved and even and odd numbered VOR airways coincide, the rule for even numbered airways will apply. NOTE: These rules are the *basis* for requesting en route altitudes on IFR flight plans. *If possible,* when flying "at least 1,000 on top (10/otp)," you should conform to the above altitudes. These

rules apply even with forward flight visibility unlimited.

ATC CLEARANCE

Before takeoff, the tower or Air Traffic Communication Station (ATCS) will obtain your ATC clearance. It will be relayed to you and you should be prepared to copy the clearance quickly and accurately. It should be read back to eliminate any misunderstanding. Check the clearance against the flight plan on the duplicate copy of the Form 175 and note any variations. Some pilots make a copy of the expected clearance prior to receiving it, then make the changes.

Most clearances will include climb instructions, such as "climb on course" or "climb on a heading of 150 degrees," and some clearances may even include the direction of takeoff as "take off southeast, right turn after takeoff, climb on a heading of 270 degrees, report when reaching 1,000 on top."

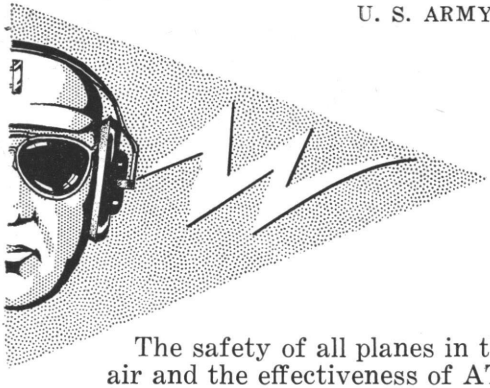
Usually, these instructions will be issued by word description, but at several major terminals a system of coded departure routes has been initiated. While planning your flight, you should study the possible routes of departure to eliminate delay and confusion after receiving your clearance.

Climbing instructions will occasionally specify a somewhat devious route of departure, but these routes are the only possible method of expediting arrivals and departures at busy terminals. VFR flight may be specified in climbing instructions, such as "climb VFR" or "maintain VFR for five minutes on a heading of 225 degrees before starting climb." It should be noted, however, that VFR departures will be given only when you indicate that you will accept a VFR climbout.

In the event clearance for all or any portion of the flight is identical to the route you have filed, the term "via flight planned route" may be given by the controlling agency. When used, this phrase will be preceded by sufficient, detailed route-of-flight information to get the flight on the filed route. It is important to remember that this clearance phraseology does *not* include approval of altitudes filed in the flight plan. Specified altitude assignments will be issued in each clearance.

The initial clearance will normally authorize flight to the point of intended landing, but in some cases the clearance will be to some intermediate point due to traffic conditions. In such case, the clearance for the remainder of the flight is usually received before reaching the intermediate point.

In the event you arrive at your clearance limit without having received either a clearance beyond or holding instructions at this fix, you are expected to begin holding in a standard racetrack pattern. You should hold the course on which you approached the fix, maintaining the last assigned altitude, and immediately request further instructions through the nearest air-ground station. Your altitude at this clearance limit will be protected, so that separation will exist in the event you do have to hold at this point.



The safety of all planes in the air and the effectiveness of ATC depend on accurate position reporting by pilots. To provide proper separation and to expedite the movement of aircraft, ATC must be able to make accurate estimates of the progress of every aircraft operating on an IFR flight plan. Unless you make all required position reports promptly and accurately, it is difficult for controllers to compute your actual and future positions, with the result that traffic conflicts cannot always be accurately foreseen. An error in position reporting can result in delays, or in separations which are less than the required minimum.

POSITION REPORTING

To assure accuracy in position reporting, check your aircraft clock before each flight and again at the time of passing a fix given to the nearest minute. Be careful to identify the reporting point correctly. When an aural or visual indication is used to determine the time of passing a reporting point, such as a fan marker, "Z" marker, cone of silence, or the intersection of two range legs, the time should be noted when the signal is first received and again when it ceases. The average of the two times should be taken as the actual time over the fix.

On an IFR flight plan, make position reports as outlined in the ATC Section of TM 11-2557. Compulsory reporting points are depicted by black triangles in TM 11-2557. Noncompulsory points are shown as outlined triangles. Another symbol consisting of a flattened black triangle with longer sides indicates that a position report is required below 15,200 feet, except when "1,000 on top."

On a VFR flight, a position report is made at least every 60 minutes. On an IFR flight, reports are made over compulsory reporting points and as requested by ATC. Under either IFR or VFR conditions, you are required to maintain a continuous listening watch on communication channels appropriate to the route being flown.

All position reports should be preceded by an initial call to establish contact. This call consists of the aircraft's service designation, plus the last five digits of its serial number.

Position reports should be made as soon as possible *after passing* a fix, not directly over the fix. Before initiating the call, the time should be noted, the estimate for the next fix computed, and the radio monitored to avoid breaking in on another conversation. Exact time over the fix is the time given in the report. The position report contains estimated time of passing the next reporting point along the route of flight. If you see that this estimate will be in error by more than three minutes, relay a corrected estimate to ATC.

All superfluous words are

eliminated to save time, with required information given in proper sequence. Don't talk too fast. Allow the range station operator time to copy the report accurately. Delete the ground station designation, "Washington Radio" or "Shreveport Approach Control," and so on after contact is established.

ATCS will receive and file all position reports received from you. They will also receive and transmit to Military Flight Service Centers inflight changes of operational interest either to flight service or air defense. ATCS will also transmit flight advisories as requested by Military Flight Service. These will include "flash advisories."

CHANGE OF FLIGHT PLAN

Any change from the original IFR clearance must be approved by ATC. You may change from IFR to VFR by informing any communications agency with direct ATC contact that you are cancelling your instrument flight plan at a stated time.

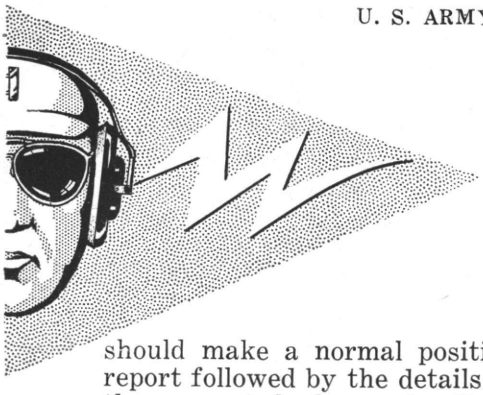
VFR Flight Plan. When you want to change your route or point of first intended landing on a VFR flight plan en route, contact an ATCS or military communications facility. Submit the change in accordance with the outline in the ATC Section of TM 11-2557, Vol. I.

Change of IFR Flight Plan or VFR to IFR. To change a flight plan en route, you must obtain clearance from ATC. The facility obtaining the traffic clearance will notify Flight Service of the change.

When a change of destination and/or route is desired, you

1. Identification: (The last five digits of the aircraft's serial number preceded by the service designation)	**Army 15004**
2. Position:	**Litchfield**
3. Time:	**Five Six**
4. Altitude:	**Eight Thousand**
5. Type:	**Instrument Flight Plan**
6. ETA over next reporting point:	**Pullman, One Eight**
7. Name only of the next succeeding reporting point along the route of flight:	**Milwaukee**
8. Remarks:	

(Instrument Flight Rule position reports must include this minimum essential information.)



should make a normal position report followed by the details of the requested change in flight plan.

If you want a change in altitude, you may request it at the desired time of change or you may make your request immediately following a normal position report.

If an emergency exists (icing conditions, loss of power, and so on), make your request and give only the information required. To get immediate action on such a request, you must DECLARE AN EMERGENCY. Don't wait until it's too late. If declaring an emergency causes ATC to alter traffic, they will request a report. If no traffic is involved, no report will be necessary. (The Airway Traffic Control section of TM 11-2557, Vol. I, contains information on data to be transmitted in requesting a change in flight plan.)

Closing Flight Plan. At locations with an established military base operations, you must close your flight plan with base operations upon landing. At nonmilitary installations, close your flight plan with the nearest Flight Service Center by interphone "drop" line, if available. At fields with no CAA facility, this can be done through the nearest ATCS, provided the aircraft is within three miles of the intended point of landing. If you are unable to close your flight plan by any of the above methods, call Flight Service by long distance telephone, collect. (The telephone numbers are listed on a green sheet in the front of TM 11-2557, Vol. I.)

HOLDING

Holding is the flight path made by an aircraft with a definite time, heading, and altitude relationship to a prescribed fix. Some holding is required on nearly all IFR flights.

To follow the standard holding flight path, fly the specified course inbound to the holding fix, make a 180-degree, standard rate turn to the right; fly a parallel course outbound from the holding fix not to exceed two minutes, correcting for known drift; turn 180 degrees to the right and again follow the specified course inbound.

When holding at an approach control fix, with instructions received specifying the time of departure from the fix, you should adjust your flight path within the limits of the established holding pattern to leave the holding fix at the specified time. A procedure turn need not be executed, as the aircraft may proceed to the new fix or to the final approach directly from the holding pattern.

All associated entry or exit turns from a holding pattern should be made on the same side of the prescribed course as the holding pattern. All descents in the holding pattern should be made at a rate not exceeding 500 fpm.

You will be expected to adhere as closely as possible to the assigned holding pattern. If at any time you are requested—or if for any reason it becomes necessary—to hold at a true airspeed greater than 180 miles per hour (155 knots), notify ATC. (Holding pattern buffer zones are established for this speed, and separation is predicated on the assumption that no one will exceed 180 mph in the holding pattern.)

Due to the location of facilities in congested areas and in order to expedite air traffic, nonstandard holding patterns are used at some locations. Clearances for holding in nonstandard patterns will contain a brief description of the nonstandard features of the pattern. Absence of instructions regarding the direction of turns will mean that right turns should be flown. Absence of instructions regarding the length of the patterns will mean that two-minute legs should be flown.

A clearance for holding in a right-hand, one-minute pattern will only contain the time length of the pattern, i.e., "one-minute pattern." A clearance for holding in a left-turn, two-minute pattern will only contain the direction of turns, i.e., "left turns." A clearance for holding in a left-turn, one-minute pattern will contain both the direction of turns and length of pattern, i.e., "left turns, one-minute pattern."

Holding instructions will include the expected approach time to allow you to plan a course of action. If you are issued instructions to hold at a point en route and no expected approach clearance time is issued, the holding clearance will contain a time limit, using the phrase, "Expect further clearance at (*time*)."

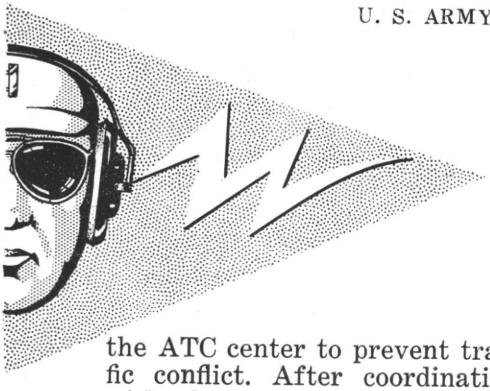
APPROACH CLEARANCE

Approach Control. This is a service whereby specified CAA and military control towers, by means of direct communications with the aircraft, control IFR flights arriving at, departing from, and operating in the vicinity of airports. It is the controlling authority in a zone usually consisting of one or more airports and includes approach and departure instrument flight patterns.

Approach control towers are responsible for providing separation between departing aircraft and all other aircraft within their jurisdiction. The clearance limit given departing aircraft includes altitude, route, and other control. Time of takeoff, direction of turn, altitude restrictions after takeoff, and specific restrictions necessary to effect aircraft separations are determined by approach control.

The time of takeoff is specified in the ATC clearance only if necessary to coordinate the departure with traffic *not* under approach control jurisdiction. A "clearance-void-time" will be specified by the ATC center if a delayed departure would result in conflict with traffic not released to tower control. A "clearance-void-time" determined by the tower will never be later than that issued by the ATC center.

Close coordination is essential between approach control and



the ATC center to prevent traffic conflict. After coordination with the tower, a center may clear arrivals to hold at holding points until advised by approach control.

LIMIT OF CLEARANCE

An air traffic clearance from an Air Traffic Control Center ordinarily clears aircraft on IFR flights to a holding point. This is normally a radio range station, ILS outer marker, fan marker or other radio fix and is used as the limit of the ATC clearance. Instructions to hold may be included by the Air Route Traffic Control Center which may tell you to contact approach control prior to arriving over the holding point.

You should not contact approach control until over the specified holding point, unless directed to do so. Approach Control will usually issue *clearance* for instrument approach to an airport. The *type* of approach will be specified by ATC.

APPROACH SEQUENCE

In an approach sequence you will be given advance notice of the time to leave the holding point on approach to the airport. On receipt of fixed departure time, adjust your flight path within the limits of established holding patterns so as to arrive over the fix inbound at precisely the specified time or as soon thereafter as possible.

The pilot's timing calculations are relatively simple and are based on the fact that a 180-degree turn should use up one minute of flight time. Thus, it is possible to vary the holding pattern time with precision. Experience in using these procedures indicates that, with practice, pilots can consistently cross the fix inbound within 20 seconds of the specified time.

MISSED APPROACH

If a landing is not completed after the first approach, follow the standard missed-approach procedure (outlined on approach charts in TM 11-2557, Vols. II & III), or advise the traffic controller of your intentions and receive further clearance.

If you want to make a second approach, Air Traffic Control will determine whether you will be cleared for another *immediate* attempt. You may be directed to stand by on a designated leg of the range at an assigned altitude until another aircraft in line has landed or taken off. This decision will be based upon existing traffic conditions unless an emergency exists. A decision to go to an alternate airport must be made by you, and *clearance to the alternate airport must be obtained.*

The minimum ceilings and visibility requirements for instrument approaches are listed in TM 11-2557, Vols. II & III. When weather is below the landing minimum and you decide to hold

for improvement in weather, Air Traffic Control may direct you to proceed to an adjacent holding point or to a position higher in the approach sequence.

COMPULSORY REPORTS

The following reports should *always* be made to Air Traffic Control:

The time and altitude of reaching a holding point or the point to which cleared.

When vacating any altitude for a newly assigned altitude.

The time of leaving an assigned holding point.

When an approach has been missed.

When visual reference to the ground is established.

The following reports should be made *when requested* by Air Traffic Control:

Time of starting procedure turn on final approach.

Time over range station or outer marker inbound on final approach.

Altitudes when climbing or descending.

Time when reaching a newly assigned altitude.

Any other information which may aid in the control of air traffic.

EMERGENCY PROCEDURES

Emergencies and the circumstances surrounding them are so varied that exact rules to be followed in all cases cannot be established. However, the procedures outlined below should be followed as closely as possible.

Emergency communication procedures using distress, urgency or safety signals are contained in the Radio General section of TM 11-2557, Vol. I.

In the event of *radio failure,* either transmitter, receiver or both—or inability to receive radio signals because of static—do one of the following:

1. If operating under VFR conditions, proceed VFR and land as soon as possible.

2. Procedures outlined on pages 31 and 32 of Radio General section of TM 11-2557, Vol. I, may be used to initiate radar emergency interception within an ADIZ and surrounding areas.

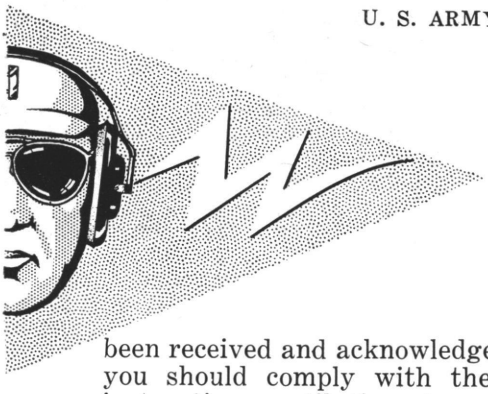
3. Proceed according to the latest ATC clearance.

4. If you proceed IFR according to the last received and acknowledged traffic clearance, and other instructions to the contrary are not received and acknowledged, you will be expected to observe certain rules. ATC procedure is based on the assumption that you are following these rules:

a. If you have received and acknowledged a clearance to the destination airport or the radio facility serving that point, you should continue flight at the altitude(s) last assigned by ATC or the minimum instrument altitude (whichever is the higher) to the radio facility serving the destination airport.

b. If you have received and acknowledged a clearance to a point *other* than the destination airport or the radio facility serving the destination airport, you should continue flight at the altitude(s) last assigned by ATC or the minimum instrument altitude (whichever is the higher) to the radio facility serving the destination airport.

c. If holding instructions have



been received and acknowledged, you should comply with these instructions until time to continue the flight so as to arrive at the radio facility serving the destination airport at the expected approach time last received and acknowledged. Maintain the last assigned altitude or the minimum instrument altitude, whichever is higher.

d. If holding instructions but no expected approach time have been received, follow the holding instructions until the time ATC has specified that further clearance may be expected. If you are not contacted at that time, continue the flight, maintaining the last assigned altitude or the minimum instrument altitude, whichever is higher.

NOTE: The minimum instrument altitude referred to is the minimum established for that portion of the route over which you are flying, regardless of the direction of flight. If you have to climb to a higher altitude than that assigned by ATC to comply with a higher minimum instrument altitude, you may later have to descend to comply with a lower minimum instrument altitude. In this case, you should not descend below the altitude last assigned by ATC.

Descent from the altitude maintained should start over your destination radio facility at the expected approach time last received. If no expected approach time was received, start your descent at the *last estimated arrival time you specified,* or as soon as possible thereafter. A full, standard instrument approach should be executed unless a VFR approach can be made. ATC will hold all altitudes below the clearance altitude open for you at the destination radio facility. These altitudes are held vacant for any unreported aircraft until (1) 30 minutes after the last expected approach time acknowledged by you, (2) your ETE or last estimated arrival time, or (3) the estimated time of arrival computed by ATC, *whichever is later.*

If you have received and acknowledged a clearance from the tower at the airport of intended landing, you will be expected to comply with any special instructions contained in that clearance and make a normal descent for landing.

NOTE: ATC may issue appropriate instructions to be broadcast "blind" over suitable radio range facilities. Instructions will not be broadcast unless ATC authorizes such broadcast.

Upon receipt of information that an aircraft in flight within a control area or control zone has encountered an emergency which may affect other air traffic, ATC will act to give the emergency aircraft priority over any other aircraft involved.

Should it become necessary for you, while holding, to make an emergency descent through other traffic areas, you should *advise ATC immediately.*

Upon receipt of information that an aircraft is making an

emergency descent through traffic at assigned altitudes over the airport, ATC will immediately broadcast, or cause to be broadcast, the following:

Emergency to All Concerned: Emergency Landing at ..... Airport. All Aircraft Below ..... Thousand Feet Within ..... Miles of ..... Radio Range Leave ..... Course(s) Immediately.

Upon hearing such a broadcast, you should clear specified areas in accordance with the emergency instructions. ATC will issue further directions through the various communications facilities immediately following the emergency broadcast.

When terrain, traffic, or other factors make it impractical for you to maintain the last assigned altitude, ATC will issue specific directions.

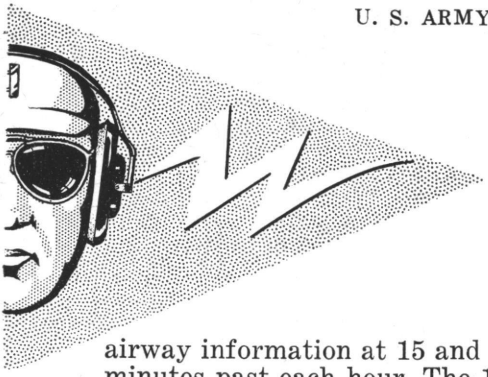
If all radio equipment should fail or become inoperative, you should exercise your emergency authority under Civil Air Regulations 60.2. You may attempt to alert civil or military radar by flying the appropriate patterns as prescribed in the Radio General section of TM 11-2557, Vol. I.

In an emergency deviation from the rules prescribed in CAR 60 you must make an immediate report to the nearest CAA regional office. When the emergency situation results in no deviation from CAR 60 but requires ATC to give priority to the aircraft, you must make a report to the nearest CAA regional office within 48 hours. (Compliance with this does not eliminate your responsibility in accordance with AR 95-8 to notify your commanding officer and Flight Service of a violation within 24 hours.)

WEATHER BROADCASTS

All CAA communications stations having voice facilities on continuously operated radio ranges or radio beacons, broadcast weather reports and other

Civil Air Regulations prescribe that flight altitudes shall be in feet above sea level. Accordingly, altimeters should be set to the current setting of the nearest station reporting the official altimeter setting along the route of flight. All altitudes used in connection with the control of air traffic are based on *indicated altitude*, since any temperature error will affect all altimeters in the same vicinity. Thus, relative separation between aircraft will be approximately maintained. Consider temperature error only when necessary to insure that actual altitude of the aircraft permits ample clearance of terrain and obstructions.



airway information at 15 and 45 minutes past each hour. The 15-minutes past-the-hour broadcast is an *airway* broadcast consisting of weather reports from important terminals located within approximately 400 miles of the station.

The 45-minutes past-the-hour broadcast is an *area* broadcast consisting of weather reports from stations within approximately 150 miles of the broadcasting station.

The broadcast consists of the local weather report and the latest available surface reports from other locations. Reports more than one hour old are not used. Local winds aloft are broadcast twice daily when available. In addition, the Weather Bureau broadcasts a local terminal forecast covering the next two hours. This forecast is broadcast immediately following the local weather report.

If possible, you should avoid calling airway communications stations at or about 15 and 45 minutes past-the-hour to request weather information. Such calls may delay scheduled broadcasts and cause inconvenience to others.

When you encounter weather conditions which have not been forecast, you are required to report such conditions to the closest ATCS facility. Report in this sequence:

Any unusual or hazardous weather.
Turbulence.
Icing, altitude encountered.
Precipitation, type and intensity.
Clouds, amount, type and height.
Temperature.
Type aircraft.

When flying airways remember to follow the rules, for the rules were designed for your safety and convenience. Make sure your flight plan is accurate and covers the exact route. Know the weather along the route and study all fixes and approach charts for the area of intended landing. Choose your alternate with care and, upon reaching your destination, *close your flight plan.*

Maintenance Hints—

Spark Plug Fouling

M/Sgt A. M. Rutledge, *USA*

SPARK PLUG FOULING occurs during ground operation and low-power flight conditions when conductive deposits build up on the spark plug insulator to form an alternate electrical path to ground. In extreme cases, these deposits bridge the electrode gap.

At times, spark plug fouling will permit a satisfactory magneto check but will cause a power loss in the high power range. This may or may not be associated with a rough engine and afterfiring.

The more severe fouling results in a poor magneto check and a rough running engine. Fortunately, at cruise power in flight, spark plug and combustion chamber conditions are not conducive to plug fouling.

Two types of deposits, carbon and lead, form on spark plugs to cause fouling. Additionally, silica (sand) and other minerals which enter the engine in the form of dust will combine with certain lead salts to form plug-fouling compounds. The nature and quantity of these deposits depend on spark plug core nose temperature and time of exposure, as well as mixture strength and lead content of the fuel.

Carbon deposits form during very low power or idle conditions where the spark plug core nose tempertaure is less than about 800°F. The richer the idle mixture, the more carbon will be deposited. Lead deposits occur in the form of salts such as lead bromide, lead oxide, lead sulphate, and other complex compounds. The type of lead salt deposited and its ability to conduct electricity depend on the spark plug core nose temperature.

As the plug temperature increases, the conductance of the lead salt compound increases until the temperature is reached at which the compound changes to another type of lead salt with a low conductivity. A further increase in temperature causes this new salt to increase until it again changes composition. This process continues throughout the operating temperature range of the spark plug.

M/Sgt. A. M. Rutledge is the NCO-in-Charge, Field Maintenance Shop, the U. S. Army Aviation School. Perusal of TO 8E2-6-1-37 is recommended for latest information on replacement of spark plugs. The views expressed in this department are the author's and are not necessarily those of the Department of the Army or of the U. S. Army Aviation School.—The Editor.

Spark plug fouling must be considered in two phases: prevention and remedy. Once spark plug fouling has occurred, it is difficult, and in some cases impossible, to clean out the conductive deposits by operational techniques. Therefore, it is important that the deposits which cause fouling are scavenged from the spark plug before fouling occurs. In order to accomplish this, the spark plug core nose temperature must be raised periodically to a range which will burn off the carbon deposits and scavenge the lead salts before fouling occurs.

Carbon deposits will burn off the spark plug at temperatures above 800°F. At temperatures above approximately 1150°F., lead salts can be reduced into small globules of highly conductive lead compounds which cannot be burned out. Consequently, operation of the spark plug at approximately 1000°F. core nose temperature will result in optimum scavenging of these deposits.

In the event fouling has occurred, it is most important that the plug temperature be raised very gradually by slow throttle application after first operating the engine at low power and lean mixture to permit the spark plug to jump the gap. If the power is increased slowly enough to permit the plug to continue firing until its temperature reaches 1000°F., a successful cleanout can be expected, provided the lead compounds have not fused or glazed.

Other spark plug cleanout procedures—such as thermal shocking by use of prime or alcohol—may be effective for special cases. However, they are not approved by most operators.

In summary, ground spark plug fouling will be minimized by strict adherence to these points:

(1) Insuring that the proper spark plugs specified for the engine are utilized;

(2) Maintenance of proper idle mixture adjustments which will prevent excessive carbon buildup;

(3) Periodic spark plug cleanout during ground operation and prior to takeoff; and

(4) Slow throttle movement. (This is particularly important when advancing throttle during ground run, takeoff, or missed-approach go-around.)

These new procedures reflect the latest thinking and recommendations for satisfactory spark plug performance. Basically, the procedure calls for operation of the engine at a power setting which will result in spark plug temperatures of 1000°F. for sufficient time to scavenge the deposits. Power settings should be held for one minute or until cylinder head temperature is 200°C. This should be accomplished approximately every 15 minutes during ground running.

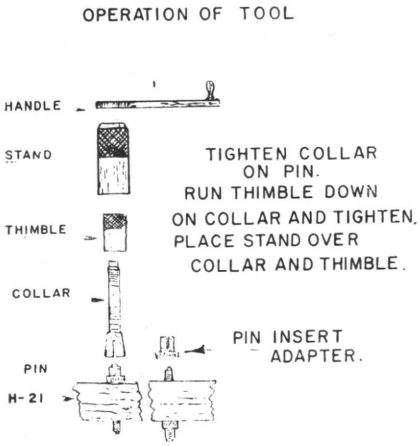
Increasing the useful life of the snap ring of the H-13 door vent was the basis of a recent award to Mr. Otto A. Buettner, a U. S. Army Aviation School rotary-wing instructor. A reinforcing strip placed inside the vent prevents it from shattering. The aluminum strip can be quickly cut to size with metal shears and fitted into place.

This tool for breaking the bead on tires came about as a result of extensive damage to aircraft tires. Simple

Tire Bead Breaker

to construct, it breaks the bead all around and makes tire removal easy. This tool can be made from scrap iron in your maintenance shop.

The factory furnished blade pin puller was UR'd because of damage to blade pins on the H-21. This item



CUTCHEN H-21. BLADE PIN PULLER.

came about through school experience. Conceived by a project engineer, this not only removes the pin but also replaces it.

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Army Aircraft Mobile Technical Assistance Program

Charles G. Hall

AN ADDITIONAL SERVICE to the field is being provided by the United States Army Transportation Supply and Maintenance Command through the recently instituted Army Aircraft Mobile Technical Assistance Program. This program will assist Army Aviation maintenance facilities through courses of instruction on specific types of aircraft for mechanics at their home station.

Basically, the program consists of mobile teams under contract to the Army to provide organizational maintenance instruction as authorized by paragraphs 16.1 b(2), AR 750-5 (Change 4). Each mobile team travels in a station wagon equipped with modern training devices and up-to-date technical literature for a specific type of Army aircraft. At present, there are six such teams: Beech L-23, Bell H-13, Hiller H-23, Vertol H-21, Sikorsky H-19, and Sikorsky H-34. These teams are operating as separate units, travel-

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Mr. Hall is a Maintenance Training Advisor, Directorate of Field Services, United States Army Transportation Supply and Maintenance Command, St. Louis, Missouri. Views expressed in this article are the author's and are not necessarily those of the Department of the Army or of the U. S. Army Aviation School.—The Editor.

ing nationwide to provide on-the-spot assistance in accordance with a predetermined schedule.

AIRCRAFT NECESSARY

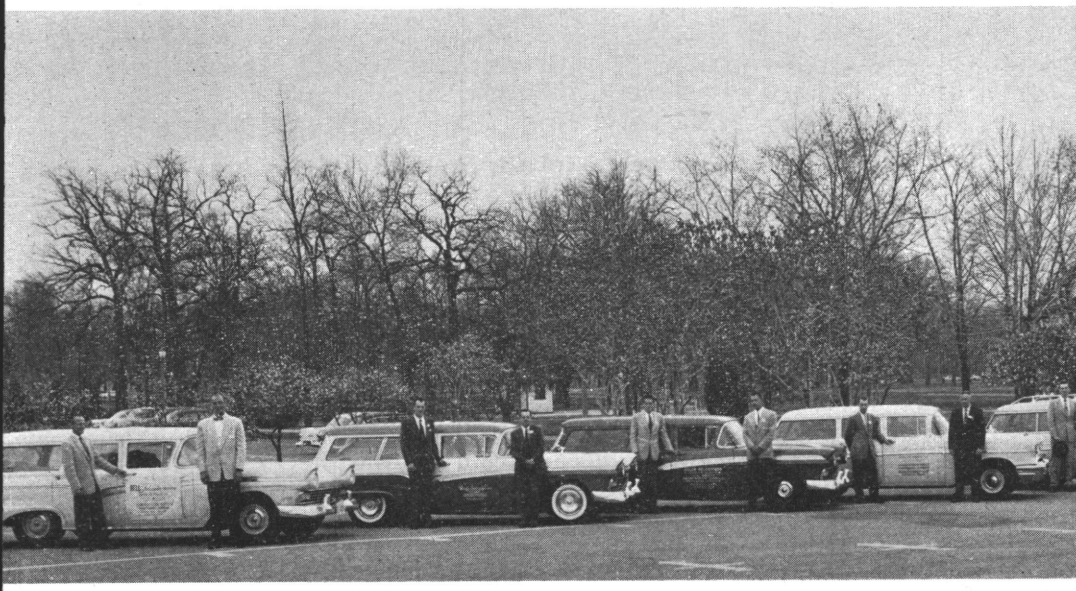
In addition to classroom instruction utilizing the portable training aids carried by the unit, an aircraft of the type under discussion is also essential. The highly skilled factory technicians use the aircraft for practical maintenance demonstrations as well as a means of illustrating solutions to specific maintenance problems. Through the use of an aircraft and components available at the activities being visited, a tremendous savings is realized without adversely affecting the quality of the instruction through elimination of heavy training aids that are expensive to procure and transport.

The need for this type of assistance has long been recognized by the U. S. Army TSMC, and many possibilities were explored prior to implementing the present program. The problem was to furnish an economical means of disseminating the specialized technical knowledge needed to maintain present-day complex Army aircraft. The program is preventative in nature as opposed to corrective measures, thereby representing a potential reduction in requests for other forms of technical assistance that are now threatening to surpass economic limitations of the overall technical assistance program.

SCHEDULING IMPORTANT

The scheduling of the mobile teams is controlled by U. S. Army TSMC and is based on aircraft population and requests for

Mobile teams leave on nationwide tours



assistance from major commands. In order to prevent the simultaneous arrival of two or more teams and to space visits at a particular installation, minimizing interference with routine duties, a long-range schedule is necessary. This schedule provides advance notification of the team's arrival so that necessary planning for the courses can be accomplished.

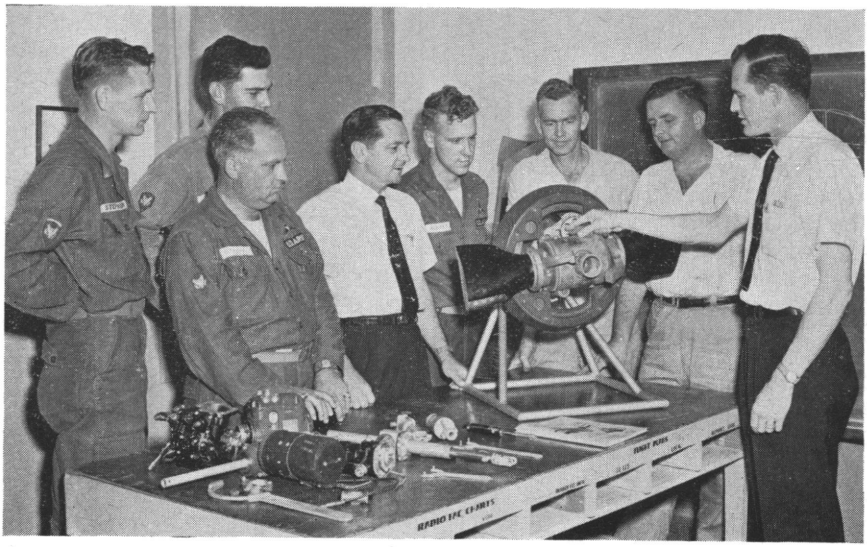
Since the revision of the schedule for one visit has a possible chain reaction on the entire schedule, it is hoped that requests for changes will be kept to a minimum. However, a certain amount of revision will be necessary due to unforeseen developments, and such changes will be desirable to assure maximum utilization of all teams.

There will be instances where activation of new organizations or movement of aircraft will make a request for this type of assistance desirable, thereby necessitating a revision of the schedule. U. S. Army TSMC will make every effort to provide the assistance as requested by Department of the Army activities within the physical and economic limitations of the program.

FIRST DAY

The first day of the team's visit is devoted to making advance arrangements for the class. The team will sign in and report to the Transportation Officer or other designated person to discuss these arrangements. During this meeting, all maintenance problems should be discussed to assure that the team can cover solutions during presentation of their course. This aspect of the Army Aircraft Mobile Technical Assistance Program has the effect of providing a course of instruction tailor-made to fit the needs of the installation being visited.

In order to limit the time re-



Beechcraft expert explains prop at Fort Hood

quired for advance arrangements to one day, it is suggested that each activity scheduled for a visit plan for the use of an aircraft, classroom, and full attendance by a group of trainees. Since the aircraft is the principal training aid, it should be available for at least 50 percent of the duration of the visit.

A suitable classroom area should be selected and reserved for the entire period of the visit. While not essential, a conventional classroom is desirable since a portion of the course depends on projection equipment requiring electrical outlets and a semidarkened room.

Fort Benning soldiers listen to Sikorsky expert

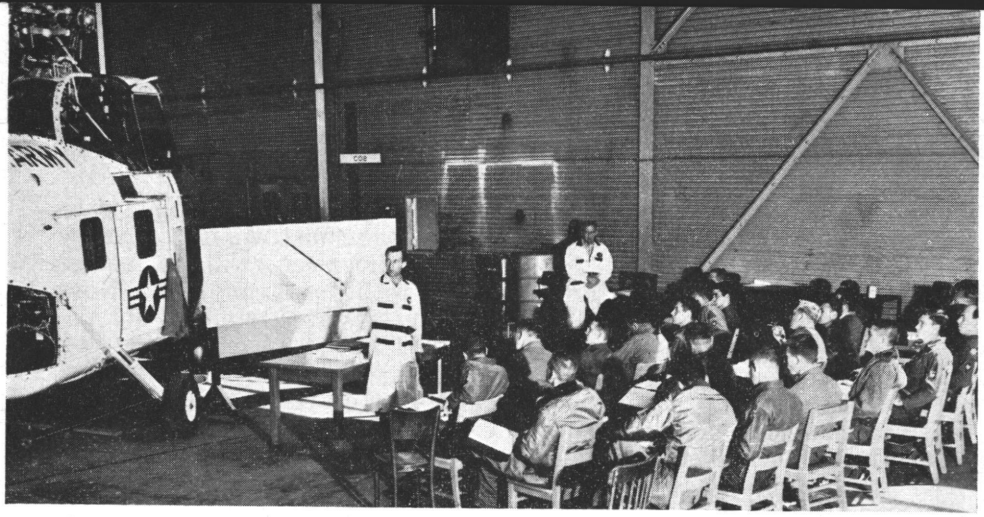
SIZE OF CLASS

A group of 15 trainees is considered an ideal class. It is suggested that the number be limited to between 12 and 25 to assure a sufficient number of trainees to make the class economically feasible, yet small enough for classroom and practical demonstrations. Exceptions, however, will be necessary to fit local conditions. Normally, if the number of expected trainees exceeds 29, two classes will be scheduled. The practice of placing men on orders and excusing them from other duties has proved successful in obtaining full benefit from the program.

The length of present courses varies from one week for the L-23 to three weeks for the H-34. The H-13, H-23, H-21, and H-19 courses require two weeks. Until each team has made one complete tour, each installation will be limited to two consecutive courses for an equitable distribution of this assistance.

ADVANCE COURSE PLANNED

The present mobile units are furnishing organizational maintenance-type courses. This portion of the program is known as



Sikorsky "rep" conducts class at Sharpe General Depot

Phase I. Plans for an advanced field maintenance course are being developed in which the course will be known as Phase II.

U. S. Army TSMC expects to have the Phase II units in the field prior to January 1958, pending successful negotiation of contracts. Wide publicity will be given to Phase II prior to the first visits of these units to allow a sufficient amount of time for planning. Phase I teams will continue to operate at organizational maintenance facilities after implementation of Phase II.

Bell instructor checks mast at Meade

DA Circular 750-8, 12 June 1957, has been published to provide information to the field regarding this program. In addition to this circular, U. S. Army TSMC has prepared an informative brochure entitled "Army Aircraft Mobile Technical Assistance Program" which will soon be distributed on a limited basis to the major commands and installations scheduled to receive assistance under this program. These two publications will serve as valuable guides to acquaint Department of the Army personnel with the program and aid all activities in making arrangements for the visits.

The reception given this program by field installations will be the governing factor in determining the success of this type of assistance. The cooperation of all personnel at installations being visited is solicited by U. S. Army TSMC in order that full capabilities of the mobile teams can be realized. Comments, suggestions, and recommendations are also desirable to aid in evaluating and improving the Army Aircraft Mobile Technical Assistance Program.

Memo from Flight Surgeon

IT WAS just before dusk when the lieutenant reduced throttle and swung his L-19 onto short final on runway two five. Peering ahead, he watched the tip of the disappearing sun flicker against his propeller. It made him feel queer, and a quick wave of uneasiness passed through him. The feeling switched to a mild irritation that immediately expanded into a tiny rage, and as he continued to stare through the propeller, he grew certain that the sun itself was a steady point of light, and that he was blinking his eyes uncontrollably. A wave of nausea filled him now and blocked out every other feeling. He was sure he was about to pass out.

Then just as suddenly the sickness vanished. At the very moment the tip of the sun disappeared below the horizon, the sickness and the rage vanished as if an unseen hand had flipped a switch.

As he taxied the L-19 onto the ramp, he was confused and a little frightened. "What happened to me back there?" he wondered. "Am I losing my mind?"

No, he wasn't losing his mind. But what happened was "flicker vertigo" — a condition that can resemble an epileptic seizure. The situation was perfect for it: a bright shaft of light flickering at the right rate of speed against the pilot's eyes.

If you'd like to get an approximate idea of what it's like, try looking at a bright light through the blades of an electric fan. Spin the blades with your finger so that the light flashes between 4 and 20 times a second. If you're a fairly stolid person,

you'll feel only irritation, but if you're flicker sensitive, you may experience the first signs of flicker vertigo.

Oddly enough, one lab study made in France seems to indicate that persons most susceptible to flicker are those who adapt most swiftly, learn most rapidly, and, in general, have the quickest reaction times in psychological tests. Pilots are chosen for these very characteristics.

To sum it up: the setting sun, plus a single-engine plane, plus a propeller turning three to six hundred rpm can produce a really perilous situation. The rotary aircraft beacon may even serve as a hazard at night, especially with its beam flickering against the overcast.

Flicker vertigo can mean quick trouble. It can lay you out cold in a moment. So if you run into it, turn your head or change your angle immediately. Don't tolerate it; get rid of it quickly. If not, it may get rid of you.

LOOK AROUND

Unfortunately our eyes have certain weaknesses which make them "unreliable as a collision warning device."

Dr. Walter F. Grether in *Flying Safety* writes that, obviously, we cannot see an approaching aircraft hidden by clouds or one which comes at us from the rear. "But with clear air, daylight, and an approaching aircraft not hidden by a blind spot, why can we not depend on the pilot's vision to detect the other aircraft in time to avoid a collision?"

Actually, we can nearly always depend on our eyes under the right conditions. Assuming we've got daylight and our eyes are focused for distant vision, then if the aircraft we see stands out against its background and we happen to be looking directly at it, we have little problem unless—and this is something else again—our gray matter isn't registering.

Let's talk about these conditions because without them we may not have enough time to keep out of trouble. The need for daylight we can skip; everyone understands it. But, what about focus? Dr. Grether tells us that "the eyes need sharply defined objects to focus on," otherwise they will focus for near instead of distant vision (altitude myopia). Now, a clear sky has nothing in it to focus on, so, in effect, we'll be nearsighted much of the time, a poor condition for spotting aircraft far out. We can see an object best when it contrasts 100 percent with its background. We can see it least when it tends to blend in.

Under certain conditions, at

certain times of the day, with the airplane just the right color, or the clouds or haze just right, an airplane and its background will have very nearly the same brightness. It may emerge almost explosively from this natural camouflage, too close in to dodge.

Finally, direction affects the efficiency of vision. You will not see another aircraft at maximum distance unless you are looking directly at it. If it's ten degrees off the center of your vision, it must be ten times as big to be seen. Thirty degrees, thirty times as big. From this, note how far into your field of danger another aircraft may have penetrated before you detect it. More than that, it takes just about a half second for each look or glance in a specific direction. Easy to see you won't have time for too many glances before another aircraft may have crept in, ready to tag you.

Dr. Grether offers the following sensible suggestions for reducing this collision hazard:

1. Keep constantly alert.
2. Make good use of your time by continually scanning the area. Avoid spending too much time on a limited area since you may thereby neglect other areas which should be covered.

PUZZLER

During a routine mission in a *Sioux* you are required to enter into a small confined area. After making your high reconnaissance, you elect to land with a quartering headwind from the right over barriers 20 to 30 feet high. You initiate your entry in the normal manner at an angle slightly less than that required for a steep approach. As you approach within 100 feet of the tree tops, you notice that your aircraft is vibrating violently, your antitorque pedals are soft and unresponsive, airspeed is low and manifold pressure is high. You know immediately that the condition is:

1. Select the best answer or answers.

☐ Fuel starvation.

☐ Left or right magneto causing plugs to miss.

☐ The helicopter is nearing the point of final application of power to arrive at a three-foot hover.

☐ Settling with power.

2. The best corrective action is to:

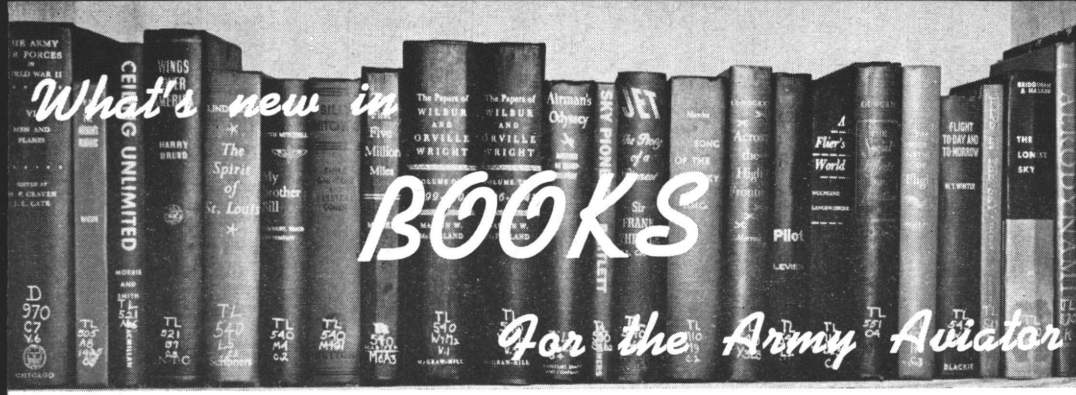
☐ Enrich mixture, continue approach.

☐ Increase power, continue approach.

☐ Reduce pitch, enter autorotation to area.

☐ Slightly reduce pitch, lower the nose, gain airspeed and make go-around.

The correct solution to the PUZZLER may be found on page 33.



ZOOMIES, SUBS AND ZEROS — Vice Admiral Charles A. Lockwood, USN, Ret., and Colonel Hans Christian Adamson, USAF, Ret. (Greenberg, 201 East 57th Street, New York 22, N. Y. $3.95)

Reviewed by
Captain Theodore Ferry, *Arty*
U. S. Army Board For
Aviation Accident Research

Regardless of the branch of military service to which a pilot belongs, many thousands of tax dollars go into his training. In combat this highly trained specialist becomes important beyond financial consideration. No amount of money can replace him when he is needed most. Although this pilot might be replaced, it is not in the American tradition to consider him expendable, and he performs better knowing this.

ZOOMIES (friendly pilots), *SUBS* (our lifeguard submarines), and *ZEROS* (the ever-present Japanese fighter plane) is the story of some 86 American submarines and the 504 airmen they rescued.

In the Pacific in 1943, Admiral Lockwood was given the task of saving the lives of Allied airmen flying that vast expanse of ocean. Many airmen were being lost, and no suitable means existed for search and rescue. Especially was this true near enemy-held territory. An old submariner, Admiral Lockwood, was sure that submarines were the answer. His theory was: "Cruise along the lanes our pilots would fly, be near the scene of action, and be ready to take whatever action necessary to save our airmen." From the start this was a sound procedure and a life saver. This was the Lifeguard League. The play was fast, the risk great, and the prize high.

Looking for downed airmen involved considerable risk. Not only were enemy planes apt to bomb and strafe, but our own aircraft often mistook the Lifeguard subs for the enemy. The submarine, "Skate," drew first blood when it was "standing by" off Wake Island, so close the crew could plainly see action ashore. The Skate's Officer of the Deck was mortally wounded by a strafing Zero, but the score was evened somewhat by the rescue of two Naval aviators beneath the noses of the Japs.

From this first encounter, the Lifeguard League went into the bigtime, with rescue after rescue, often under circumstances

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Book reviews appearing in this department do not necessarily reflect the opinions of the Department of the Army or of the U. S. Army Aviation School.—The Editor.

thrilling enough to warrant a separate book about each rescue. As the war progressed across the Pacific, so did the ever-expanding fleet of submarines on the hunt for downed aviators.

Depth charges, torpedoes, strafing planes, uncharted waters, and raging seas became commonplace entries in the logs of the Lifeguard League. As the end of the war neared, our Zoomies were being rescued in Japanese home waters. Some rescues even took place while under fire from shore batteries in Tokyo Bay.

A great adventure book for all, this true account of *Zoomies, Subs and Zeros* goes from one thrill to another, yet never loses touch with the day-to-day routine of the submariner.

THE WAR POTENTIAL OF NATIONS — Klaus Knorr (Princeton University Press, Princeton, N. J., 1956. $5.00)

Reviewed by
L. D. Parrish, Ph.D.
Educational Advisor, MOI,
U. S. Army Aviation School

Dr. Klaus Knorr conceives of war potential as the "stuff from which military strength can be mobilized in time of war or international tension." He analyzes the various elements which constitute immediate and latent strength of a nation in three types of warfare: firstly, the hydrogen bomb Gotterdammerung of sudden mutual collapse of warring nations; secondly, the conventional war of attrition, a nuclear weapons stalemate growing out of mutual forebearance born of horror; and thirdly, the war of the periphery, the "gray areas" such as the Malayan, Korean, or Indo-Chinese disturbances, a type of conflict limited in extent and in the use of major thermonuclear devices.

The military thinker will find in this book materials from the fields of history, political science, psychology, and economics, a clever combination of factors which will be of value in estimating war potential of any nation in future conflicts. He will be interested in the author's analysis of the problems involved in a nation's economic capacity, its will to fight, and its proper use of administrative methods in wartime.

VICTORY IN PAPUA—Samuel Milner (Office of the Chief of Military History, Department of the Army, Washington, D. C., 1957. $6.00)

Nearly fifteen years ago in the hot summer of 1942, the Japanese won a race with the Allies by landing troops near two villages named Buna and Gona on New Guinea's steaming Papuan Peninsula. *Victory in Papua,* the latest Pacific volume of the U. S. ARMY IN WORLD WAR II series, tells the story of the six-month struggle that followed when General Douglas MacArthur's American and Australian troops tried to drive the Japanese back into the sea.

For battle-hardened veterans, Papua would have been a grueling trial. For most of the 32d

Book reviews appearing in this department do not necessarily reflect the opinions of the Department of the Army or the U. S. Army Aviation School.—The Editor

Division troops entering combat for the first time, the peninsula was, as the author describes it, "a military nightmare" where "towering sawtoothed mountains, densely covered by mountain and rain forests, alternate with flat malarial, coastal areas of matted jungle, reeking swamp, and broad patches of knife-edged kunai grass four to seven feet high."

Against this forbidding backdrop, the story unfolded in *Victory in Papua* takes on an almost harrowing intensity.

WEATHER AROUND THE WORLD —Ivan Ray Tannehill (Princeton University Press, Princeton, N. J. $2.50)

Reviewed by Major Joseph H. Hall, *USAF**

In *Weather Around the World,* Mr. Tannehill has combined a superior knowledge of meteorology with a remarkable talent for writing in a style that is as easily understood by the average layman as by the professional meteorologist.

Although written primarily for the layman, the book is a valuable source of information for the professional meteorologist on waves, ocean currents, and seasonal weather around the world.

For the traveler, or would-be traveler, this book presents an exciting picture of the weather phenomena expected by seasons along all major routes, whether travel is contemplated by air, sea, or land. It provides a valuable source of information on 185 key places around the world.

Weather Around the World is recommended for anyone interested in weather, travel, or just plain good reading. It is especially recommended for service personnel contemplating a transfer to any overseas station.

**Major Hall is the former Commanding Officer of the 14th Det, 25th Weather Sqdn, located at Ozark Army Airfield.*

Solution to PUZZLER

On the basis of the factual information contained in the PUZZLER on page 30, the recommended solution is as follows:

√ Settling with power.

√ Slightly reduce pitch, lower the nose, gain airspeed, and make a go-around.

Senior Aviator of The Month

Major William R. Mathews, the Senior Army Aviator pictured above, is Aviation Staff Officer, Aviation Section, Headquarters, United States Continental Army Command. He graduated in January, 1942 from the Test Group for Artillery Air Observation, Experimental Pilot Training Class for Army Aviation at Fort Sill, Okla.

In 1943, Major Mathews became the Air Officer for the 2nd Cavalry Division and in 1944 was ordered to Europe, where he served as Air Officer of the 344th FA Battalion and later with Headquarters, 9th U. S. Army, as Assistant Army Artillery Aviation Officer.

After World War II, he attended the University of Texas. He re-entered the Army in 1947 and in 1948 was assigned as Battery Commander in the 159th FA Battalion in Japan.

Major Mathews joined the Department of Air Training, the Artillery School, Fort Sill, in 1951 as Flight Commander, later serving as Plans Officer. He was assigned as Executive Officer of the 45th Trans Hcptr Bn at Fort Sill in 1954. He also attended the Twin Engine Pilot Course at Fort Sill that same year. After receiving his helicopter rating in 1955, he became the 7th Infantry Division Aviation Officer in Korea before joining USCONARC.

During his long career in Army Aviation, Major Mathews has accumulated more than 3,300 hours. He has been awarded the Silver Star, Bronze Star with cluster, Air Medal with three clusters, Army Commendation Ribbon, Belgium Order of Leopold with palm, and Croix de Guerre.

The Gray Hair Department

A SHAWNEE was dispatched in subzero temperature to recover a jeep from an area blanketed with two feet of snow. The helicopter hovered high over the area attempting to blow the loose snow away. The pilot then brought the aircraft over the vehicle, and it was attached to the cargo sling.

The sling release tripped on the first attempt to pick up the jeep. Although swirling snow caused poor visibility, the crew chief, lying prone in the doorway, directed the pilot over the load, and a second hookup was effected.

As the pilot applied collective pitch, the Shawnee slipped to the right. Realizing the load must be offcenter, he immediately corrected the controls to right the aircraft, but without success.

An attempt was made to jettison the load, but the electric release would not work. The copilot, not realizing what the pilot was doing, was also pressing the release button. The pilot then shouted to the copilot to pull the

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The Gray Hair Department is prepared by the U. S. ARMY AVIATION DIGEST *staff with information obtained from the files of the United States Army Board for Aviation Accident Research. The views expressed in this department are not necessarily those of the Department of the Army or of the U. S. Army Aviation School.—The Editor.*

emergency release, but his pleas were not heard. He could not use the intercom because it was monopolized by the excited crew chief trying to explain what was wrong.

As the helicopter lifted the load from the ground, it swung in a pendulum motion to the right. The Shawnee rolled to the left, causing the rotors to strike the ground, then fell awkwardly to the surface.

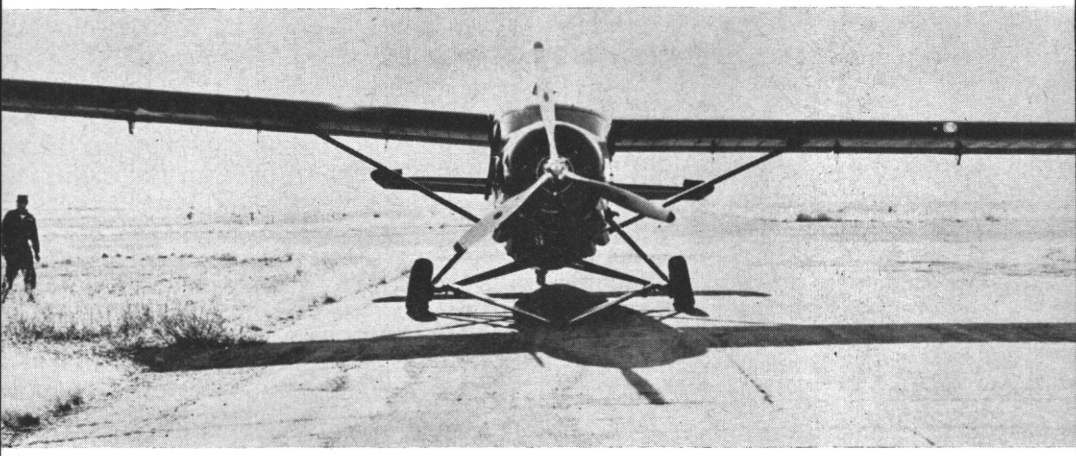
Two dangerous situations were inherent in this accident. Either could have brought about an occurrence of this type. When combined, they rendered a safe recovery impossible. The blizzard created by the downwash of the rotors and the improper positioning of the helicopter over the load have each caused innumerable accidents. In this case, one assisted the other.

Had visibility been better, the crew chief would have been able to position the aircraft perfectly over the load. As it happened, he was lying with his head out of the door, catching the full force of the biting wind and snow.

Many accidents within the last year have been attributed to poor visibility when hovering in dust or snow. Do not attempt to use the cargo sling under these conditions. If it becomes necessary to land, the proper procedure is to make a normal approach and continue it to the ground. DO NOT TERMINATE THE APPROACH IN A HOVER! Visibility is quickly lost, and the danger of vertigo increases. If hovering is necessary, do so at a greater altitude, 20 feet or more if it is still hazy.

FORGOTTEN THROTTLE

On a hot summer afternoon in a semiarid region, an Army Aviator loaded four passengers and "about" 500 pounds of cargo into his Otter for a 30-minute return flight to his home field where the elevation is over 3,000 feet. The subsequent flight was uneventful until he entered the pattern for a landing on runway



The Otter stalled 20 feet above the runway

17. The wind was from 167° at about 3 knots.

On final approach, he reduced throttle, continuing toward the runway in a poweroff glide. As the aircraft neared the touchdown point, the nose dropped slightly, steepening the glide. The pilot, attempting to raise the nose, pulled back on the control yoke. No power was added. The Otter was 20 feet above the runway when it stalled, dropping hard on the tailwheel and main gear in a three-point attitude.

After allowing the aircraft to roll to a nearby taxiway, the pilot cut all switches and got out to survey the damage. This inadvertent landing resulted in extensive damage to the main gear, main bulkhead, and tailwheel strut assembly. It was later estimated that repairs would cost about $30,000.

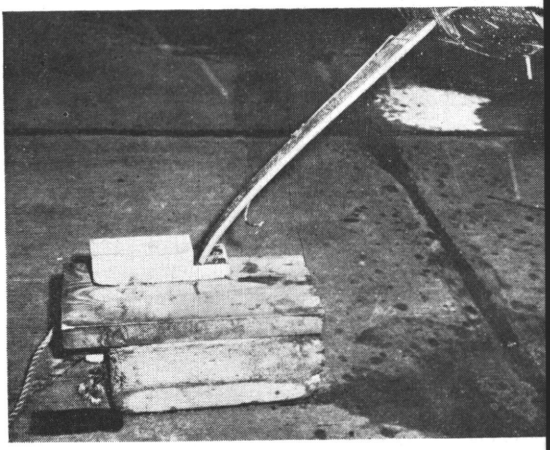
Proper pilot technique dictates that power be used when raising the nose of an aircraft to maintain airspeed above the stalling point. Heavily loaded aircraft will stall at higher airspeeds than less encumbered aircraft. If power had been added at the time the nose was pulled up, the Otter would have settled nicely to the runway. *Poor pilot technique returns poor results.*

Commanders of units using airplanes of the utility or light transport type should be more attentive to pilot checkouts with loads. The results will be gratifying.

HE COULDN'T SAY NO

Once in a while an accident involving only minor damage will demonstrate what older aviators repeatedly emphasize—it takes time and experience to develop good judgment and the ability to say *no* to the tower.

Here is an example. A young aviator with less than 100 hours first-pilot time was taking a passenger to a nearby Air Force Base in a Bird Dog. Some Air Force bases, because of their heavier aircraft, need not be too particular about wind direction and may not change runways when wind shifts.

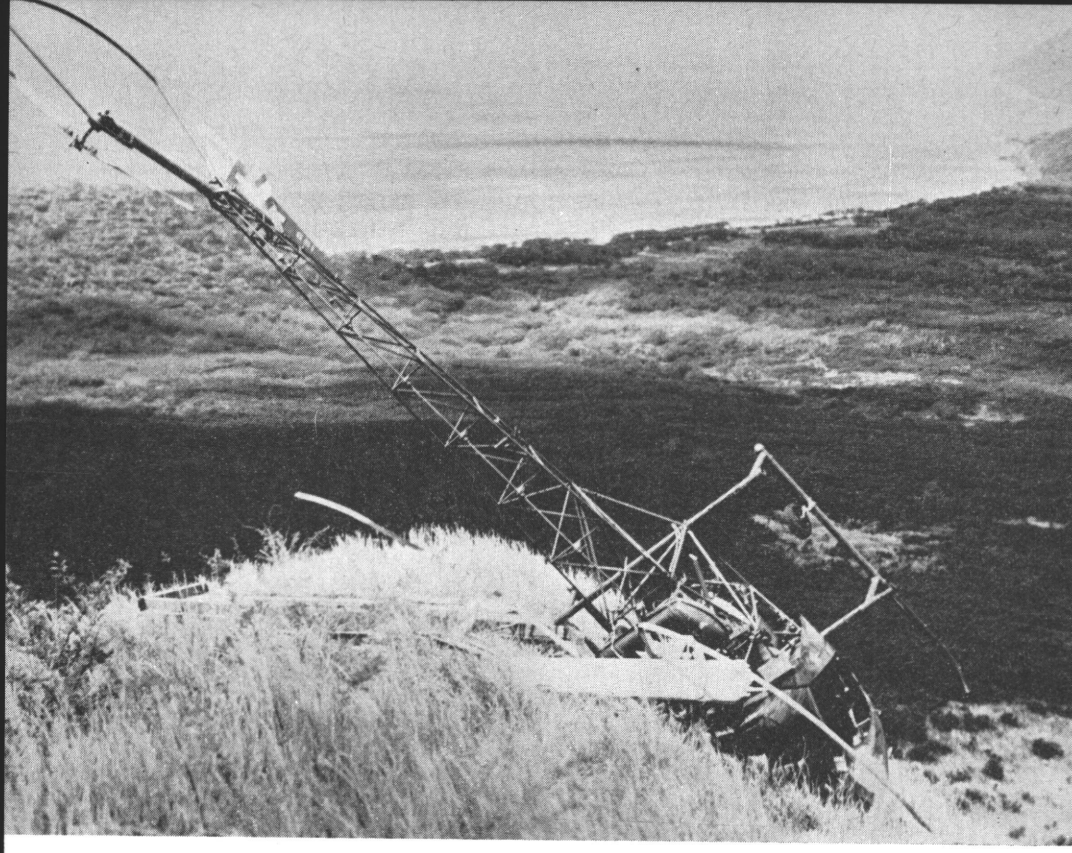


Cleared for a downwind approach

Our young aviator, out of fixed-wing training only three months, was accustomed to following verbatim the instructions of the tower. As he neared the base, he requested landing instructions.

The tower stated the active runway was 30 with the wind from the south at 10 knots. Knowing this was a quartering tailwind and remembering his instructor's warning to land downwind only when there was no other alternative, the young aviator overruled his apprehension and decided the tower knew best.

He entered left traffic and on



The left side pitched up violently

final pulled 45° flaps, assuming a wing low attitude just as he had been taught. The Bird Dog touched down, then bounced several feet into the air. A sudden gust of wind caught the aircraft and turned it 30° to the left. Before the aviator could straighten it, the Bird Dog touched down again in a crab.

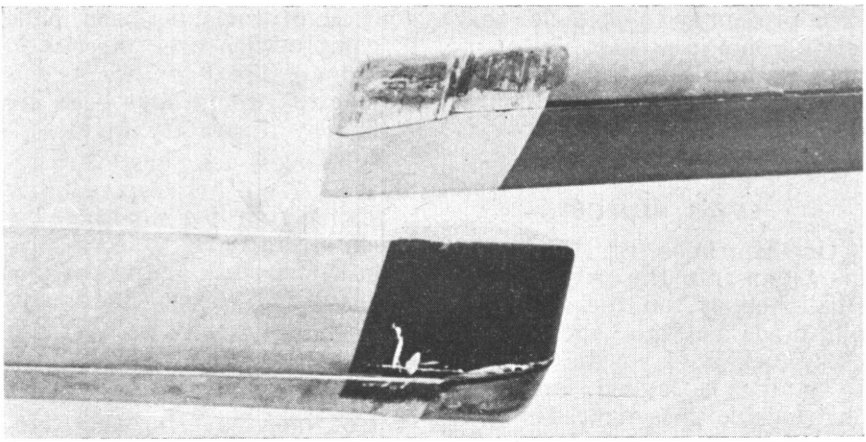
The right wheel turned under as it skidded down the runway, shearing the main landing gear spring about six inches above the wheel. The aircraft then completed a 180° ground loop and stopped without further damage.

The young aviator's crosswind technique was satisfactory; his judgment was not. An experienced pilot would have quickly indicated to the tower his desire for another runway. Some aviators learn the hard way that the tower is an *advisory* facility, and its directions can be altered if the pilot deems necessary. Gaining experience the hard way is not recommended.

DELICATE BALANCE

As the aviator neared the pinnacle, he checked the instrument panel of his Sioux and noted everything was in the green. He was happy. The "exec" of his unit was with him, and he wanted to demonstrate his skill with the machine. Their mission was to examine the wooden safety zone markers on the ranges to determine their state of repair.

To enable a close examination, the aviator hovered as near to the marker as possible, placing one skid against the slope and maintaining a level attitude with



The helipads were close together

power. All was well for about a minute, then the left side of the helicopter pitched up violently. It continued to rise, although he immediately countered with full left cyclic, adding pitch and throttle. The main rotor blades struck the ground, throwing the fuselage into the air and smashing it back to the surface on its right side. No serious injury was incurred.

It was later determined that the right skid came in contact with the marker, resulting in the violent reaction which caused the accident.

The slightest error by the pilot in performing such a maneuver may result in a serious accident. Therefore, this type of maneuver should be reserved for emergencies only. Aviators should be instructed to avoid any

The right wing contacted a tree

close proximity to obstacles that might come in contact with portions of the aircraft. Zealous performance of duty is an admirable trait. Overzealousness is foolhardy.

SMALL HELIPORT

One afternoon, Lt. *A.* brought his Sioux into the pattern of a small heliport on the side of a hill, made a normal approach to the panel, hovered the aircraft to stall #1, landed, and discharged his passenger. He shut off the engine and began to fill out the Form 781.

A few minutes later Lt. *B.* in another Sioux made a normal approach to the panel and hovered toward stall #2. He parked his helicopter with the left skid contacting the ground only a few inches from the center of the panel marking the middle of the stall. He reduced power and discharged his passenger.

Soon after his passenger had cleared the area, the rotor blades on his aircraft contacted those on the helicopter of Lt. *A.*, causing major damage to both machines. Since Lt. *B.'s* helicopter was not centered over the parking panel, the rotor blades of the two aircraft overlapped approximately 10 inches.

In the investigation of this accident, it was found that current directives published by the area command required at least 60 feet between each helipad. This allows 24 feet between main rotor arcs. The pads in this instance had a tolerance of only four feet *if* the helicopters were centered perfectly on the parking panels.

Supervisory error was a major contributing factor to this accident. Had provisions been made to comply with area directives, the small distance Lt. *B.* was "offcenter" would have been absorbed by the safety factor.

This does not, however, relieve Lt. *B.* of his responsibility to maintain proper clearance between aircraft. His sole reliance upon the spacing of the parking panels displayed poor judgment.

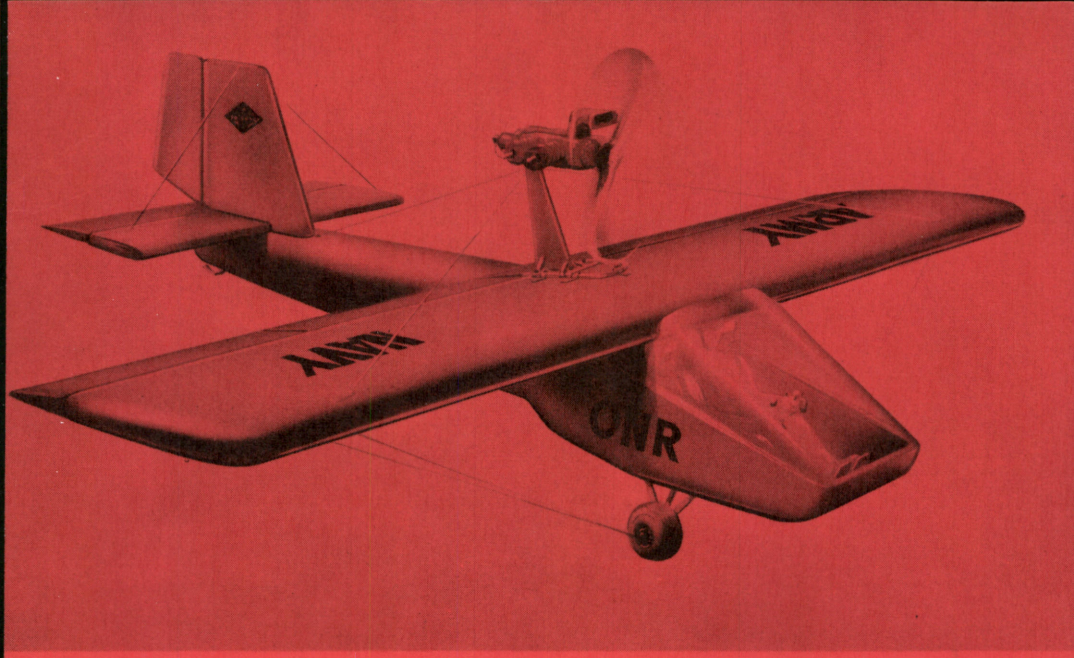
LOCAL PROFICIENCY

On a cold wintry day with a foot of snow covering the countryside, an aviator took off in a Bird Dog to practice basic flight maneuvers. Within a short time, he tired of practicing lazy-8s, chandelles, and S-turns and decided to fly around two nearby towns on a low-level cross-country. Flying along this route also proved boring.

He simulated attack by an enemy aircraft and started evasive maneuvers. He executed a steep spiral to the left and dove into the river valley, leveling off at about 50 feet. Immediately thereafter, at an airspeed of 125 mph, the aviator saw two wires in his line of flight and attempted to fly underneath them. In this nose-low attitude, the aircraft hit and broke both wires, the impact swinging the Bird Dog to the right.

As the aviator fought to regain control, the right wing came in contact with a tree on the bank of the river. Nevertheless, he completed the recovery, climbed away from the river under full power, and landed safely at his home field.

This aviator is lucky to be alive. If he was in search of excitement, he found it!



New Concept In Aircraft

The idea for the Goodyear Aircraft Inflatoplane came from the development of "Airmat," a revolutionary inflatable structural material. The "airmat" is made from two woven nylon layers interconnected by strong drop threads, coated with neoprene for leakproofing. Continual pressure is maintained by an automatic compressor.

America's first powered inflatable airplane was developed in just 12 weeks and was originally flown in late 1955. The present ONR sponsored GA-447 one-place inflatoplane (see back cover) is completely collapsible and portable and can be unrolled ready for flight in minutes. The only rigid parts are the engine mounting, control cables, landing gear, and certain control components.

The single-place Inflatoplane has a wing span and length each of about 34 feet. It is powered by a 44-hp Nelson H-59A engine and is capable of speeds to 50-mph with a range of 400 miles. Takeoff and landing can be accomplished within 200 feet.

A two-place model (see above), featuring side-by-side seating, increased horsepower, and improved performance is currently being developed under the joint sponsorship of the Army and Navy.

UNR