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UNITED STATES ARMY AVIATION DIGEST

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Guide For Speakers

The following article consists of extracts from a speech delivered to the Institute of Aeronautical Sciences at Los Angeles on September 18, 1958 by Brigadier General E. F. Easterbrook, Director of Army Aviation. It is published here as a basis of ideas for other speakers on the subject of Army Aviation at all levels of command.

WHY DO WE have aviation in the U. S. Army and what is this Army Aviation intended to accomplish?

Since 1945 the application of military power has been oriented on nuclear capacity. This nuclear capacity has had two important effects on tactical thinking in the Army. First, its destructive capability has dictated a dispersion of personnel and equipment, which under former tactical doctrines had been concentrated for major military efforts. Second, the application of nuclear capacity has increased the tempo of warfare by an almost incalculable amount, so that speed is a factor with which we must reckon on an ever-increasing scale.

The Army contends that the application of military power is not necessarily limited to the all-out major war concept. We must be prepared to apply the requisite amount of power to any situation. This means that we have almost diametrically opposed objective requirements. At the one extreme is an all-out nuclear war, while at the other extreme are military situations such as that in Lebanon, where thus far (18 Sep 58) we have not been called upon to fire a shot in anger. This latter situation, however, is an important application of military power in the large scheme of things. Thus the mental, physiological, and hardware flexibility dictated by these divergent requirements challenges the imagination.

Combined with these tactical requirements is the relative manpower situation between ourselves and our potential enemies, together with the differing philosophies of military operations. It's unnecessary to delve into the ramifications of these points. Suffice it to say that the combinations thus posed dictate an optimum capability in mobility and in weapons systems to offset any disparity in comparative numbers of people in uniform.

Very loosely translated, mobility is simply beating your opponent to the punch in any situation. To counterpunch, we must be able to move faster and more purposefully than he does. Here is where the philosophy of aviation enters Army thinking.

Insofar as speed is concerned, we feel that essentially we have arrived at the limit of groundspeed with groundbound means

of movement. In the light of present science there are only two other media in which we can move, below the surface of the ground, and above it. As far as I know we have not yet approached a realistic capacity for subterranean movement. We are left, then, with movement through the air as our most ready solution. And thus Army Aviation.

Generalizing a little, our mission in Army Aviation is to provide two facilities to the Army commander in the combat zone. The first mission is to increase his capacity or capability for acquiring information so that he may effectively apply the military force available to him. This is battlefield surveillance — a day and night, all-weather watch over the battlefield to provide the commander with information essential to operation. This information, this ability to detect and verify targets, is of utmost significance for the successful employment of the Army's tactical missiles.

The second general mission is to provide a means for more rapidly moving personnel and equipment within the combat zone—in other words, increased mobility and flexibility.

Actually, aviation in the Army must be classified as an **activity** rather than as a cohesive branch of the service, such as the Infantry, the Artillery, the Engineers, or the Transportation Corps. Our personnel in aviation are drawn from most of the branches of the service, and our philosophy is that our officer personnel, some 5,000 of them now who are aviators, will remain qualified in their basic branch in addition to being specifically qualified to operate aircraft. This may eventually present a complex problem in personnel. In the meantime though, Army Aviation is not a separate branch as such; it is a part of each of the several arms and services.

In describing our mission, I stressed the use of the term "combat zone," which we might also call the "battle area," for a very important reason. In order to work in this combat zone, it is essential that Army Aviation be able to live in the field side by side with the other elements of the Army. This requirement is essential if the aircraft are to be immediately responsive to the demands of the troops.

This rather simple thesis imposes heavy limitations. Immediately the age-old problems of supply and maintenance become magnified. This need to live in the environment of the soldier requires very simple and rugged flying machines, with simplified maintenance procedures to give us a high standard of availability.

Another extremely important consideration is the requirement that our aircraft be ready to fly when the soldiers whom they serve are ready to fight. This sounds quite logical and not unreasonable; however, this too imposes a burden.

There has always been a requirement for soldiers to move under cover of darkness or adverse weather, and many a successful attack has been made under just such protective cover. With the new and improved weapons systems of today, we see an increased requirement for soldiers to make the most of pro-

tective cover — darkness, rain, fog.

I certainly don't need to indicate the incompatibility of foul weather and low-level flying. Yet, I do believe that in the Army we will have to make the most of this condition and work towards a proper solution. Certainly to be effective our aircraft must fly when the soldier is set to fight.

True, we are operating aircraft that can be classified in the low and slow category. At the same time we are working towards minimum altitude to make maximum utilization of the terrain configuration to hide from the enemy, to stay out of the radar scan. Flying this way is not easy and imposes increased problems in aircraft control, in navigation, in fatigue factors, and in performing cockpit duties. We have a long way to go in this field. I suppose that our ultimate goal could be referred to as the flying carpet concept, in which the operation and use of air vehicles in support of Army operations will be about the same as the use of the famed ¼-ton truck of World War II. We realize that this ultimate goal is not immediately around the corner, but our efforts must be pointed toward this objective. In the meantime, we are making the flying soldier a reality.

I mentioned that we have upwards of 5,000 officer aviators in the Army. In addition to these officers, we have 1,200 warrant officer aviators and about 10,000 school trained enlisted personnel who are aviation specialists. This represents 16,000 people who have been given a considerable amount of costly training. You can see that, from a dollars and cents standpoint, aviation is an expensive operation in the Army.

Add this to our aircraft figures and the dollar aspect becomes even more critical. We have more than 5,000 aircraft, both fixed and rotary wing, in the Army inventory today. And it is significant to note that in an Army which is on a definite budget economy program, that aviation activity continues to receive priority consideration. We fully expect to see even more emphasis on aviation during the coming years, perhaps not as much as some of us would like, but I am sure that it will be a reasonable and acceptable status. One of my primary objectives as Director of Army Aviation is to make every possible effort to insure that we are getting our dollar's worth of defense, aviation wise, for every dollar's worth of tax money which we spend.

Now perhaps it might be interesting to look at the organization of our aviation activities in the Army. Basically there are two different types of organization, just as we have two almost distinctively separate missions. Our first basic organization is called the combat aviation company. This company is organic to the combat division, one to each infantry, armored, and airborne division. Each company comprises about 50 aircraft of several varieties, 70 aviators, and 150-200 enlisted aviation specialists. This company is at the disposal of the division commander to help him accomplish his combat mission in whatever

capacity he desires.

Our other group of basic aviation units is our helicopter and fixed wing transportation companies. These companies, both fixed and rotary wing, are, generally speaking, single type aircraft companies. We have companies of light transport helicopters, medium transport helicopters, and transport airplanes. These units usually have about 20 aircraft of the principal type, some 40-50 officer and warrant officer aviators, and 100-150 enlisted aviation specialists. The tactical doctrine covering the use of this latter group of transportation aviation companies goes something as follows: They are under the army commander or corps commander and he uses them on special missions to accomplish his over-all objectives and can, if need be, attach them to the combat divisions for certain operations. Their use is in the second category of missions, which is the movement of personnel, supplies, and equipment within the combat zone.

Totaling up our aviation basic elements, the flying companies, we have more than 40 of these units in the active Army today, and we hope to increase this number to some extent within the coming years.

CRUISE OR MAINTAIN

Your clearance reads "Cruise and Maintain," and if you rejected it you'd be 100 percent right. If such a clearance is received, the only action possible is to refuse it, and here's why: CRUISE—The term "cruise" may be used instead of "maintain" to signify to the pilot that descent from cruising altitude may be commenced at pilot's discretion without further clearance from ATC. "Cruise" is normally used only for relatively short flights in uncongested areas and is authorized for the flight to proceed to, and make an approach at, destination. MAINTAIN—The altitude instructions in an ATC clearance normally required that a pilot "maintain" the altitude at which the flight will enter the control area of the next center along the route of flight. Altitude changes while en route should be requested at the time the change is desired (FLYING SAFETY, August 1958)

"See, Winter comes, to rule the varied year,
Sullen and sad, with all his rising train;
Vapors, and Clouds, and Storms."
Thompson—*The Seasons*

WINTER IS HERE

WINTER WEATHER is demanding, both on aviators and aircraft. Those who neglect commonsense precautions and procedures for winter flying are likely to find themselves in undesirable statistical columns.

An aircraft covered with snow is a booby trap. Don't be fooled into thinking the stuff will be blown off before the monster becomes airborne. Facts taken from case histories of many winter accidents disprove such wishful thinking. Ice is where you find it, and in all probability you will find it on the aircraft surfaces under that nice, white blanket—if you're smart enough to look.

PREVENTION

The old adage, "An ounce of prevention is worth a pound of cure," most certainly applies to frost, ice, or snow where aircraft are concerned. A preventive measure in lieu of inside storage is the use of fabric covers, or some other suitable protective covering, on the aircraft surfaces. A little time spent in covering the surfaces prior to adverse weather will be repaid a hundredfold when the aircraft is readied for flight.

The effect of snow or ice in all forms is very difficult to predict; the many variable factors involved make any such prediction unreliable. The aircraft is dependent upon smooth, uninterrupted airflow over all of its surfaces for safe, efficient flight. Then, and only then, is the pilot in complete control of the aircraft.

Aircraft icing is a kingsize headache in winter flying. The weather produces icing in many ways. Turbulent air may suspend supercooled water droplets above the freezing level; glaze ice may form in the dry cold air under a warm front where air temperature is near or below freezing; air passing through intakes and carburetors undergoes extreme cooling which may result in ice formation.

FROSTY MENACE

Frost is formed upon an object that is cooled to below freezing in moist air. Frost may be formed on parked aircraft at night by radiational cooling, or it may be formed when an aircraft is cooled at high altitudes and lets down quickly into moist air.

Wet snow that accumulates on parked or taxiing aircraft may freeze to the aircraft on takeoff, especially where a temperature-

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—The Editor

Brakes and ice don't mix

dewpoint spread induces evaporational cooling. This type of icing can freeze control action.

Stalling speed increases as structural ice builds up, and lift decreases with the changed airfoil and increased drag and gross weight. When this occurs, a safe margin of airspeed must be maintained, especially in such critical maneuvers as takeoffs, climbs, turns, letdowns, and landings.

Dynamic efficiency of propellers and rotor blades is lowered when ice changes blade profiles. Deicing of propeller blades is aided by alternately increasing and decreasing rpm so that air friction and propeller vibration act to break off ice. Deicing of rotor blades is aided by rapid changes of pitch so that air friction and blade flexing act to break off ice.

Aircraft engines lose efficiency or fail when ice forms in carburetors. Adequate carburetor heat should be maintained, although in dry, very cold air that is clear of clouds, the heat requirement may be reduced. Care must be used during takeoff to avoid excessive heat that would cause detonation and engine failure. The pendulum swings both ways —too much and too little; use heat, but monitor its effect on the engine.

USE PITOT HEAT

Air pressure instruments, such as altimeter, airspeed, and rate of climb, fail when ice clogs pitot tube or static airlines. Use pitot heat at any time such icing is likely.

Any time a mission involves a flight through rain or sleet in below-freezing temperatures, the aircraft will pick up a coat of glaze, sometimes in a matter of seconds. The extra weight of the ice, the changes in configuration

due to its build-up, and the loss of prop efficiency add up to a dangerous flight condition—and one that must be corrected immediately. (See U. S. ARMY AVIATION DIGEST, June 1958.)

180° INDICATED

The only procedure that offers any degree of safety in such a situation is an easy 180° turn out of the area of icing. With the aircraft's stall speed substantially increased by the load of ice, the 180 has to be gentle and easy to prevent stalling. If the icing continues to build up, an emergency landing is the only solution, and it must be accomplished before the elements equalize stall and flight speed and you crash into the ground under full power.

When landing an iced-up aircraft, make a faster than normal approach and never land with power off. You will need power to maintain adequate control.

ICE INSURANCE

The best insurance against icing is careful flight planning. Before taking off on any mission during late fall and winter months, whether in fixed or rotary wing aircraft, check the weather for areas of possible icing along your route. Ask the weather officer for the height of the freezing level at various points, and keep out of those levels. If information on freezing levels is not available, check the current surface temperatures along your route and, by using the assumed lapse rate of correction (3.2° per thousand feet of altitude), estimate the freezing level. This should be a last resort method of establishing freezing level. Remember, the lapse rate may vary.

If the terrain does not permit safe flying below the freezing level, either change your route or cancel the flight. The only really safe compromise with ice is to stay on the ground.

Should the mission necessitate your flying in regions of possible icing, plan your flight to be in that region the shortest possible time. And never fly parallel to a front under icing conditions.

When flying in mountainous regions, with the temperature below freezing in the clouds, maintain a clearance of at least 4,000 to 5,000 feet above the ridges. Remember that icing is more probable over the crest of ridges than over adjacent valleys.

LONG WAY AROUND

Fly around areas of heavy cloud turbulence. These usually involve heavy icing conditions. If you must fly in icing conditions, keep in mind that there will be less icing at levels where the temperature is below 15°F., except in cumulus or cumulonimbus formations.

No two winters are ever exactly alike, but there are certain general adverse weather conditions which may be anticipated each year. Here are some items that will help to winterize and minimize these conditions:

Preflight. Frost, snow, and frozen ice particles mean trouble on any aircraft; prevent it or remove it before flight. Check air intakes, all deicing equipment and exhaust systems; car-

bon monoxide is a killer in closed cockpits.

Starting Engines. Check the Dash-1 operating handbook for winter starting procedure. Watch minimum temperature requirements.

Taxiing. Aircraft tailwheels and nosewheels are not effective on wet or icy ramps and taxiways, EXCEPT AT SLOW SPEEDS.

Takeoff and Climb. Have pitot heat on where conditions dictate, and use enough heat to keep the windscreen clear. Have navigation aids set up for a quick return to the field if necessary.

Cruise. If weather ahead is bad, review the plan of action and have everything organized before trouble starts.

Descent. Take precautions against windscreen fogging on the way down. Have deicing equipment on and everything all warmed up before starting down through clouds. When throttle openings are reduced, exposure to carburetor ice goes up fast; low-power descents in clouds and precipitation should always be made with carburetor heat ON.

Landing. Have the right speed values in mind for your load. Having flown through icing conditions, consider the effect on airfoils and carry an extra margin of speed. Remember that blowing snow can erase all visibility. Wet or icy runways must be longer than dry runways. Too much slush or water can bang up an aircraft.

Winter sports are fun. Know-how and good equipment make ice skating a pleasure enjoyed by thousands. Winter flying can be fun, too, if we get into a winter frame of mind and use our equipment properly.

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Aircraft Recovery Using the Helicopter

Major Jack Crable, TC

AN INCREASING AREA of helicopter operational possibilities has evolved during the past ten years. Helicopters possess such versatility that they have served most conceivable transport applications.

Civilian use has been unbelievably extensive, from crop-dusting and seal hunting to uranium and oil prospecting. In military usage, particularly in the field of Army Aviation, the 'copter's combat role was partially demonstrated in Korea.

We have frequently employed the methods of recovery and evacuation, born of battle in the early 1950s, to the national scene. In one instance in 1955, severe flash floods crippled northeastern sections of the country; hundreds of individuals were rescued by hoist cables, slings, stretchers and direct loading into helicopters from inaccessible areas. Life saving and evacuation via the helicopter have become common occurrences.

RECOVERY OF MATERIAL

A new development in the expanding role of helicopter utilization is that of material recovery. As an example, the helicopter has been used to pick up expended jet drone target missiles. Formerly, ground vehicles, spotter and guide planes, and sometimes patrol boats were used in this type of salvage work. When a drone completes a mission, it automatically parachutes to earth. Today, Shawnee helicopters, with suspension bridles attached to conventional cargo slings, easily pick up the drone wherever it lands. The loss rate is appreciably lower. Drone recovery operations with helicopter proceed more rapidly than with ground equipment. The employment of less equipment, fewer personnel, and less manhours represents an economical saving, and men and equipment are released for other duty. In every respect the use of helicopters in recovery operations has been more satisfactory than former salvage processes. This applies to the recovery of disabled aircraft.

FORCED LANDINGS AND RECOVERY

A pilot's flight plan crosses natural barriers of water, mountains, swamps, and ravines; consequently, when a forced landing occurs, the aircraft is often inaccessible to ground recovery equipment. In such cases, salvageable equipment and components are written off as a total loss.

Increased density and widespread operation of Army aircraft demands that more efficient recovery systems be utilized. Present ground equipment, whether amphibious, crane-type,

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—The Editor

or lorry, can be useless in many circumstances. When ground recovery equipment is used, it is often a time-consuming operation. Further aircraft damage occurs as the craft is hoisted and hauled over rough terrain. Components, such as wings, rudders, aerials, and wheels, are often broken off. Sometimes punctures caused by branches, stones, or stumps inflict body or structural damage to the ship.

Once a ship is recovered, more time-consuming transport and then depot services are necessary. Moreover, some aircraft now in use, and future aircraft of Army Aviation, are not transportable on ground vehicles or recovery trailers without extensive disassembly.

RECOVERY BY HELICOPTER

It is clearly evident that under combat conditions the limitations and time-consuming practices of ground recovery equipment are not tolerable.

Past experience in Korea, Alaska, Europe, and the United States has positively indicated that helicopters can, in most instances, be employed as recovery vehicles. In one case, a Bird Dog made a forced landing on a sand spit in the Gulf of Mexico. A takeoff could have been attempted, but an engine change was necessary. A Choctaw brought the aircraft home for repairs.

In another instance a Sioux, en route from the factory in Dallas, had an engine failure about 51 miles west of New Orleans. It was impossible to change the engine at the scene. A Choctaw "sky-hooked" it some 20 miles to an airport, thus making disassembly of the craft unnecessary.

Navy gets a lift

Is this the answer? Can the 'copter's versatility, as opposed to that of ground recovery equipment, become an important factor in its acceptance as the preferred recovery vehicle?

OPERATION BLOWHARD

One story of helicopter recovery that is hard to top concerns a military Globemaster adrift in the foggy waters of Cook Inlet, Alaska.

The Globemaster ditched with a 13-man crew and a cargo of jet engines after an engine failure at takeoff. The crew was fished out immediately. However, the huge ship and a half-million dollar cargo floated in the fog and ice floes for 40 hours before whirlybirds saved the day.

Small boats had been unable to approach the craft due to the ice and were not capable of moving it toward shore in any event. On the second morning two Shawnees approached the Globe-

master, intending to use downdraft from their rotor blades to push it toward shore so that salvage operations could proceed.

The results make easy reading. The ship was slowly nudged into mudflats hundreds of feet offshore. A cable from a bulldozer on the beach was then fastened to the tail and the aircraft moved inland. During the recovery one of the worst traffic jams occurred in the history of Anchorage, Alaska. When the operation was completed, thousands of interested spectators who had lined the water front and high downtown areas of the city returned to their normal pursuits.

The plan was perfectly executed. The jet engines were snatched from Davy Jones and much salvageable equipment eventually returned to duty in other Globemasters. This was a particularly successful, if somewhat unorthodox, recovery attempt. It only demonstrates the trial and error methods of present recovery operations. Success is often directly attributable to the ingenuity and experience of the person in charge.

NECESSARY CHANGES

Recovery of Army aircraft using helicopters, in preference to ground equipment, can in a majority of cases be accomplished with minimum changes or additions to the equipment presently at hand.

The development of a standard harness or sling suitable for lifting components and stripped aircraft is being planned. In addition, a collapsible, lightweight hoisting device to be carried to the recovery scene is being developed. Such devices and slings will make possible the more efficient recovery of downed aircraft.

PROCEDURE

In a typical recovery operation, the first inbound flight will land the recovery team with their pioneer tools as close to the wrecked craft as possible. The team will clear a suitable area near the craft for the next inbound flight of necessary mechanic tools. These tools can be easily landed in a sling load, so a large area need not be cleared around the disabled aircraft.

During a recovery operation utilizing a helicopter as the recovery vehicle, the officer in charge will determine:

1. The weight reduction necessary to permit lift evacuation of the wrecked ship.

2. The effects of weight reduction on the center of gravity location and how it, in turn, will affect the lift attaching points. Normally, the rotor blades receive no special care as they usually are damaged in the crash. If not damaged, they will be dismantled with care. This applies to all components of the craft.

The recovery vehicle will hover over the wreck while the lifting harness is connected to the sling. The lifting harness will be attached to the transmission mount attaching points on the downed ship. A test lift is essential to determine the load center of gravity and to prove the lift can be accomplished. If the load remains horizontal in the sling, no further adjustments will be made. If, however, the load tips toward the nose or tail, weight distri-

bution adjustments are necessary. When the pilot and crew are satisfied that the load will ride well, takeoff is made and recovery accomplished.

FUTURE APPLICATIONS

The helicopter employed in the role of material recovery hovers over a new and versatile field. Drafting boards now hold designs of a "flying crane" type of vehicle which will incorporate a structural body (to carry pilots, rotors, engines, hoists, etc.) with lift capacities ranging from 3 to more than 20 tons.

Igor Sikorsky, a zealous rotary wing proponent, maintains that these "crane helicopters" will have "one unique and essentially important characteristic that places it far above the abilities of any other vehicle. There is no limitation to the place where it may pick up cargo or the place where it may lower it. It has no limit, either, as to the size or bulk of the object to be carried, providing the weight does not exceed the aircraft's capabilities."

As helicopters become larger and lifting capacity increases, proportionately less and less dismantling will be employed in recovery of wrecked aircraft. Greater time and manpower savings will result by using the larger class 'copters available.

Minimum dismantling and disassembly field work by relatively small crews, together with the helicopter's increased lift capacity and operational versatility, means more efficient aircraft recovery. Improved ground procedures will further promote helicopter recovery of damaged aircraft — or any material of war.

Rule: Where dewpoints en route are reported to be below 32°F. at surface stations under clouds from which rain and/or sleet are falling or are forecast to fall, do not file VFR to avoid an IFR flight in icing conditions above.

Why: When rain strikes metal surfaces in cold, dry air, evaporation cools the wing rapidly, and severe icing may occur. Recently, a C-47 filed IFR to another base, but was refused clearance as the aircraft had no deicing equipment and icing was forecast. The pilot refiled VFR and flew under the clouds. The C-47 rapidly accrued such a heavy load of clear ice that, even with full power on, the pilot was unable to maintain flight and the aircraft crashed on final approach. (Flight Safety Foundation)

Beware the Mountain Wave

THE WEATHER REPORT gave the minimum ceiling as 30,000 feet, with maximum cloud tops at 35,000 feet; minimum visibility 15 miles; freezing level 12,000 feet; winds at 10,000 feet from 260° at 30 knots; no dust, haze, thunderstorms, turbulence, hail, smoke, rain, fog, or icing conditions. It seemed to be a perfect night for the 160-mile flight. Crossing the mountain range would require a cruising altitude of 10,000 feet and put the Beaver square in the face of that 30-knot headwind. But this was no cause for sweat. The flight would take 1 hour and 45 minutes, and a full fuel load gave the Beaver over 4 hours cruise. Now, let's see what the pilot has to say:

"I took off at 1900 hours and set course, using an inbound ADF heading and an outbound Omni course. I flew for about an hour and was making very poor headway toward the mountain range ahead. Finally, as I neared the mountains, I could see my destination. At this time, I began experiencing a violent downdraft. I was losing 500 to 1,000 feet per minute at normal cruise power settings. I increased power and propeller rpm in an attempt to hold my altitude. Still losing altitude, I began putting flaps down, but to no avail. I lost 2,500 feet and considered it dangerous to continue on. I reversed my course and climbed to 12,000 feet. During this climb, strong tailwinds drove me back approximately 25-30 miles. I turned around and again tried to cross the mountains, with the same result.

"I made a total of four attempts to cross the mountains without success. Each time I lost altitude at a dangerous rate and had to turn back. By this time, I had exhausted my fuel to 20 gallons. I abandoned the attempt to cross the mountains and attempted to contact nearby radio facilities. Receiving no answer to my transmissions, I tuned to the emergency channel and started calling MAY DAY, giving identification, altitude, and position. Again, I received no reply.

"As a last resort I tried to contact a distant Army airfield and finally received them. I told them that I was going to attempt a landing on the highway below, knowing that I had enough fuel remaining to descend and look at the highway. In the event that a safe landing could not be made, I had enough fuel to climb to a safe jumping altitude and abandon the aircraft. I instructed my passengers that they might have to bail out and gave them the proper procedures for leaving the aircraft. I told them I was going to attempt a landing on the highway and had them tighten their safety belts. I began my descent, heading toward the nearest town, and flashed my landing lights all the way down. All the

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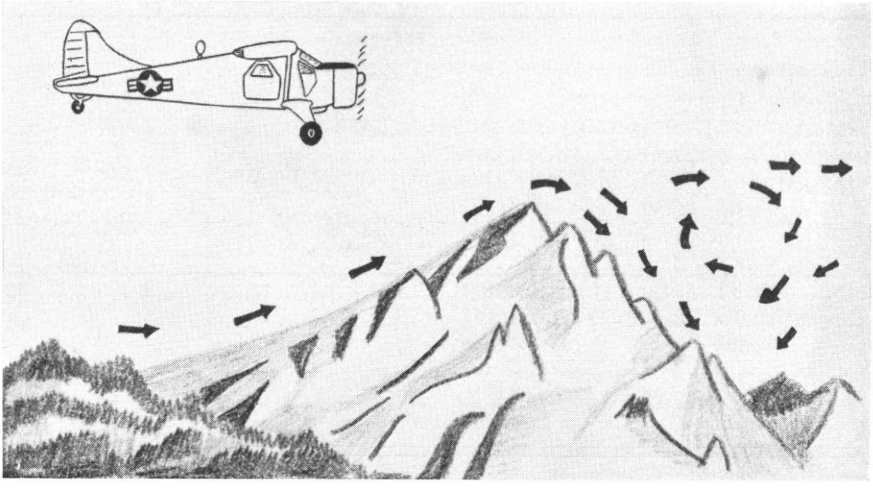
—The Editor



Beware the downwind side of a mountain

traffic on the highway cleared off to the side. I effected a safe landing and taxied off the highway."

This was the manner in which another pilot was introduced to the phenomenon known as "Mountain Wave." You may have heard it called the "Standing Wave" or "Sierra Wave." It has been compared to the flow of water over a barrier which forms into downstream waves and rapids. This pilot was very lucky. He encountered only a mild form of one of the hazards associated with this condition.

FEW FACTS

Other than organized studies done at Bishop, Calif., and Denver, Colo. and certain scattered studies in Europe and England, there is little information available on areas suitable for mountain wave formation. Since it is known that any mountain range with a crest of 300 feet or higher can produce the wave. it follows that the mountain wave could be experienced in many parts of the world. Wave evidence has been found up to 75,000 feet over hills only a few hundred feet high.

Dr. Joachim Kuettner, head of the Mountain Wave Project at Bishop, Calif., provides the following facts concerning the jet stream and the mountain wave:

"1. The jet stream and mountain wave are so closely related the two often blend into one phenomenon. While mountain waves occur without the jet stream overhead, nearly every jet stream produces mountain wave effects in hilly or mountainous country.

"2. Effects of the mountain wave extend to 70,000 feet and higher.

"3. The most extreme turbulence occurs from the mountain crest level downward.

"4. Heavy turbulence reaches up to a point about 50% higher than the difference between val-

ley floor and mountain crest. Over the Continental Divide, this means 18,000 to 19,000 feet.

"5. If there is any question concerning the amount of turbulence in a mountain wave, consider the case of a sailplane that was stressed to withstand 14 g's — it was torn apart in flight through a mountain wave rotor cloud at Bishop (California). The pilot bailed out, but he suffered injury."

WIND FLOW VILLAIN

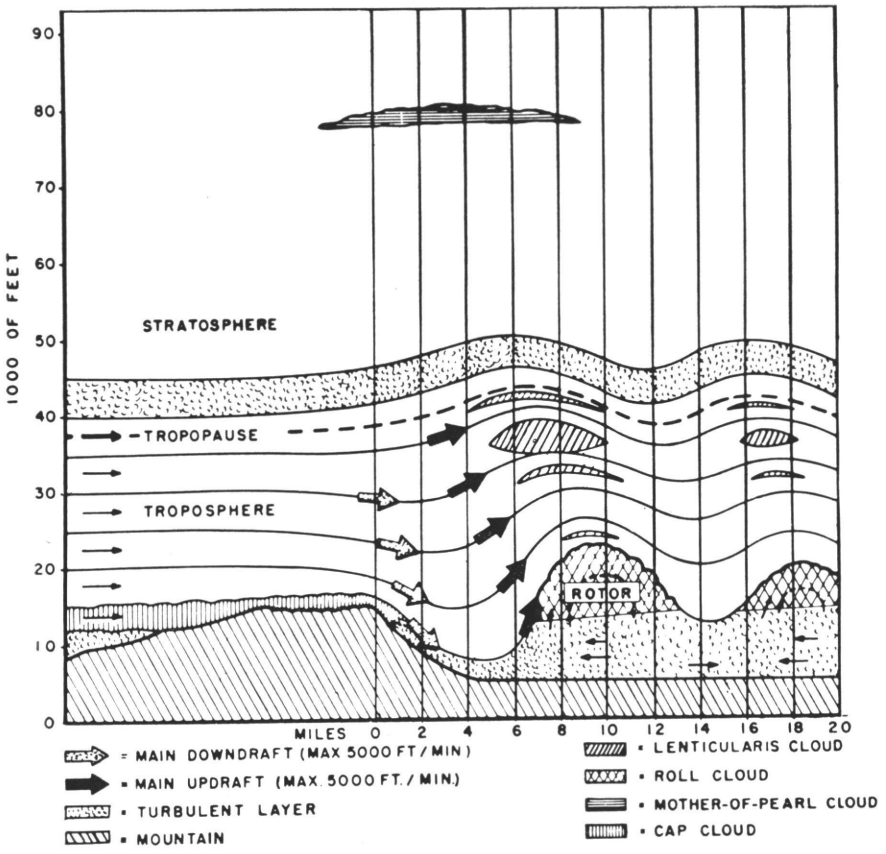
According to the best available information, mountain waves are caused by the flow of wind over rough terrain to the crest of a mountain or hill range. In some respects the mountain wave is similar to the airflow over a stalled airfoil. The windward side of the mountain forces the wind up, increasing its velocity and producing a venturi effect on the lee side. This results in unstable air which is the cause of downdrafts, updrafts, and turbulence.

A popular misconception about mountain waves is that particular cloud formations will indicate their presence. Many impressive photographs are shown of various types of clouds associated with mountain waves. Unfortunately, waves are more frequent where one, several, or none of these types of clouds are present. The latter results when meteorological conditions favor creation of a mountain wave, but dryness of the air prevents cloud formation. These invisible waves can be just as rough as those with clouds, with the added hazard that there is no advance notice of trouble. When clouds are present, they may be identified as:

Cap Cloud. The cap cloud hugs the mountain tops and flows down the leeward side. It is dangerous because it hides the mountain and is connected with the strong lee side downdraft (up to 5,000 fpm).

Rotor or Roll Cloud. The rotor or roll cloud forms downwind of the cap cloud at the crest of the almost vertical updrafts. Its base may be below the mountain peaks; and its top may rise as high as 30,000 feet, often merging with lenticular clouds. While it may look harmless, it is severely turbulent with updrafts sometimes over 5,000 fpm on its trailing edge. It is practically impossible to penetrate the lower parts of a strong rotor cloud in controlled instrument flight. It appears to be constantly boiling, but remains essentially stationary, since it is always forming on the windward side and dissipating to the leeward. Thunderstorms have been known to form in unusually big roll clouds. Frequently, a number of roll cloud lines extend parallel to the mountain range, each marking a wave crest. The initial roll cloud may form anywhere from a position immediately to the lee of the mountain peaks to 10 miles downwind.

Lenticular (Lens Shaped) Cloud. Lenticular clouds are relatively smooth and appear in layers to altitudes often exceeding 40,000 feet. The smooth layered appearance is consistent with the smooth flow of air in this portion of the wave. These



Mountain Wave Structure

clouds are also stationary, constantly forming to windward and dissipating to leeward. Ten or more of these tiers may be seen downwind of the ridge, each marking another wave crest. At times, severe turbulence occurs above the lenticular clouds. This high-level turbulence is most apt to be present if a jet stream is associated with the mountain wave. Up and down currents with a total amplitude of 7,000 fpm within five seconds of flight time have been measured in this turbulent layer.

Mother of Pearl Cloud. This is a rare, high-level lenticular cloud usually at 80,000 to 100,000 feet. Presence of this cloud indicates an enormous vertical extent of the mountain wave. Such a cloud will give notice of a strong wave long before the mountain range appears.

While cloud formations of mountain waves are generally

stationary, individual clouds can change position, shape, and structure quite rapidly. There is a considerable amount of continuous motion in and around them, with extensive clouds forming or dissipating within minutes. Be warned by any standing cloud in a strong wind flow.

CHANGE SIGNALS

Occasionally, a breakdown of the smooth flow sets off severe turbulence throughout the whole depth of a mountain wave. The highest lenticular clouds will signal such a change by showing very jagged, irregular edges rather than the normal, smooth edges. In addition, the roll clouds in this turbulent mountain wave generally build to extreme heights. It is doubtful that an aircraft could be designed with enough strength to withstand the excessive loads created by this turbulence. Like the boat pilot who remains clear of Niagara Falls, the aircraft pilot should avoid flight into this zone when there are critical signals.

The wave flow hidden by thick overcast is very serious because the warning signs are concealed from the pilot, who is preoccupied with instrument flight. There is the additional danger of icing. This lethal combination of ice and strong downdrafts needs no explanation.

Mountain wave phenomena present serious hazards to aviation. These hazards are:

Downdrafts. The most important locations of severe downdrafts are over the lee slope of the mountain range and on the downwind side of the rotor cloud (remember, the downdraft can be there without the cloud). These two main downdrafts, separated by an area of strong updrafts, are generally 5 to 10 miles apart. Not many aircraft using full power can match such downdrafts. Any length of time spent in the wide downdraft areas will inevitably bring the aircraft down into the turbulent layer and close to the mountains.

Turbulence. From a pilot's outlook, the clear air turbulence in a mountain wave compares with the most severe thunderstorm turbulence. The low-level turbulent layer will almost always be present, and it is apt to be destructive to an aircraft which flies into a roll cloud with a tailwind. From evidence at hand, the high-level layer is rarer but, when present, may reach destructive force in 4,000 fpm vertical and horizontal gusts.

Local Change of Upper Winds. Strong, but gradual, changes of wind direction and speed have been observed over distances up to 10 miles. It becomes obvious that a pilot cannot put too much faith in forecast winds, which are of necessity average winds. The implications are clear: Position errors may follow from erroneous use of the last wind determination; prolonged stay in downdraft areas due to excessive headwinds may cause rapid loss of altitude; airspeed may approach stalling in suddenly diminished headwinds.

Altimeter Errors. The sole purpose of one mountain wave

project (and the only reason money was made available for it) was to investigate and publicize the altimeter error associated with the low pressure caused by the venturi effect of high wind over an obstruction. This effect has been grossly minimized. A pilot who has occasion to make ski landings on the eastern side of the Sierras reports: "Near the tops of these mountains, after landing at points of known elevation, the altimeter has read as much as **2,500 feet high** if a strong wave is in progress." Beware the altimeter's erroneously high reading when approaching a mountain ridge, or even high hills, upwind on instruments. Under these conditions, many aircraft have crashed on the lee side of the ridge.

QUERY FORECASTER

The best life insurance for a pilot planning to fly over mountains is a careful discussion with his weather forecaster. In addition, the pilot can alert himself to the possibility of a mountain wave lying across his proposed route by (1) checking the REMARKS section of the weather operations sequence, where lenticular and rotor cloud indications are now reported, and (2) knowing that a strong wind flow aloft across a mountain ridge will often give notice of a mountain wave.

RULES SAVE LIVES

The safest way to fly a mountain wave is to go around it. However, if the wave must be penetrated, remember:

1. Cross the mountain range at a level at least 50% higher than the highest terrain. A mountain 9,000 feet high should be crossed at 13,500 feet altitude.
2. Avoid all flights in the lee side turbulent area.
3. Do not enter the cap cloud over the mountain crest (severe downdrafts).
4. Do not penetrate a strong mountain wave on instruments.
5. If trapped in a severe downdraft, change course quickly to a tailwind direction.
6. Allow for a high magnitude of altimeter error near mountain peaks.
7. If flying against headwinds, use updraft areas (especially the one upwind of the rotor cloud) as an aid in gaining an altitude reserve to pass through the next downdraft area.
8. Cross a mountain wave at right angles to the mountain range to minimize flight time in downdrafts.

How Airspace Problems

AFFECT PILOT TECHNIQUE

Sylvester L. McElroy

AIR TRAFFIC CONTROL is a service established by competent authority to promote the safe, orderly, and expeditious flow of air traffic. As a working controller, I have had the opportunity to see the increase in traffic problems caused by more and faster airplanes. These problems will increase with future development and expansion of aviation; consequently, greater demands will be made on the pilot than ever before.

In the complex field of Air Traffic Control, the continued increase in aircraft speeds has two immediate effects. First, as aircraft become faster, more airspace is required to provide a safe, orderly flow of air traffic. An aircraft traveling at 500 mph requires more than 18 times as much protected airspace as one traveling 180 mph. Second, air traffic controllers and pilots must be thoroughly familiar with air traffic control procedures and capable of executing those procedures with minimum delay. Safety of flight in densely occupied airspace demands high proficiency in both pilots and controllers. This becomes readily apparent with an understanding of airspace utilization, i.e., the application of minimum separation standards between aircraft operating on air traffic control clearance.

Three types of separation are used in the control of aircraft: longitudinal, vertical, and lateral.

Longitudinal separation, sometimes called "time separation," is described as the "Longitudinal spacing of aircraft at the same altitude by a minimum distance expressed in units of time, so that after one aircraft passes over a specified position, the next succeeding aircraft at the same altitude will not arrive over the same position within less than the minimum number of minutes." This minimum time is normally considered to be 10 minutes, if radio facilities permit frequent determination of position and speed; otherwise,

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—The Editor

the minimum is 15 minutes.

Let's suppose that aircraft are perfectly spaced 10 minutes apart along the same route or airway for a distance of 240 miles. This airspace would accommodate 8 aircraft flying at 180 mph, but only 2 aircraft flying at speeds of 500 mph since the 10-minute interval between aircraft would equal 30 miles for the slower aircraft and 83 miles for the faster aircraft. The faster aircraft require more than three times as much airspace to meet only longitudinal separation requirements.

Vertical separation, sometimes called "altitude separation," is described as "the vertical spacing of aircraft." Aircraft flying at the lower altitudes must be vertically spaced by 1,000 feet. Due to altimeter inaccuracy, all jet aircraft flying at altitudes of 30,000 feet or above must be vertically spaced by 2,000 feet. The fact that jet aircraft require twice as much airspace to meet vertical separation requirements greatly adds to the airspace problem, since there is now very heavy air traffic above 30,000 feet.

Lateral separation is described as the lateral spacing of aircraft at the same altitude by requiring operation on different routes or in different geographical locations. Aircraft operating on different routes or in different geographical locations do not require longitudinal or vertical separation once lateral separation has been established.

For **en route** aircraft, protected airspace varies from a width of 10 miles for aircraft at

ARTC controllers at work

lower altitudes to a width of 40 miles for aircraft operating at 41,000 feet and above. The airspace protected for aircraft in a holding pattern varies from a rectangular pattern 19 miles long and 8 miles wide for an aircraft holding at a true airspeed of 156 knots (180 mph) or less at an altitude under 19,000 feet to a pattern 57 miles long and 24 miles wide for aircraft above 29,000 feet. The need for more than three times as much airspace for the faster aircraft to meet lateral separation requirements becomes critical, particularly in congested areas where many airways and holding patterns are needed in close proximity to handle the air traffic landing and departing adjacent airports.

The dense use of airspace, increased aircraft performance, and a continuing growth in the number of aircraft tend to place heavier responsibility on pilots. In addition to being familiar with the general rules and pro-

cedures of instrument flying, the pilot should be thoroughly familiar with all special procedures which will affect his particular flight. Congested terminal areas may require more than 100 complicated arrival and departure procedures to adequately handle air traffic. For example, a pilot's departure clearance may be governed by his direction of takeoff and proposed routing, other aircraft in the immediate area, whether the aircraft has low-frequency radio or omni, by engine type, and other factors. Experience has shown that a pilot who is unfamiliar with departure procedures may take 30 minutes to complete a normal 15-minute operation.

With maximum use made of airspace, the air traffic controller depends on being able to contact all aircraft in his area **immediately,** and expects pilots to execute their clearances with a minimum of delay. Since en route aircraft can't park when delays or unusual situations develop, any interruption in the flow of air traffic at one location may affect the control, and planned control, of other aircraft for hundreds of miles.

Complex procedures also affect phraseology. The controller endeavors to make his clearances as clear and concise as possible. The pilot must understand every word of the clearance, rather than the general intent, because all control is based on confidence that the pilot will comply with every single word of the clearance issued.

It is of the greatest importance that a pilot possess a vast knowledge of instrument flying rules, become thoroughly familiar with the necessary procedures to accomplish his particular flight, always be alert for any Air Traffic Control clearances, be attentive to the whole content of clearances, and fulfill all clearances with speed and precision.

Air traffic controllers often work under very heavy pressures. The exacting nature of their work demands constant effort to meet the rapid growth of air traffic and airspace problems. Since they are in close contact with pilots, and are often pilots themselves, they fully realize the additional burdens confronting pilots. Flying has advanced from an occasional pleasure to a highly scientific profession demanding the utmost effort of trained and capable personnel; controllers are proud to be a part of it.

New program of instruction for the Mojave conceives training the entire crew of the Army's biggest helicopter. The U. S. Army Aviation School began the new program at mid-year, graduating pilot, copilot, flight engineer, and crew chief as an integrated unit.

Memo from Flight Surgeon

IF YOU HAD TO FLY an aircraft that hadn't been checked by a good mechanic, you'd be unhappy. If you were rating a pilot who did not report poor aircraft performance, you'd place him in a very low category. In your opinion, he would not only endanger his aircraft, but also his life and the lives of his passengers. In these respects YOU would qualify as a *safety-conscious* Army Aviator.

How do you feel about pilots who fly in poor physical condition? How would you rate them? Do you feel that they, too, are dangerous to life and limb? You should; after all, their neglect can be just as disastrous as that of the fellow who does not report poor performance qualities. A pilot who does not report physical or psychological troubles to his flight surgeon endangers human lives.

The flight surgeon is to the pilot what the ground crew is to his plane. He wants to keep YOU flying. When you do not report your physical and psychological troubles, you give yourself and your fellow "watchdogs" a bad break. Reporting personal deficiencies may cost you a few days on the ground, but it may save you many weeks later on. The oft repeated admonition, "Consult your flight surgeon," remains good advice.

In his field, the flight surgeon is a qualified expert. His advice should be followed whenever possible. His efforts to improve flying safety through application of his aeromedical knowledge are in the best interest of Army Aviation. This month's column concerns the most common forms of pilot dissipation—drinking and smoking.

THE CUP THAT CHEERS

If a pilot has no immediate flying obligations (within 24 hours) the occasional social highball is harmless. Excessive drinking, however, will eventually ground the ablest flyer.

Those who drink occasionally, or leave it alone as the situation dictates, are neither chronic alcoholics nor pathological drinkers. Their controlled drinking doesn't interfere with their business or profession, nor are their family relationships affected.

THE END OF THE ROAD

The chronic alcoholic allows his drinking to become a detriment. He loses control of himself and becomes a medical problem. As fewer of his plans and hopes are realized he seeks further solace in alcohol. He becomes an escapist, often a pathological liar. He loses the respect

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The views and opinions expressed herein do not necessarily represent those of the Department of Defense, The Surgeon General, the Department of the Army, or of the U. S. Army Aviation School.—The Editor

of associates, and can no longer respect himself.

In the final stages he evidences degenerate characteristics, as well as an unsound personality. His capacity for work decreases, incompatibility wrecks his domestic relationships, and jealousy towards his associates cripples his sense of responsibility and initiative. He is tortured by feelings of persecution.

TODDY FOR THE BODY

As little as three ounces of whiskey will adversely affect quick and precise muscular coordination. Judgment degenerates; skillful work and thought flow are decelerated. The effect of alcohol on the blood stream and central nervous system is long-lasting. Traces of alcohol will be present as late as 8 hours after the last drink. In extreme cases of drunkenness, alcohol and its effects will be present for as long as 24 hours. For this reason airplanes and drinkers do not get along well. There are times when pilots wish they could live over the night before, wish they hadn't had that "hair." Slow coordination, slow thinking, and over-all inefficiency in sudden bad weather or in difficult formation flying are harmful to safe flying and a happy landing.

If "the morning after" is to include flying, the pilot should not imbibe. When last night's party-boy becomes today's pilot he is often unable to exert reasonably safe control of his aircraft because of throbbing headache, visual impairment, reduced concentration power, and lack of muscular coordination.

TREATS AND TREATMENTS

In our daily work we strive for relaxation wherever and whenever possible. Millions of us relieve the pressure with small doses of prussic acid, carbon monoxide gases, toxic furfural agents, cellulose and resins, sugars, and a camphor-like drug called nicotine. These are the principal ingredients of the "weed" or "coffin nail," or just plain cigarette.

Tobacco may well be the most widely used drug in modern life. Americans are so addicted that more than 409,000,000,000 cigarettes were consumed in the United States during 1957! Tobacco's moderate use in pipes, cigars, or cigarettes produces a soothing, relaxing effect. However, excessive smoking, or tobacco dissipation, particularly following periods of overwork, strain, or loss of sleep is definitely harmful.

ON THE JOB DISSIPATION

As usually occurs in instances of immoderation, heavy smoking reduces the over-all efficiency of the smoker. The effects of this dissipation can be serious to flyers. Most pilots do not realize that tobacco affects vision like alcohol does. Nor do many of them know that tobacco reduces altitude tolerance by lessening the supply of oxygen while at the same time increasing the rate of oxygen use.

THE GAS PIPE

No one would knowingly inhale exhaust fumes; yet, carbon monoxide gases from incompletely burned tobacco are identical to engine exhausts. Incomplete

tobacco combustion causes small amounts of carbon monoxide in the smoke. Whether you inhale or not, the blood stream absorbs the gas in place of oxygen. The fact that your blood actually *prefers* carbon monoxide to oxygen (and absorbs it 210 times as readily) makes things worse. If you inhale when you smoke, you simply facilitate absorption of carbon monoxide gases. When the blood stream approaches a point of carbon monoxide saturation, oxygen enters the blood stream only with considerable difficulty. If you are a heavy smoker you may have a saturation point as high as 10%. Only 3% saturation will cause measurable impairment of functions, such as vision and altitude tolerance.

CHAIN SMOKERS

If you chain smoke or smoke heavily and steadily, your blood may have enough carbon monoxide that your body will react when flying at 10,000 feet as it should at an altitude of 14,000 or 16,000. Your vision will be correspondingly affected.

Once in the blood stream, carbon monoxide leaves very slowly. About half the gas will be present at the end of 6 hours, and there may still be some present at the end of 24 hours. Chain-smoking pilots, therefore, represent a certain flaw to efficient, fail-safe flying, particularly on night flights.

NICOTINE

Nicotine, the second poisoning in tobacco, does not burn. It is absorbed directly through the mucous membranes of the mouth and through the linings of the lungs. The smoke of each cigarette contains an average of 6.8 mg. nicotine of which 3 or 4 mg. are absorbed from puffing. Nicotine raises the oxygen requirement by 10 to 15 percent. It increases nervous instability, tires the mental processes, reduces the power of concentration, and fosters muscular incoordination. Nicotine reduces a flyer's night vision and unbalances his depth perception. Smoldering cigarettes also produce ammonia which irritates the eyes.

CANCER

As yet, it is not definite that smoking can or does cause cancer. The Surgeon General of the United States Public Health Service has said: "The Public Health Service *feels* the weight of evidence is increasingly pointing in one direction: that excessive smoking is *one* of the causative factors in lung cancer." Across the world, the Medical Research Council in Great Britain (the British counterpart to the U. S. Public Health Service) has cited the cigarette and lung cancer relationship as, "one of direct cause and effect." As a cautionary measure they have distributed posters warning the public of cigarette smoking dangers.

By and large, these are unproven claims. For every medical authority who maintains that smoking causes cancer, there is another, equally as authoritative and respected in the profession, who maintains that it does not. Both proponents hold impressive facts and figures to bolster their stand. These conflicting opin-

ions have had their effect on the smoking public. Some smokers have stopped entirely; others have switched to filtertip brands. Most of us have adopted a wait-and-see attitude.

PUZZLER

YOU HAVE PLANNED a flight in a Sioux from point A to point B and return. The two stations are approximately 2,250 feet above sea level and about 50 miles apart. Your commanding officer desires that you pick up a maximum load at point B and return it to point A. He also desires that you notify him at least 45 minutes in advance as to the weight you can return from point B. The landing areas are open.

Indicate by a √ the solution or solutions which you think would best fit the situation.

A good way of determining this load to be carried from point B is:

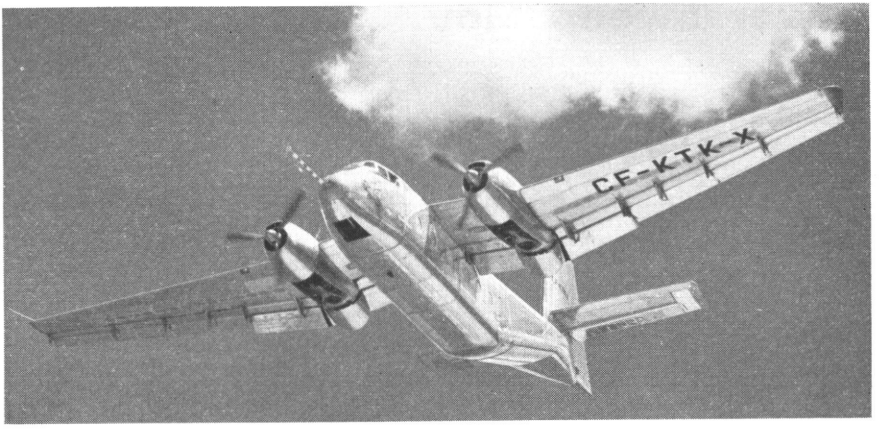
☐ **Tell him you can carry a maximum gross weight of 2,500 pounds and that he can load on approximately 650 pounds, which will put the aircraft at maximum gross weight.**

☐ **Pick the helicopter up to a hover and see how many inches of manifold pressure it takes to hover. Then see how many inches of manifold pressure can be pulled on the helicopter. From this information you compute a rough estimate of the load you will be able to return.**

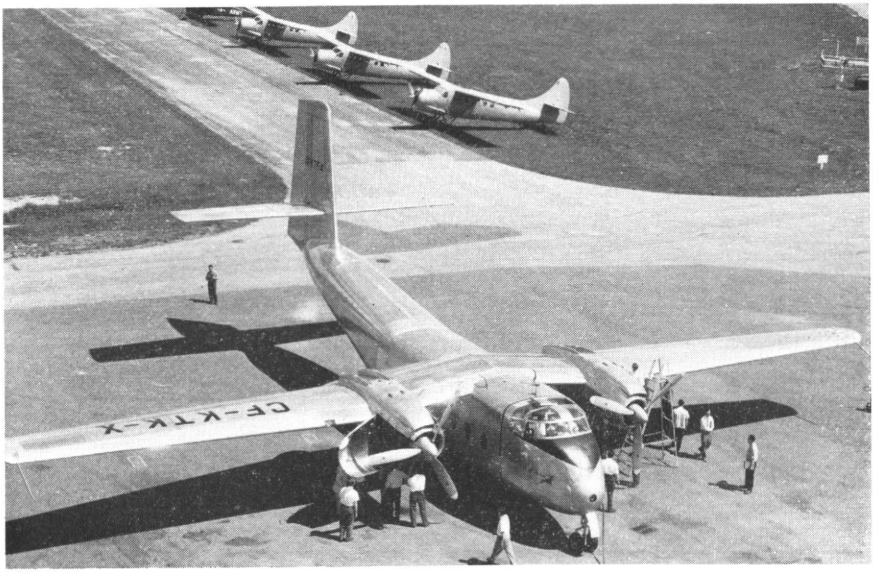
☐ **Tell the commanding officer it is impossible to give him an exact figure and that you will just have to make a rough guess.**

The recommended solution to the PUZZLER may be found on page 32.

Army's Caribou Flies



Designed primarily for short field takeoffs and landings, the all-weather Caribou (shown above and below) can cruise at 159 knots, using 51 percent of takeoff power. The ability to climb out on one engine with takeoff flap and landing gear extended, coupled with automatic propeller feathering, adds to the safety of operation. Stalling speed of the Caribou (flaps landing) is 52 knots. With a maximum range of 1,170 nm and service ceiling 24,900 feet (single engine, 10,500), the Caribou is expected to add considerably to Army Aviation's capability in the combat zone.



Maintenance Hints

Never Sweep Sioux Blades Forward

When Sioux main rotor blades are lined up at the factory or in the field in accordance with paragraph 7-18, TO 1H-13C-2, the center of pressure pins in the blades are lined up on the pitch change or feathering axis. This is referred to as the "no sweep" position. If, during initial check flights, a nudging or erratic feedback force is present in the cyclic stick (boost off), it is permissible to sweep both blades aft up to a maximum of five flats of the drag brace hex nut, as described in paragraph 7-28 of the TO.

The center of pressure must always be on or aft of the pitch change axis. This is because of the effects produced by gusts striking the rotor blades. Gusts effectively increase the angle of attack of the rotor blades and, thereby, increase the lift force. This change in lift force acts at the center of pressure of the blade and will bend the blade up. If the center of pressure is on the pitch change axis, there is no tendency for the blade to rotate about this axis due to the increased airload. If the center of pressure is aft of the pitch change axis, the increase in lift force tends to tip the blade nose down, decreasing the angle of attack and dampening the effect of the gust.

With the main rotor blades swept forward, the center of pressure lies ahead of the pitch change axis. In this case, as the gust lifts the blade, it also produces a nose-up tendency about this axis. This increases the angle of attack of the blade and produces still more lift. This amplification of the initial disturbance produces rotor instability, also called weaving. In severe cases, this can result in an uncontrollable rotor.

The most effective cure for this trouble is summed up in three words. *Don't sweep forward.* (Bell Helicopter ROTOR BREEZE)

Many are the words that have been spoken and written about loose articles in aircraft — usually after accident investigations.

An Army Aviator was performing a ferry mission, leading a flight of three Sioux. The temperature was in the nineties and the left doors of the three aircraft had been removed and stored in the right seats, properly secured.

During the flight, the lead aviator placed his map on the seat to his right. Wind, rushing through the open left side, caught the map and blew it about the cabin. The aviator attempted to retrieve the map, but was unable to accomplish this and retain control of the helicopter.

Realizing his responsibility for navigation and fearing the map might blow through the open door, the aviator elected to land in a clearing beside the highway ahead. No obstacles were apparent, and he began a straight approach, into the wind.

When approximately 40 feet from the ground, at an airspeed of 50 knots, the aviator saw wires across the selected landing area. He attempted to turn and climb immediately, but the aircraft's forward speed carried it into the wires. After turning the helicopter 180°, the wires snapped and wrapped around the aviator's head. He went into autorotation at an altitude of 65 feet, with zero airspeed, recovered with power and completed the landing.

The other two aviators landed immediately and administered first aid for minor wire and electrical burns suffered by the pilot.

Loose articles can take many forms. In a recent Choctaw incident, a ball cap was blown from the copilot's head into the tail rotor. A metal paratrooper

Sioux scalped by wire

Bird Dog Classic—V

AND REVELRY SWELLED OVER the green, for this was a time of great joy. Brightly colored silks swirled from the masts of every knight in the kingdom. Nobles and ladies, dandies and damsels, all pressed to the arena edge and shouted acclaim for each event in the Tournament of Knights.

The last jousting bout ended with the clanging fall of an unseated warrior. Trumpeters raised their horns and blew a mighty flourish. An expectant quiet fell over the crowd and the Tourney Master called out: "Knights of His Majesty's Bird Dog Brigade, mount for the Landings of Barrier!"

From the stables there came an angry noise as a covey of mighty Birds trundled forth and roared into the air. They formed an aerial pattern above the trees, following one behind the other.

Sir Stauling Bhounce, last to win his spurs in this elite group, eagerly peered down at the crowded turf and focused on the silken target panel beside the barrier. At the proper moment, he choked the noise from the Dog and gentled it downward. And when the panel had come to rest atop the barrier, Sir Stauling eased the controlling stick back and spurred the beast lightly to hold his target in place. All was well, and the good knight burned with pride at this chance to demonstrate his prowess before the king.

But hold! Could it be the panel had risen? Quickly, Sir Stauling pulled the spur, stared

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emblem from the cap was left embedded in one of the blades.

Loose articles, whatever their form, are potential hazards to flight. Blowing about the cockpit, they distract the pilot; rolling around, or carelessly stored, they jam controls; in an emergency, they can become deadly missiles, capable of serious or fatal injuries.

Think of this the next time you find control locks, chocks, pitot covers with wooden handles, mooring kits, fire extinguishers in loose brackets, or any one of a thousand other such items in the aircraft you're about to fly. Think of it when your passenger arrives bearing a load of baggage and parcels, and think of it when you're loading cargo. Make it a part of your preflight to ensure that every article is correctly stored and secured.

The Gray Hair Department is prepared by the U. S. Army Board for Aviation Accident Research with information from its files. 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.

FLYING LESSON

It's a perfect fall day, ceiling and visibility unlimited. A light wind is blowing straight up the runway; it's a wonderful day for flying. In fact, you feel so good

anxiously at the panel, and then sighed with relief when it began to sink again to the barrier.

The capricious god of the winds then dealt an evil blow. A gentle breeze, which wafted across the green, suddenly increased to a velocity that left the knight staring at the panel from below the barrier. No thought of aborting entered Sir Stauling's head as he reared the Dog's nose heavenward, thinking to climb above the barrier.

Alas, such was not to be. The Bird Dog struggled mightily, then lost its will and dropped toward the sod. Too late, the knight sank home the spur. When the craft struck, its noisy roar was heard above the crowd.

Both forelegs collapsed and the Dog's nose ploughed into the turf, showering divots all about. Its wings folded downward and hid the knight from view. Mortally wounded, the Bird bounded upward, issued a last gasp, turned aside and crumpled to the earth. And a great silence came upon that place.

The gray beards were called forth. They measured the marks of the sod and regarded the broken Dog. And when they were finished, they trooped around the silent knight.

The eldest spake harshly, "Knowest thou not thy craft will cease to fly in such an attitude?

"Has thou not been instructed in the ways of thy angle of attack?

"Is the spur of such dreaded use that it should remain idle at such a time?

"Woe unto him whose foolish pride doth prevent a going again around!"

And while the sorrowing knight hung his head, the gray beards hurried back to their cups. For they were very wise.

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about it you'd like to share the thrill of piloting an aircraft with someone less fortunate. How about the serviceman in the back seat? You're not an instructor pilot and he has never flown, but you've been out of flying school for a year and have over 500 hours flying time. You have every confidence that you can take over if it becomes necessary.

The Army Aviator taxied the Bird Dog into the grass and performed his engine runup. He explained the takeoff procedure to the man in the back seat and told him he would follow through lightly on the controls. The aviator taxied to the runway and gave control to his passenger. The novice "student" applied approximately half throttle and the aircraft began to roll. The tail began to rise, so the aviator advanced the front throttle to the full open position. The Bird Dog rolled approximately 600 feet down the runway and began

An unauthorized flying lesson

veering to the left. The aviator attempted to take corrective action, but the passenger had panicked and frozen at the controls. The aircraft continued off the runway and came to rest against some trees 165 feet away. The left main landing gear was torn from the aircraft a short distance before it contacted the trees.

Flight instructing ability does not result from learning to fly. It is an entirely separate field and an aviator must have specialized training to develop into a competent flight instructor. Very few flight instructors allow their students to practice takeoffs on the first dual flight.

Next time *you're* tempted in this manner, try reading AR 95-5, para 20.

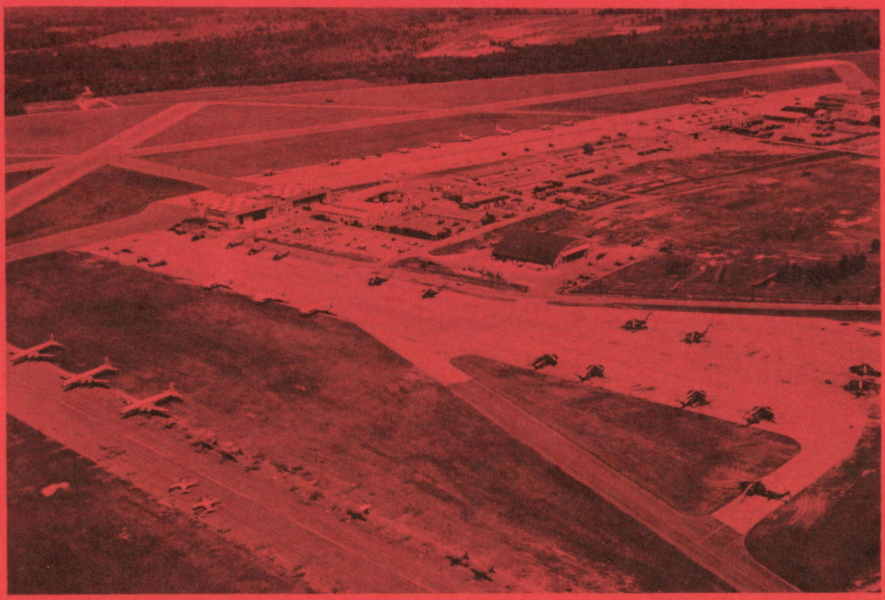
Solution to PUZZLER

On the basis of the factual information contained in the PUZZLER on page 26, the recommended solution is as follows:

Pick the helicopter up to a hover and see how many inches of manifold pressure it takes to hover. Then see how many inches of manifold pressure can be pulled on the helicopter. From this information you compute a rough estimate of the load you will be able to return.

Appendix III, TM 1-260, para 2b (4) states: "The difference in manifold pressure changed into weight (1 inch of manifold pressure equals 80 pounds) gives the approximate additional payload which can be carried to lift to a hover for a safe takeoff."

NOTE: *You are encouraged to submit comments to the Editor-in-Chief of the U. S. ARMY AVIATION DIGEST on the contents of the problem or on any of the material appearing in the magazine.*



Another view (above) of Lawson U. S. Army Airfield that illustrates the variety of aircraft using this facility. Flight Operations (below) and Flight Dispatch are among the busiest in Third Army.

LAWSON U. S. ARMY AIRFIELD

Serving the U. S. Army Infantry Center and the U. S. Army Infantry School, Lawson U. S. Army Airfield is the home of the 3rd Trans Bn, 1st Army Avn Co, 4th Trans Co (Med Hcptr, Mojave), and 31st Trans Co (Lt Hcptr, Choctaw). Maintenance units are 3rd Army TFM, 138th FM and 152nd FM. One runway (32-14) is 7,200 feet long, with 1,000 feet overrun; the north/south strip is 5,000 feet. Not many Army airfields can offer transient billets a short five-minute walk from where the aviator lands. In addition Lawson also maintains a 24-hour transient mess.

Called the "Aviation Crossroads of the Army," Lawson justly deserves the title, as the free world beats a path to the Infantry Center for the latest information on the job of the ground soldier in the Pentomic Army. As the Infantry Center's "front door," Lawson sees more transient aircraft from the far corners than most Army airfields.