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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.

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COVER

The 13th Helicopter Company and the 51st Signal Battalion are shown working together to set up an electrical powerline in Korea. The line extends from Camp Red Cloud, I Corps (GP) Headquarters to a relay site situated on a hill overlooking the position. The Shawnee first airlifted the men to the site, then returned later with telephone poles, which they "placed" into prepared holes. The entire operation was accomplished within one hour.

NOTES FROM THE PENTAGON

Aviation Company Field Training Exercise

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

THE PROOF OF THE PUDDING is in the eating; the proof of training is success in combat. We cannot "prove our pudding" in normal times by drumming up a war just to see how we'd do. We must therefore spend a proper portion of our time in tests, maneuvers, and exercises to train for the eventuality of combat. This means to develop and prove new concepts of organization, doctrine, techniques and procedures.

The Field Training Exercise occupies a unique position in this system, for it constitutes an invaluable aid in determining the combat effectiveness of commanders, staffs, and operating personnel. Moreover, the FTX properly and imaginatively conducted is *good fun,* assuming of course that it doesn't rain.

It is a common error to assume the FTX is the climax of both individual and small unit or section training; in other words, to assume that a high state of individual and small unit training *must* be achieved as a prerequisite to an exercise involving the whole outfit. This is not so. Individual and specialist training will get its greatest impetus through the field exercise which demonstrates plainly the *requirement* for the more basic stuff, and exposes the ever-present weaknesses. The FTX is a good vehicle to permit a commander to appraise the combat effectiveness of the unit, and this can be done profitably at almost any stage of training.

The newly reorganized infantry, armored and airborne divisions reflect that Army Aviation has come into the limelight as a principal means of affording division commanders the necessary mobility and control to cope with situations arising on the atomic battlefield. We in Army Aviation must be constantly aware of our new and greater responsibilities, be quick to grasp new ideas, and be objective in our evaluation of new doctrine. This is equally applicable to the proposed corps and fixed- and rotary-wing companies. Required, then, is intensive training of every individual to fit the requirement, as well as repeated tests of the composite organization.

Division aviation will no longer be satellited on some other unit for administrative or logistical support. As commander of a division, corps, army or separate aviation company, you are on your own, and you stand or fall on its performance as a whole, whether it be communications, unit administration, motor maintenance, or those tasks with which we are accustomed i.e.,

aircraft maintenance, supply, and tactical flying. The FTX presents a perfect training vehicle for use in developing those operational techniques essential to the successful support of division, corps, or field army in combat.

An aviation company FTX requires planning if it is to be of any real value. The initial stages of planning require careful coordination with the general and special staff of the division, corps and army. G3 should assist in drawing up a tactical situation; G2 will probably jump at the chance to exploit his intelligence training and check security while in the field. G4 will assist in portraying realistic logistics problems. In most cases, aircraft maintenance and supply problems will need no exercise embellishment. The assistance of the Signal Officer will be invaluable.

Be sure to develop a scenario that applies sound tactical principles, realistic time and space factors, and missions and tasks that normally will be expected of the company. Occasionally you may join forces with a combat command, battle group, or artillery battalion for part or all of the exercise. This will assist in providing realism in addition to furnishing "live" missions for your pilots.

From time to time feed new information into the situation. Otherwise, things will go stale. On the other hand, don't overplay the "mock" situation to such an extent that missions cannot be accomplished and everybody bogs down in a welter of messages.

Provide time to correct obvious errors during the course of the problem. Particularly in the first FTX conducted, it is important that procedures and techniques be meticulously corrected or errors will be compounded and may never be straightened out. Take time for critiques at various stages of the exercise to make on-the-spot corrections and evaluation of the action to that point.

The success or failure of Army Aviation depends upon flight operations. Utilize the FTX to provide various types of tactical flying, training of observers, selection of strips, camouflage and concealment of aircraft, and night field strip operations. Require good briefing and de-briefing of pilots and observers. In the absence of aggressor troops, use maximum ingenuity (Division G2, G3 and G4 can help greatly) in assignment of missions, so that aircraft are not just boring holes in the air. When possible coordinate with other units in the field to provide reconnaissance and observation targets.

The final phase of every training exercise is the critique. This is the opportunity to analyze each segment of the company's performance. Review procedures and techniques, and profit from mistakes; review unit SOPs and improve them where applicable. Throughout the critique two questions are of paramount and continuing importance: first, "Did we accomplish our mission?" and second, "Could we have done it better—if so, how?"

As Others See Us—

CALL AND HAUL

Sandy A. F. MacDonald

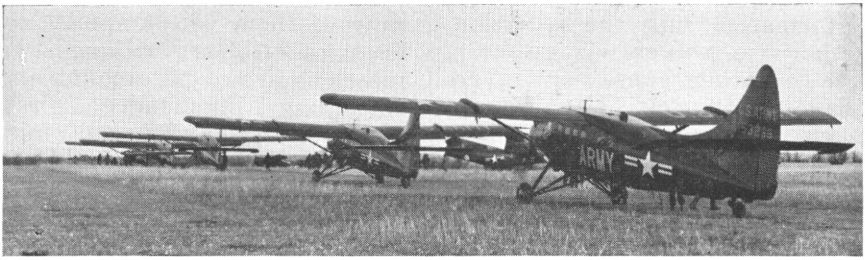
Streamlined to meet the threat of Atomic War, the new "Pentomic" Infantry Divisions have taken to the air. STOL aircraft and helicopters, working as a team, lend flying speed to infantry assault forces in the new U. S. Army concept of rapid mobile striking power. The "airborne truck" is fast becoming the logical successor to the lumbering motor lorry on the ground.

OUT OF THE sullen silence immediately preceding dawn, the lights of jeeps and lorries flash as they move up and down between the lines of Otter U1As parked row upon orderly row in the darkened parking area of the 2nd Aviation Company at Marshall Field. The wind-chill associated with a stiff northwest breeze sends the mercury plunging down to the –10° level. The voices of men out on the field are muffled by parka hoods drawn tightly over their heads for protection against the bitter cold. As the first grey light of dawn appears in the eastern sky, cold soaked engines commence to fire, cough and sputter as one by one they churn into life along the 2nd Company's Otter lines.

Soon the rich baritone voices of the P&W 1340 Wasps are united in a chorus of rising crescendo sound as they warm up to operational rpm for the fast moving sequence of events which lies immediately ahead.

On the Move: The light of day is just beginning to diffuse across a cold cloudless winter sky as the Company Commander's Otter taxies out from the end of one of the lines, followed in rapid succession by the 16 others who are taking part in operation "Call and Haul."

Otters of Operation Trade Wind



Off-Loading Troops to the Shawnee

The scene is Fort Riley, Kansas, whose spacious 6000 acres of rolling range land surrounds the military headquarters and entire peacetime establishment of the First U. S. Infantry Division — the "fighting Big Red One." Marshall Army Air Field, the airport located within the boundaries of the Fort Riley Reservation, is a training center for U. S. Army Aviation. Here the 2nd and 3rd Otter Companies and 33rd Helicopter Company have been assembled—in actual fact, for tactical training before proceeding overseas — at the moment, theoretically, to airlift combat assault troops into a battle area occupied by an enemy reinforced rifle battalion which must at all costs be dislodged.

The situation: America is at war with an enemy aggressor who has hit the key cities of the U. S. with an atomic bomb attack and succeeded in air landing an army in the heart of the continent. The enemy is in possession of the Fort Riley, Kansas area. The First Division has been pushed back north into Montana. Exercise "Red Arrow," staged in January, 1957 (in which 85,000 troops took part) was to test the ability of Air Force transport planes to airlift a counter-attacking task force a distance of almost 1,000 miles — and the capabilities of STOL and VTOL aircraft in moving this force from the airfields which C-119s and C-123s could use into front line battle positions.

Battalion Airlift: During this exercise, U-1A Otters, carrying fully equipped assault troops for the first time, airlifted a complete battalion combat team deep into enemy territory. The troops literally "hit the ground fighting." Operation "Call and Haul," which we are about to witness, has been organized to further test the ability of Army aircraft

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Reprinted by permission of the Editor, AIRCRAFT, Canada's Aero Trade Magazine, and the author, Sandy A. F. MacDonald. Mr. MacDonald is a veteran pilot with over 5,000 hours flying experience in fifty-three different types of aircraft. He has published over half a million words on aviation subjects in more than a score of magazines in Canada, the U. S. A. and England. A member of the Institute of Aeronautical Sciences, Mr. MacDonald is now Public Relations Manager for de Havilland Aircraft of Canada, Limited. Views expressed in this article are the author's and are not necessarily those of the United States Army Aviation School or of the Department of the Army.—The Editor

Mortars and Recoilless Airborne

to provide immediate airborne support in a situation requiring instant action on short notice. The object is to vertically envelop an enemy force by air landing assault troops around the perimeter of the area which the enemy is holding.

Taking off from Marshall Field, the Otters of the 2nd Aviation Company assemble 15 minutes later at Herrington Airport, which has been chosen to simulate a hastily occupied wartime airfield. Within the next hour, convoys of trucks bearing half frozen combat troops of the 16th Infantry Regiment commence to arrive. The men are transferred immediately to the warm comfortable cabins of the waiting planes. Otter tactical transport loads add up to a crew of two, nine fully equipped combat troops, and a thousand pounds more or less of equipment or supplies.

The scene now shifts to Custer Hill, a site approximately 35 miles from Herrington. Here an advance party has landed and selected a temporary landing strip. The pathfinder Otter—an APU supplying the ground battery energy to the aircraft radio set—has been converted into a temporary air traffic control center. Vertol H-21 helicopters of the 33rd Helicopter Company at Marshall Field commence to appear on the scene for their rendezvous with the Otters. Like giant hovering hawks, they settle down in the long dead grass of the frozen hilltop alongside the selected landing strip.

In the Army, a flight of aircraft is called a "Platoon." The first platoon of five Otters, flying in V formation, approaches via the "corridor" which has been selected for traffic inbound to the strip. Approaching the field, they change formation into line astern. A flagman, similar to the familiar batman on navy carrier craft, marshals the Otters, one after another in quick succession, down onto the landing strip. Continuing their landing roll to the marker at the end of the strip, the Otters execute a 180, and, single file like a column of motor transports on the ground, taxi back to the off-loading area. Here they come to a full stop. Troops scramble out and hurry across to the waiting helicopters which will ferry them into their battle action stations. The Otters move off rapidly, do a 180 at the top end of the strip, and are heading back to Herrington for another load, all in less time than it takes to write this down.

Shuttle Service: Custer Hill becomes a throbbing center of intense air activity as Otters and helicopters, working with clock-like regularity, set up a two-stage shuttle service between base and battle areas. In an 80 minute period, five platoons of Otters succeed in transporting 305 fully equipped combat troops a distance of 35 miles—plus a substantial quantity of recoilless rifles and mortars.

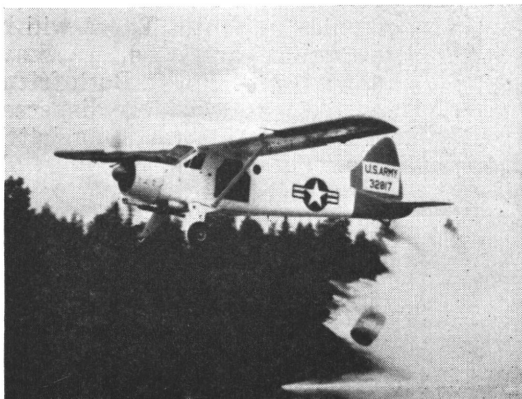
At one three zero zero hours a Mayday signal requesting ammunition and supplies is received at AHQ. The urgency of the situation dictates the selection of a tiny field in a forward battle area as the Otter-over-to-helicopter load transfer point. Ten Otters in two platoons shuttle 20 tons of ammunition and supplies into this improvised airstrip in a 45 minute period. Here it is picked up by the H-21s for delivery direct to the battlefield forwarding address of the attacking U. S. Infantry.

What you have been witnessing is a whole new concept of military strategy in war. A complete change in both the organization and tactical training of the American Army has been dictated by the threat of atomic bomb attack. Because of the risk of thermonuclear annihilation, it is no longer considered prudent to concentrate large bodies of ground forces within a small area. The new doctrine which governs the use of military land forces in war is based upon the development of small, widely dispersed units, capable of tremendous high-speed mobility, and lightning action. To this end, the Army has been streamlined. The new "Pentomic" Divisions have been broken down into smaller, but more numerous, units capable of greatly energized action — not entirely unlike the idea of splitting the atom.

Mobility: The increase in mobility that was written into the new Army manuals was far more revolutionary in character than the slim, tailor-made "new look" that decreed such drastic numerical reductions in Divisional unit strength. "Mobility" as it was spelled out in the new modus operandi meant taking the G. I. off the roads—where 40 mph transports are lucky if they can average 25 miles a day through quagmire mud and gaping enemy shell holes—and getting him airborne at speeds of 100 miles an hour and up.

To make possible the Army plan of moving infantry into battle by air, it was necessary to find a revolutionary type of airplane that could operate from a battlefield. The helicopter was—and still is—the only type of aircraft capable of meeting this requirement. In the light of practical experience, however, it was found necessary to supplement the helicopter with some other type of aircraft that could carry bigger loads a greater distance at less cost—one having simpler flying characteristics for all-weather operation—and requiring less maintenance manhours in the field. Since it was necessary for this co-operational machine to be able to land in short, unprepared fields, the STOL aircraft was the logical choice. Thus it came about that the de Havilland U-1A Otter and the Vertol H-21 helicopter were making

Filler Caps Right Side Up!



their appearance as a team in Operation "Call and Haul" — a two-stage tactical transport operation in which the Otters moved the men and supplies to the farthest forward patch of ground it was possible for them to land in, from which point the H-21s hauled the loads the balance of the way to the actual battle locations.

Because of the devastating possibilities of nuclear warfare, the battlefields of the atomic age will be vast areas, hundreds of miles in depth. There will be no "front line" as we have known it in the past. Both friend and foe will be widely dispersed throughout this far-flung battle zone. The scenes we just observed will be re-enacted day in and day out on a colossal scale. How colossal may perhaps be presaged by the fact that to move the U. S. Army in World War II required one and a half million motor vehicles.

To further this new concept of tactical transportation by air, the United States Army is spending vast sums of money in aeronautical research. Some of this money is going into development programs designed to encourage further improvements in the existing helicopter. Some of it is being channelled into aero-dynamic research intended to stimulate further development of STOL airplane design. Still further grants are finding their way into design projects shooting at the development of the "tilt-wing" airplane, an attempt to combine the most useful features of both the fixed and rotary wing types.

One Beaver Evacuated 200 Wounded in Three Weeks

The rapid expansion of its formidable fleet of airplanes by the U. S. Army has brought accusations of an attempt to set up a competitive Air Force of its own. This is emphatically contradicted by Army leaders, notably Major General Howze, Chief of Army Aviation. The Army's proprietary interest in aircraft, it is pointed out, is entirely "organic." By organic is meant assigned to, and forming an essential part of a military organization. The organic airplane is nothing more nor less than a vehicle. Like any other vehicle, the jeep, the truck, or for that matter, a ferry boat, its purpose in the Army scheme of things is to facilitate the movement of ground forces and their supplies — and for observation. It has been pointed out by Brigadier General Bunker, Chief Transportation Supply and Maintenance Command, that the Army's airplanes do not represent a new Air Force any more than Army tugs and harbor boats represent a new Navy.

In its role of a "flying boxcar," the airplane has introduced a revolutionary new factor of speed in the deployment of military forces on land. During the latter stages of the Korean War, an operation called "Teenie Weenie Air Transport" was carried out by 50 Beaver L-20s of the U. S. Army. This operation provided one of the first examples of rapid mobility in modern war by the use of STOL airplanes as flying trucks. Using blocked off sections of gravel road for landing strips, the Beavers transported an entire regiment of troops a distance of 50 miles in a matter of four hours. The airlift was across a range of mountains from one valley to another that would have taken Army trucks three whole days to traverse.

Another Korean War case may be cited as a typical example of the organic use of aircraft by other branches of the service. An Army Beaver, operating single-handed out of rough makeshift patches of ground in a bitterly contested sector of the 1952 battlefront, succeeded in a three week period in evacuating 200 casualties out of the forward battle area.

Airplanes are as much an integral part of the U. S. Army organization as any other item of equipment. Their utilization by the various branches of the Army may be broadly summarized as follows:

By Headquarters: For the rapid movement of commanders within battle areas and between various units under their command.

By the Infantry: To facilitate the transportation of troops and critical supplies. For reconnaissance.

By Signal: For wire laying and courier services.

By Ordnance: For the transportation of logistical supplies.

By the Medical Corps: For the evacuation of casualties and for the limited transportation of medical supplies.

In the Korean conflict the Beaver earned an enviable reputation as a command plane. Popularly referred to as the "Generals' Jeep" it was used by Generals Ridgway, Van Fleet and Mark Clark.

A typical example of the use of organic aircraft by a techni-

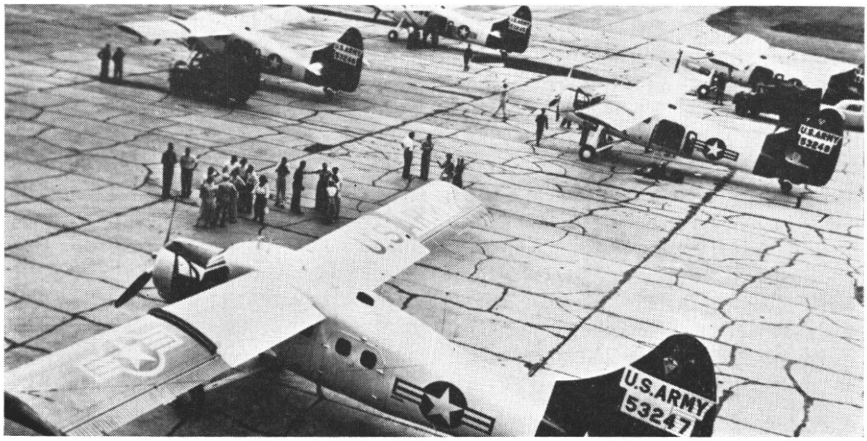
cal branch of the Army was the survey operation undertaken by the 30th Engineer Group in Alaska in 1955. This covered an area of roughly 86,000 square miles. In this operation helicopters were used to drop surveyors at control points whose locations ranged from tiny patches of tundra to dizzy crags and ledges at 8000-foot elevations in the mountains. Other than at the main bases at Umiat and Kotzebue, no landing strips existed anywhere in the area. Beavers and Otters, operating on floats and skis, were used to fly supplies into the base camps which were established, and also out to temporary rendezvous with the helicopters in the field. Time was an important factor in this undertaking. Typical of the terrific tempo which characterized the entire operation was the transfer of 80,000 lbs. of equipment from one base to another by six Otters in one night.

The unique advantage of STOL and VTOL aircraft to the Army were proven day in and day out throughout this entire operation. When open water began to appear around the shorelines of some of the frozen lakes on which supplies were being landed, Beaver and Otter skiplanes made landings on the ice pans which were left floating in the center. The supplies were then transferred ashore by canoes flown in aboard the aircraft.

"Operation Trade Wind" was another outstanding topographical survey operation that was undertaken by U. S. Army Engineers. Somewhat similar in concept to the mission completed in Alaska, the completion of the project will benefit some 15 republics in Central and South America.

Army people have a deep rooted love of tradition and a tendency to liken new things to the old familiar objects which they supersede. A G. I. will tell you that the helicopter is just the old proverbial Army mule with a windmill fastened on between his ears. "And," he will add with a deep sigh of satisfaction, "with a lot less 'ornery' disposition — and a cleaner pair of heels."

Mobility in Simulated Battle



Accident Fact Finding

NO SINGLE EFFORT in any direction can contribute more effectively to the Army Aviation safety program than the proper investigation and advertisement of an aircraft accident. It may prevent the waste of future millions in property; it may safeguard the lives of hundreds of young men.

Investigating the cause of an aircraft accident may seem a simple task. We determine the reason for things every day, directly and almost without thinking. Let one of us wake up with a hangover, for instance, and we don't split hairs over a cause. We groan, clutch our forehead and swear never again.

ACCIDENT FACT FINDING was prepared by the staff of the U. S. ARMY AVIATION DIGEST with information furnished by Department of Fixed Wing Training, the U. S. Army Aviation School and U. S. Army Board for Aviation Accident Research. Views expressed in this article are not necessarily those of the U. S. Army Aviation School or of the Department of the Army.

CAUSE OBSCURE

This is simple cause and effect, nothing difficult to determine and no need for a complicated investigation. Determining the cause of an aircraft accident isn't so simple.

The crash of an airplane may be the end result of a series of simple acts. No single act may be harmful in itself or lead inevitably to the next one, but each may create a climate, or set the stage, for the next act leading to final tragedy.

Take the pilot of a Seminole flying IFR westbound at 10,000 feet. He forgets to call over a compulsory reporting point, and at the next point, Air Route Traffic Control gives him a growl. He is incensed. Too much positive control, he may feel—after all, he is the Captain of his plane. In his state of preoccupation he may fail to check his altimeter and inadvertently descend to clip the wing of an eastbound DC3 cleared at 9,000. Far

fetched? Yes. But it illustrates the point.

RELEVANT FACTS

Because of complications and many variables, any investigator must first go after the objective facts preceding an accident. He must make certain that these facts are relevant, i.e., that they bear directly or indirectly on the accident. A young lieutenant flying a Bird Dog may ground loop while landing. His mother-in-law's visit is in its fifth week but this is irrelevant, at least, at this stage of the investigation.

Furthermore, the evidence — the facts — must be competent. The witness must be reasonably capable of giving accurate testimony. For it is clearly evident that an aviator qualified only in rotary wing, and just along for the ride in a T-37, is not the best witness to interview for a jet flame-out.

WITNESSES DIFFER

Worse yet, a competent witness may get involved in his own emotions and biases and fail to give accurate testimony. Few would deny that a senior aviator is competent to judge the distance between himself and another aircraft within a few hundred feet. But, if that aircraft flies past him while he is in the clouds on an IFR flight plan he may insist that it brushed his wing tips though actually several hundred feet away.

Sometimes when two people witness the same event, neither can agree on the details. The pilot may swear the near miss was a DC3, the copilot, a Martin 202. Don't dismiss all the testimony for one fact is definite: an aircraft flew close enough to cause concern. The investigator must determine its type from another source.

When men are momentarily terrified or feeling any other strong emotion, they rarely record accurately. On the other hand, if all had agreed, we'd have to accept the testimony in the absence of anything to the contrary.

BOARD JUDGES

The first task of the investigating board is to collect the objective facts. A witness should not be allowed to inject his own opinion or conclusion into testimony. To judge is a task for the board.

When an opinion of a witness is accepted as equal to factual testimony, it will color the final judgment, and the board may be accused of shirking its duty. A man may observe the collision of a Beaver and an Otter. He should be asked to describe the circumstances in detail. He should not be allowed to express opinion about the fault of either one. Just the facts are called for; the *opinion* must come from

the investigating board.

EVALUATING EVIDENCE

When all evidence is in, it should be reviewed to see which parts ring false. When two items of evidence seem to contradict one another or one piece of evidence casts doubt on another piece, someone must make a decision—or call for more evidence.

Having weighed the testimony and analyzed it, the board must line up the series of pertinent events prior to the accident. The big job is to determine the cause factors. One key to their discovery lies in the definition: Cause factors are those conditions which, if they had been corrected or changed, would have prevented the accident or minimized the extent of damage or degree of injury.

CAUSE FACTORS

Once we've found the cause factors, we can begin to look for other events that helped to shape them, or which may bear on them in some manner. Now is the time to find the inner reasons and to weigh the psychological and physiological aspects of the accident.

What happened inside the mind or to the physical condition of the pilot or copilot? Just why was this done or that ignored? These inner reasons will make up the interpretation and will be publicized to help prevent future accidents. Army Aviators will read them and resolve to avoid the same error.

To sum it all up, the investigator must piece together a number of objective facts about an accident, analyze them, isolate the cause factors, make a judgment, and write a report. In itself, the report may appear to be of little significance, but when it is placed beside a thousand similar reports, it may swell into a major contribution toward the prevention of future aircraft accidents.

CORRECTION

Portions of the sequence report in the November PUZZLER were unintentionally left out causing many readers to answer incorrectly the questions posed. The corrected sequence report should read:

TLH B5⦶8⊖11/4ZLF 999/3Ø/29↑↖4/987

Using the above sequence report, only two of the answers given last month could possibly be correct:

☐ **A temperature inversion exists at this station**

☐ **A cold front is approaching Tallahassee**

All other answers used in the solution to the PUZZLER were revised to show the correct terminology. Answer number two (above) is considered a possibility; however, the previous answer of "Indications are that a warm front is SW of Tallahassee," is more probable. There is also the possibility of an occlusion which further complicates our answer. What answer did you come up with? Drop a line to the Editor, U. S. ARMY AVIATION DIGEST and tell us why!

PUZZLER

YOU ARE a 3-3 pilot and scheduled to fly from Turner AFB (located in a control zone) VFR direct to the Laurel, Mississippi, Municipal Airport. Laurel is in an open area. The distance is 299 statute miles; true course is 272°; average variation is 4° east and the deviation is plus 4°. The wind at flight altitude is from 100° at 13 knots. You are flying a Beaver with three hours of fuel remaining at an estimated TAS of 100 mph. You elect to fly at an altitude of at least 3,000 feet above the surface. A senior explorer scout and a civilian employee of the Department of the Army have requested to accompany you on this flight.

Indicate by a √ the desirable or true statements. Consider each statement in its entirety.

- ☐ After having been cleared to the runup area, you note from the amount of traffic that there may be a considerable delay before you can take off. You decide to smoke a cigarette since you are positive that no gas fumes are present.
- ☐ To comply with fuel reserve requirements, it is not necessary to make a fuel stop on this flight.
- ☐ Since you are only a 3-3 pilot and the flight is in excess of 100 nautical miles, the clearing authority for this flight will have to be Flight Service.
- ☐ The civilian may be carried if he has proper identification showing he is an employee of the Department of the Army.
- ☐ The senior explorer scout may be carried if he is in uniform and has properly signed papers and authorizations as outlined in pertinent regulations.
- ☐ At least two position reports should be made to Flight Service en route.
- ☐ The minimum appropriate altitude for this flight is 3,500 feet.
- ☐ Prior to taking off, you studied the bulletin board in base operations and noted that the organizational commander had set up additional clearance requirements for his operations. You should know that you are not necessarily bound by these requirements.
- ☐ While en route you encounter unexpected conditions which indicate that your ETA will be exceeded by 35 minutes. It is mandatory for you to request that Flight Service be advised.
- ☐ In the immediate vicinity of Laurel you encounter unforecast weather with a ceiling of 900 feet and visibility of two miles. You would know that an ATC clearance is necessary for landing.
- ☐ Laurel Municipal Airport is a "PC" field. Because of this, you may properly elect to close your flight plan by calling Flight Service, collect.

References: AR 95-8, AR 96-20, and TM 11-2557, Vol. 1.

The correct solution to the PUZZLER may be found on page 29.

CAREFUL!

Top — Farther and Faster — Fig. 1

Tip Tornado Ahead

Marion J. Fortner

WITH AIRPORT TRAFFIC constantly increasing, an Army Aviator may possibly find himself flying next to a C-130 one day or a Mooney Mite the next. So it might be a good idea to discuss wingtip vortices — it could mean your life.

Today, an Army Aviator may find himself alone on a cow pasture on Monday or turning onto final behind a DC-7 at Chicago Midway later in the week. Take a medium-sized air terminal like Fresno, California, for instance. The Army aircraft that pass through this one airport may have to share final approach with a Tri-Pacer shooting touch-and-go landings, a trio of Sabre Jets simulating flame-outs or, perhaps, a B-52 practicing ILS approaches. Traffic can be heavy and the chances of stumbling into someone's vortex is not remote. Pilots should, therefore, become acquainted with this phenomenon.

Each month, the volume of airport traffic expands and the temptation to crowd that man in front grows more pressing. With this in mind, the U. S. Army Aviation Board, working with Air Force personnel at Eglin AFB, recently completed a test project on wingtip vortices. Some of the answers they found are included in this informal report. Douglas and Beech Aircraft Corporations supply much of the rest.

First, we'll define a wingtip vortex. This is necessary because the terms "jet blast," "prop blast," and "vortex" are sometimes used interchangeably but incorrectly. A wingtip vortex is a distinct phenomenon having nothing to do with the powerplant of an aircraft. Simply put, a wingtip vortex is a spinning corkscrew of air that extends rearward from the tips of the

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Marion J. Fortner is the United States Army Aviation Board Aeronautical Engineer. He is a graduate of the initial test group that led to the approval of organic Army Aviation for the field artillery in 1942. 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

wings of any moving airplane.

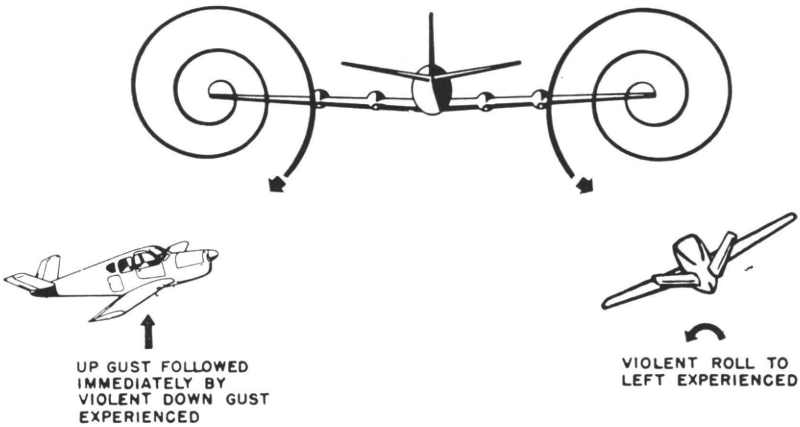
A wing is designed so (See fig. 1) the air travels farther and faster across the top than the bottom. This stretches out the air on top causing a pressure difference between the top and bottom, thus creating lift.

In the process of creating lift, the area of high pressure on the bottom of the wing attempts to force its way into the area of low pressure on top of the wing. Since it cannot go through the wing, it curls around the tips where it meets air moving across the top of the wing. As the wing "flies," the air curls up around each wingtip and down over the trailing edge to form twin corkscrews, or you might call them whirlpools of air—one from each tip. Each corkscrew of air fans out behind the wing itself, but the apex of its funnel remains constantly at the tip. Actually, almost every flier who has flown in formation has experienced wingtip vortices and compensated for it almost unconsciously.

If you were to fly into one of these spinning corkscrews of air behind a small, light aircraft, nothing much would happen except for a slight twitch of your airplane. But if you fly into one behind a large, heavy airplane with its huge vortex of air, you could get into real trouble — trouble enough to lose control of the airplane and, at the minimum, scare the daylights out of you.

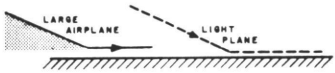
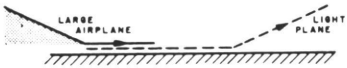
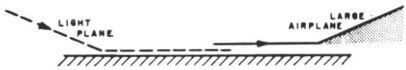
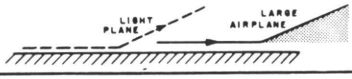
What will happen depends on how you approach the vortex. (See fig. 2.) Note how the air is curling back from the wingtips of the airplane. If you fly into one of thse vortices, you can expect some surprises. For example, in one test at Eglin, an Army QL-17 drone was flown at 1,000 feet altitude on a straight course. It was overtaken by an Air Force F-100 whose pilot flew his jet under the drone, streaked past, climbed to a position directly in front and continued on. On one occasion, the drone rolled 74° and yawed as much as 30°—this with an auto-

Figure 2

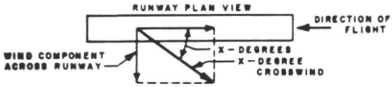


ROUGH RULES-OF-THUMB FOR "SAFE" SEPARATION TIMES FOR THE LANDING OR TAKE-OFF OF A LIGHT PLANE FOLLOWING THE LANDING OR TAKE-OFF OF A LARGE AIRPLANE

(REFERENCE: DOUGLAS REPORT SM-18647, DEC., 1954)

LARGE AIRPLANE	WIND CONDITION	REMARKS ABOUT "SAFE" SEPARATION TIME
LANDING	ANY	NORMAL SEPARATION TIME (ROUGHLY, 30 SECONDS) IF LIGHT PLANE OPERATES AS SHOWN IN THE FOLLOWING SKETCHES (SHADING INDICATES POSSIBLE DANGER): LIGHT PLANE LANDING: LIGHT PLANE SHOULD STAY WELL ABOVE THE FLIGHT PATH OF THE LARGE AIRPLANE AND SHOULD CONTACT THE RUNWAY WELL FORWARD OF THE CONTACT POSITION OF THE LARGE AIRPLANE.  LIGHT PLANE TAKING OFF: LIGHT PLANE SHOULD DELAY LIFT-OFF UNTIL WELL FORWARD OF THE CONTACT POSITION OF THE LARGE AIRPLANE. 
TAKING OFF	DIRECT CROSSWIND	NORMAL IF LIGHT PLANE OPERATES AS SHOWN IN THE FOLLOWING SKETCHES: LIGHT PLANE LANDING: LIGHT PLANE SHOULD CONTACT THE RUNWAY WELL TO THE REAR OF THE LIFT-OFF POSITION OF THE LARGE AIRPLANE.  LIGHT PLANE TAKING OFF: LIGHT PLANE SHOULD LIFT OFF WELL TO THE REAR OF THE LIFT-OFF POSITION OF THE LARGE AIRPLANE AND SHOULD STAY WELL ABOVE THE TAKE-OFF FLIGHT PATH OF THE LARGE AIRPLANE. 
	GENERAL CROSSWIND (EXCLUDING THE DIRECT CROSSWIND)	"SAFE" SEPARATION TIMES NOW DEPEND MAINLY UPON THE WIND COMPONENT ACROSS THE RUNWAY (SEE DEFINITION BELOW TABLE) AND THE CHARACTERISTICS OF THE LARGE AIRPLANE.
	THE FOLLOWING RULES APPLY TO LARGE AIRPLANES OF THE DC-3, DC-6, AND C-124 CLASSES (LIGHT PLANE LANDING OR TAKING OFF):	
	WIND COMPONENT ACROSS RUNWAY GREATER THAN 10 M.P.H.	NORMAL
	WIND COMPONENT ACROSS RUNWAY BETWEEN 2.5 AND 7 M.P.H	BETWEEN 5 AND 10 MINUTES*
	ZERO WIND COMPONENT ACROSS RUNWAY (WIND DIRECTLY ALONG RUNWAY)	2 MINUTES*

DEFINITION OF WIND COMPONENTS:



A WIND COMPONENT ACROSS THE RUNWAY OF	CORRESPONDS TO A		
	10-DEGREE CROSSWIND OF	20-DEGREE CROSSWIND OF	30-DEGREE CROSSWIND OF
2.5 M.P.H.	14.5 M.P.H	7.5 M.P.H.	5 M.P.H.
7 M.P.H.	40 M.P.H.	20.5 M.P.H.	14 M.P.H.
10 M.P.H.	57.5 M.P.H.	29 M.P.H.	20 M.P.H.

*NOTE: IT SHOULD BE EMPHASIZED THAT THESE ARE APPROXIMATE SEPARATION TIMES WHICH ARE NECESSARY IN ORDER THAT THERE BE VERY LITTLE CHANCE OF ENCOUNTERING DIFFICULTIES. FOR SHORTER SEPARATION TIMES DIFFICULTIES WILL NOT NECESSARILY BE ENCOUNTERED BUT THE CHANCE OF RUNNING INTO TROUBLE IS MUCH GREATER.

Figure 3

pilot—no human could have begun recovery so quickly.

Some time ago, the Beech Aircraft Corporation sent out a form letter asking for comments on this problem of vortices. The following are two of the replies. Both are typical. The first is from an aviator flying a Model 35 Bonanza, who wrote:

"I spaced myself accordingly behind a C-46 and turned on final approach about 1,000 feet from the end of the runway at about 400 feet altitude. At this point, the wheels were down, full flaps on, and prop in low pitch with airspeed of 80 mph, and airplane trimmed in hands-off attitude. The air was very smooth and stable." *(Note: Nearly every pilot's report on vortex turbulence contains a similar remark about the calm condition of the air.)*

"At approximately 150 feet from the end of the runway, and about 200 feet altitude, the plane was thrown violently on its side, left wing down about 70 to 80 degrees, and headed for the ground at terrific speed. During this very brief period, I had no evident control over the airplane. I did have my hand on the throttle and remember applying a considerable amount of power. Recovery was effected about three or four feet off the ground —far too close for comfort. Witnesses afterward confirmed this, saying that they started to run as they saw the Bonanza apparently falling out of control. I still don't know who was most surprised at a recovery that apparently wasn't in the cards."

Here is another example — also in a Beechcraft:

"On a very still, clear day, I came in on a low, slow approach (about 72 mph) on the end of the runway. A DC-6 was just turning off the other end of the runway. At about 40 feet altitude, the turbulence struck; my wing went down and we almost cartwheeled into the ground. The airplane was a complete loss, but we were not hurt at all because our seat belts were tight."

Whether you run into a heavy vortex or a light one, or none at all, will depend on a number of factors which should be kept in mind. These factors are wind velocity, wing loading of the leading aircraft, and speed of the leading aircraft.

The first of these, wind velocity, is fairly obvious.

Whether the wind is blowing or not makes a difference. The vortex is a whirling column of air itself, and the greater the wind velocity, the quicker the vortex will dissipate. This is clear, but here is one hint that may help. Since wind has direction, make your approach and land on the upwind side of the runway when behind a large aircraft.

The second factor is wing loading—the greater it is, the stronger the vortex. Simply stated, wing loading is merely the ratio of the weight of the airplane to its wing area.

In further detail, two airplanes may each have the same weight. One has a wing span of 50 feet, the other 100 feet. The average chord (distance from leading to trailing edge) of each wing is the same. By definition, wing loading will be twice as great for the airplane with a wing span of 50 feet.

In effect, the shorter wing

must carry the same load with half as much wing area. Therefore, the air pressure differential between the upper and lower surface of the wing will be twice as large for the shorter wing. Assuming equal speeds, the short wing span airplane will produce a stronger vortex from this greater pressure difference. Remember that the greater the wing loading, the stronger the generated vortices.

The final factor is speed. At first you might decide that the higher the speed, the bigger the vortex. This sounds like common sense, but *it is not true.* Of two identical airliners, the slower will produce the stronger vortex. Here is why: Let each airliner have the same span and wing-loading. This results in each producing the same size or diameter of vortex. The faster aircraft will disperse the energy of the vortices over a greater distance than the slower one. Remember that these slow speeds always occur in traffic patterns.

There you have it, the why and what of vortices. But how can you avoid them or stay right side up?

In the recent test, one conclusion was that the duration of the vortices is governed primarily by existing atmospheric conditions and the strength of the vortex. Any wind has an immediate dispersing effect. So for maximum safety, you should always land on the upwind side of the runway.

Be careful when following another aircraft while landing or taking off. The Board concluded that the greatest disturbances produced by any aircraft occur when that aircraft is traveling at low airspeeds, as in traffic patterns. Douglas Aircraft Corporation has devised a set of rough rules-of-thumb for separating a light plane from a large one when landing or taking off. (See fig. 3.)

The rules may be difficult to follow considering the pressure of traffic at a busy airport. Nevertheless, keep in mind that they simply repeat methods you may use to evade the wake of a large aircraft.

Beech, Douglas, and the Army Aviation Board all emphasize allowing plenty of space between you and large aircraft in front of you. The wind will have more chance to disperse the vortex.

Beyond remaining clear of the wake itself, perhaps the most important thing to remember is to always remain aware of what might happen; and stay alert, ready to take counteraction. This should include keeping your safety belt snugged tight. If a problem cannot be entirely eradicated, our best defense is to understand it.

Famous Last Words

Lieutenant Ronald C. Wilson, *Arty*

THEY ASKED US if we could fly a night illumination problem, and our operations officer answered, "Of course—no sweat." Easy? It was not that simple and the exercise taught us a lot about the importance of one missing ingredient—experience. What we learned may be applied to other problems that come up in Army Aviation.

We took on the assignment of illuminating an impact area that was to be used in a big firepower demonstration. We had no doubt we could light up that target area like Broadway on New Year's Eve. Only one pilot in the outfit had ever used aircraft flares and he assured the rest of us there would be no problem. We found out differently.

Our typically Korean airstrip was in a narrow valley surrounded by mountains. We'd done a lot of night flying out of it using flare pots to light the boundaries of the runway. Flying out of the strip was only one of our worries.

Our mission was to provide illumination for the target area for ten minutes, allowing the artillery to fire an area mission, then to drop flares to illuminate the atomic simulator for the end of the demonstration.

For the first flight we decided to use three Bird Dogs, each loaded with two 1,000,000 candle power flares. We were to take off 30 minutes before drop time and orbit above the home field until given instructions by radio to proceed to the drop zone.

Our field was located approximately two minutes from the target area. Since we had no visual references, we had to time our flight from a known point to the target area, make our drop, and get out of the impact area. A radio tower near the north end of the strip had red blinking lights, so it was decided this tower would be the "initial point" from which we could time our flight to the drop zone. By making dry runs during the day, we found it took forty seconds from the tower to the drop area with the wind out of the NW. With this determined, we knew that two Bird Dogs would have to fly a five-minute pattern above the field. The pattern would be flown so that an aircraft would at no time be more than one minute and thirty seconds from the initial point (IP).

The first plane had to be over the impact area and drop its first flare at a precise moment, so our timing had to be almost perfect. The third Bird Dog was to orbit above the other two aircraft flying the pattern and be on standby in case one of the flares malfunctioned. Finally, a Beaver was to fly at a still

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Lieutenant Ronald C. Wilson, Arty, is an instructor in the Department of Fixed Wing Training, U. S. Army Aviation School. 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

higher altitude to drop flares for the finale—the detonation of the atomic simulator.

Upon signal from the OP to "bug out," the plane nearest the IP was to go in and drop one flare, make a right turn and fly a pattern that would put it over the drop area two minutes after the second plane had dropped its first flare. This second pattern would be flown maintaining a two-minute interval between planes until all flares had been dropped and the fire mission completed. Since we were using three-minute flares, we could achieve constant illumination for over fifteen minutes with a total of six flares.

After considerable planning, we made our first live run. We found that only about forty per cent of our flares worked and those were dropped from the Beaver. This problem we solved by using a different hook-up for the flares on the bomb shackles.

The big problem was to determine the right time to drop a flare, allowing for drift. We constantly dropped them too soon or too late, and the wind would cause them to drift so that any advantageous effect of the flares was lost within a few seconds.

Determined to maintain our reputation, we flew five straight nights perfecting our flight pattern to and from the drop zone. But, we didn't have one perfect drop.

On the night of the actual show, some clouds moved in over the impact area and gave us about 500 feet between the tops of the mountains and the bottom of the cloud layer. This wasn't conducive to calm nerves, but we didn't allow it to hinder the drop.

One of our pilots did get lost in the clouds after his final drop, and had to be calmed a bit and talked back to the field by the Beaver pilot who saw him through a break in the clouds. Another aviator, new to the outfit, yelled into his mike that the needle on his manifold pressure gauge had gone "clear out of sight." Someone reminded him that he didn't have a manifold pressure gauge in a Bird Dog. We heard no more from him.

We did illuminate the impact area but nothing like Broadway on New Year's Eve. As in the practice sessions, we didn't hit the right spots with many of the flares. In fact, the first two flares didn't help at all. They drifted clear away from the target area. Though we had practiced, planned, and gritted our teeth, we could not achieve the desired effect.

Well, there it is. Can you fly a night illumination problem? Or any other problem? They aren't simple. A lot of planning goes into any mission, and even that may not be enough. Practice has to be dovetailed with planning and experience. Our little operation had planning and practice but it lacked something —maybe experience.

Of one thing I am certain: You don't solve problems by remarking, "No sweat."

When you add energy and zeal you may still miss. But add planning, practice, and experience and perhaps you've got the solution.

Memo from Flight Surgeon

A YOUNG FOREIGN OFFICER training at an American base was designated the Commanding General of his country's Air Force. While flying his first solo at 10,000, he decided that his airplane was gradually turning on its back against his will. He shouted his anxiety into the mike and cried that his *fingers were tingling and slowly going numb.*

Quickly, the tower ordered him to 100 percent oxygen. He obeyed and *continued to breathe deeply and anxiously. In a moment he passed out.* His airplane now went into a screaming dive while his instructor shouted hoarsely, "Throttle back! Throttle back!"

Only partly understanding—almost paralyzed — he tried to obey. Clutching the stick with near lifeless fingers, he strained to pull on it. Slowly, agonizingly it came back and at the final moment, his nose came up. He clipped the top branches of some trees and landed sizzling hot on an outlying field.

Gently they took him from the cockpit and laid him out on the ground. In a moment he woke up healthy and bright—a little puzzled but none the worse.

When the Board investigated they found "he had not received his military pay for over two and a half months, and that he was extremely anxious."* He was grounded until his government sent his pay.

"Later, (the same officer) on a night flight *without heat, with inadequate clothing,* and with *no evening meal* before takeoff, became anxious to complete the flight. In the landing pattern he suddenly felt that the runway lights and airdrome lights were going in circles. He left his place in the pattern, dived across the signal officer, disregarded flares and radio wave off, and landed badly to one side of the runway, almost overrunning the plane ahead and the one astern which he cut out of the pattern.

Again, medical examinations were negative. This time he complained of great concern over his family, all of whom he had learned were ill."*

The investigators diagnosed his ailment as *hyperventilation* arising from deep anxiety. This was serious but should they eliminate the Chief of another nation's Air Force? Or should they — diplomatically — let him continue—to almost certain suicide?

They deliberated a long time, were forced reluctantly to deny him entrance into jet training. However, to prevent the attendant loss of face, they retained him for multiengine training,

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***Journal of Aviation Medicine, August, 1957**

adding only this simple requirement, that he carry a copilot at all times.

Solomon, himself, must have smiled his benediction.

NOISE

The problem of noise has finally come to Army Aviation. For example, we'll bet you didn't know that our latest observation aircraft makes more noise at certain times than the Air Force F-100.

Noise used to be an exclusive problem of the Air Force and the Navy, and of those civilians who unwisely settled themselves in tract homes just off the side of a main runway. But with our huge transport helicopters and the new higher performance aircraft, we've moved right into a trouble area that can do you harm when you take no precautions.

Either a high noise intensity or a lower intensity over a long period of time can give you trouble. Like other parts of the body, the ear may be ruptured or grow weary from overwork. Worse still, too much stimulation over too long a period may injure the ear muscle semipermanently in the same way that another muscle might become muscle bound.

Like Louis Armstrong's trumpet poised an inch from your ear, the sudden blast of a jet engine could burst your eardrum, or dislocate one of the three tiny bones that help carry sound waves across your middle ear. Loud noise can destroy part of your hearing permanently or for a short time, depending on how long and how often you are exposed.

With temporary deafness you may get an annoying ringing in your ears. Some aviators even get a double tone: a buzzing or a ringing in one ear at one frequency, the same at an entirely new frequency in the other.

FATIGUE IN NOISE

You get tired more quickly in noise. You may work eight hours in silence at a tough job, go home whistling, kiss your wife and take her out cheerfully for filet mignon and a show. Add noise and you may botch the job, argue with the boss, and divorce your wife.

There is hardly any end to the miscellaneous ills noise may cause. At the very least, you'll concentrate less. With enough noise you may even get sick enough to vomit. A blast of noise may make you shaky in the knees; you may even lose part of your sight momentarily.

No one has yet found a way to adequately lower noise intensity at its source without compromising the desired power. The best way to prevent injury is to cap the ears and block off part of the sound wave that roars in against your eardrum. If you work in noise, your flight surgeon will provide you with earplugs, earmuffs or both, and he will instruct you in their use. Wear them—you'll stay calm, sleep soundly, and hear well.

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

MASTER Army Aviator

The second Master Army Aviator rating to an officer on active duty has been awarded to Captain James H. Lefler of the U. S. Army Aviation Board. Captain Lefler is a Project Officer in the Test Division.

He has accumulated over 8,000 hours of first pilot time in 19 years of flying and is qualified in all fixed- and rotary-wing aircraft.

His flying career began in 1938 as a civilian pilot instructing and flying for hire. In 1942 he joined the RCAF. After completing transition training in Spitfires he was sent to the RCAF Instructor's School.

Late in 1942 he returned to the United States and became a liaison pilot, graduating in class number 9 of the Department of Air Training, The Artillery School. He remained at Fort Sill as a flight instructor until being assigned in 1946 to Headquarters, U. S. Constabulary in Germany.

He has played an important role in Army Aviation. He helped establish the instrument flight training program at Fort Sill and instructed in that program until being transferred to the Army Aviation Detachment at Fort Belvoir. In 1952 he was ordered to Korea and assigned to the 8th Army Flight Detachment. He assisted in forming the TO/E for the first Provisional Aviation Company during this period and later established the AFFE Twin Engine Transition School in Japan.

As VIP pilot in Washington, he has flown such well-known passengers as Vice President Nixon, the Secretary of Defense, Secretary of State, three secretaries of the Army, and Army Chiefs of Staff.

THE ARMY AVIATOR entered downwind in a Bird Dog, applied carburetor heat, switched tanks, and checked the mixture for full rich. As he turned final, he observed another aircraft on the runway and executed a go-around. He removed carburetor heat at this time.

As he again flew downwind, the engine failed. The aviator switched tanks again, applied carburetor heat and turned on the auxiliary fuel pump. The engine caught for a few seconds, then died for the second time.

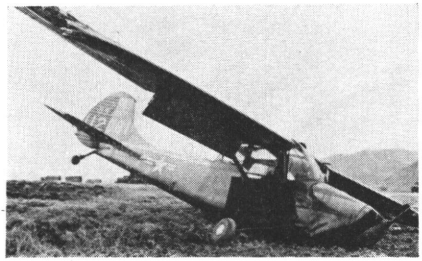
The aviator then called the tower, declared an emergency, and requested that the obstructing aircraft clear the strip. To allow the plane on the ground enough time to move, he extended his downwind a few seconds before turning on base. He lowered 30° flaps after turning on base, and applied 45° flaps just prior to touchdown. The Bird Dog landed short of the runway, struck an embankment, bounced and hit a tree with the right wing before coming to a stop.

All graduates of the Army flight program have at one time or another received instruction pertaining to "priority of aircraft." In an emergency, the aircraft in distress has the right of way over all others. A dead engine *is* considered an emergency.

The aviator used his flaps in a mechanical manner. They should only be used when the aircraft is too high or on a power approach. Even then only the necessary amount should be applied. If this aviator had conserved his altitude with discriminate use of flaps, he would have made the runway with room to spare.

It is not cheerful to note that about 85 percent of the accidents reviewed in this department can be directly attributed to Army Aviators with less than 500 hours first pilot time. This aviator had less than 100 hours since graduation from flight school.

The Gray Hair Department is prepared by the U. S. ARMY AVIATION DIGEST staff with information obtained from the files of the U. S. 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



Landed Short

HOT LANDING

The Army Aviator arrived at the Bell Helicopter plant for the purpose of ferrying an "H" model Sioux to his unit. He was introduced to two company pilots and later was asked if he would like to have a flight demonstration. He requested only a cockpit checkout and a briefing of the local traffic pattern and the plant practice area.

Under the supervision of one company pilot, the aviator started the helicopter and ran through the normal run-up check. After a minor discrepancy had been corrected, he made a normal takeoff and proceeded to the practice area, about one mile southeast of the plant.

Upon arrival at this mile-square area, the aviator made a normal approach and landing. With the servo system engaged, he made 360° turns testing the controls. He landed, disengaged the servos, and repeated the hovering turns. He then landed for the third time, engaged the servos again, and made a normal takeoff to the west.

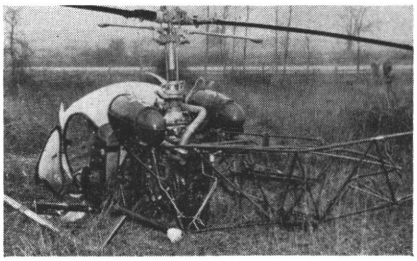
Using a left-hand pattern, he set up an approach to the west for a normal touchdown autorotation to the center of the field. He retarded the throttle to 2200 rpm and established a descent at 45 mph. He then closed the throttle, added pitch, and contacted the ground in a slight tail-low attitude.

After skimming the ground for about 60 feet, the skids hit a ridge of earth about nine inches high. The helicopter left the ground, turned 180° from the line of flight, and touched down 18 feet from the ridge. From this point the Sioux bounced forward a few feet and came to rest facing east. Major damage was incurred to the airframe and main rotor system, with the anti-torque system completely separated from the remainder of the aircraft.

Touchdown autorotations should never be made on acceptance checks—a point unfamiliar to the aviator. The procedure for a normal autorotation is to reduce airspeed prior to touchdown by leveling the aircraft at 50 to 75 feet. This aviator demonstrated poor technique by failing to do this. He further showed poor judgment when he did not walk over the area, after landing the first time and prior to performing the autorotation, to check for obstructions.

Most units are now emphasiz-

Hot Landing



ing that an instructor pilot *must* be in the aircraft before touchdown autorotations can be practiced.

TAIL FIRST

Two Army Aviators took off in a Beaver on an orientation flight to another airfield. The first leg of their journey was IFR and, after accomplishing a GCA letdown over an Air Force Base, continued "under the hood" toward their destination.

As they passed over an OMNI station near the end of the flight, the IP told the pilot to remove the goggles. He then proceeded to locate the airfield for the pilot, who was unfamiliar with the area.

After turning downwind for runway 33, the IP pointed out markings designating the usable portion of the runway. Both aviators noted the wind "Tee" pointing toward 220°. Because of its location, the "Tee" at this particular field was considered unreliable and the nearby municipal airport tower was usually contacted for surface conditions prior to landing. This was not done or the aviators would have known the surface winds were from 170° at four knots.

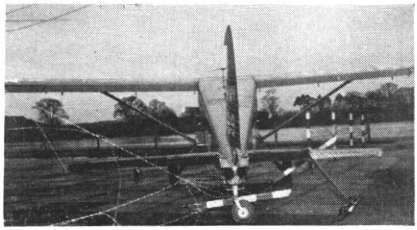
The pilot decided to use additional airspeed throughout the pattern and climb flaps only for landing. Maintaining 100 mph on base leg and final, the aviators saw a fence on the near end of the runway and cleared it by 15 feet.

After rounding out, the aircraft floated 750 feet down the runway before actually touching down and then skipped for about 1450 feet before brakes could be applied with results.

At this point the aircraft was 400 feet from another fence marking the forward end of the strip. The fence as yet had not been seen by the aviator. The IP was aware of it and thought the pilot had also seen it.

Two hundred feet away, the pilot saw the fence and continued hard braking, thinking he could stop in time.

Seventy-five feet away he realized that he could not stop and immediately started a ground loop to the left.



IP Saw It — Student Didn't

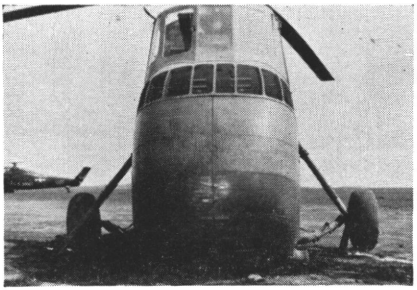
Twenty-five feet from the fence the aircraft reversed direction, striking the fence posts tail first.

To maintain an airspeed of 100 mph in an aircraft designed to stall between 55 and 60 mph is overdoing it. Even at lower airspeed with takeoff or landing flaps and the throttle completely closed, the Beaver will float after roundout. Also, when an aviator does not see a fence in front of the aircraft while landing, his eyes and/or thoughts are somewhere else. A timely go-around would have forestalled this accident. Also, it couldn't have happened had the Instructor Pilot been as alert as he might have been.

EXPERT INSTRUCTION

After an uneventful flight to the practice area in their Choctaw, the instructor pilot (IP) proceeded with one hour and 15 minutes dual practice in all basic maneuvers. Then a straight-in autorotation was started to the south, from an altitude of about 1,000 feet actual.

The helicopter carried a 1,500-pound load and an estimated 1,000 pounds of fuel, making the gross weight about 10,500 pounds. The wind was light and variable from the west (crosswind). Indicated airspeed upon entry was 80 knots, later reduced to 60 knots during the descent. Rotor rpm stabilized at 230.



Heavy Load, RPM Dropoff

During the initial portion of the descent the student told the IP he was going to overshoot the panel. At this time the IP took over the controls and established a moderate flare to reduce forward speed and shorten the ground track. Rotor rpm increased during this maneuver and he lowered the nose to regain lost airspeed. A second flare was accomplished about 40 feet above the ground to reduce the rate of descent.

Collective pitch was applied at this time in anticipation of touchdown. The helicopter continued its rapid descent and the collective was pulled to its maximum upward position. With a forward airspeed of five to ten knots, the Choctaw "fell through," contacting the ground in a tail-low attitude. After the tailwheel had rolled about five feet, the main gear contacted the ground causing the lower fittings of the main shock struts to shear.

The helicopter slid another 25 feet with the nose digging a trench about 20 feet long and three to five inches deep. The engine was still running and the main rotor was turning at low rpm. Fuel lines were ruptured and gasoline spilled around the nose section. The IP immediately shut down the engine and braked the main rotor to a stop. The two aviators then evacuated the aircraft. Miraculously no fire resulted from the spilled fuel.

The application of collective pitch to reduce descent was premature. Carrying a load with power off, the rotor rpm will rapidly drop off, causing the helicopter to "fall through." Pitch should be applied at the last possible moment to conserve rpm but only when necessary to cushion the landing.

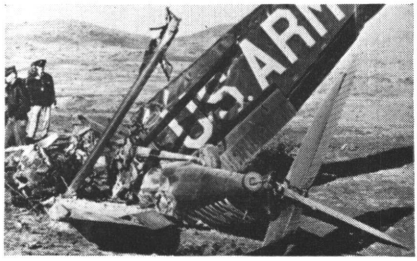
WELL EXPERIENCED

The new Army Aviator took off in a Bird Dog on a routine "flour sack" mission. After locating the troops in the training area (which was in mountainous terrain with an average elevation of about 7,000 feet), he made a low pass over the men and climbed to the east at a steep angle.

At approximately 300 feet altitude, he entered a maneuver similar to a wing-over. The aircraft was dangerously near a stall. The young aviator started his run on the target area and during the dive tried to recover flying speed by forward pressure on the stick. Unable to regain enough airspeed for a recovery, he realized the Bird Dog was going to hit the ground and attempted to level the aircraft.

It struck the side of a ravine in a three-point attitude damaging the engine cowl, landing gear, and lower fuselage. It then glanced into the air, rolling from side to side dragging wingtips across the ground. The right wing was torn loose from the fuselage, which finally came to rest 105 feet from the point of impact. Besides the pilot and passenger, one trainee was injured from flying debris.

This Army Aviator had been out of flight school slightly over three months when this accident happened. Upon arrival at the unit he was placed in the standardization program and received approximately 20 hours flying time. One 30-day period was devoted entirely to ground duty. His total flying time since graduation was 29 hours.



Just Out of School

The aviator showed poor judgment in performing the maneuver at low altitude. However, he was not briefed prior to the mission; nor did his supervisors take into consideration his lack of experience.

The U. S. Army Aviation School can teach only so much; the unit must continue where school training stops.

Solution to PUZZLER

On the basis of the factual information contained in the PUZZLER on page 14, the recommended solution is as follows:

√ At least two position reports should be made to Flight Service en route.

√ Prior to taking off, you studied the bulletin board in base operations and noted that the organizational commander had set up additional clearance requirements for his airfield. You should know that you are not necessarily bound by these requirements.

√ While en route you encounter unexpected conditions which indicate that your ETA will be exceeded by 35 minutes. It is mandatory for you to request that Flight Service be advised.

√ Laurel Municipal Airport is a "PC" field. Because of this, you may properly elect to close your flight plan by calling Flight Service collect.

All other selections are considered either false or undesirable.

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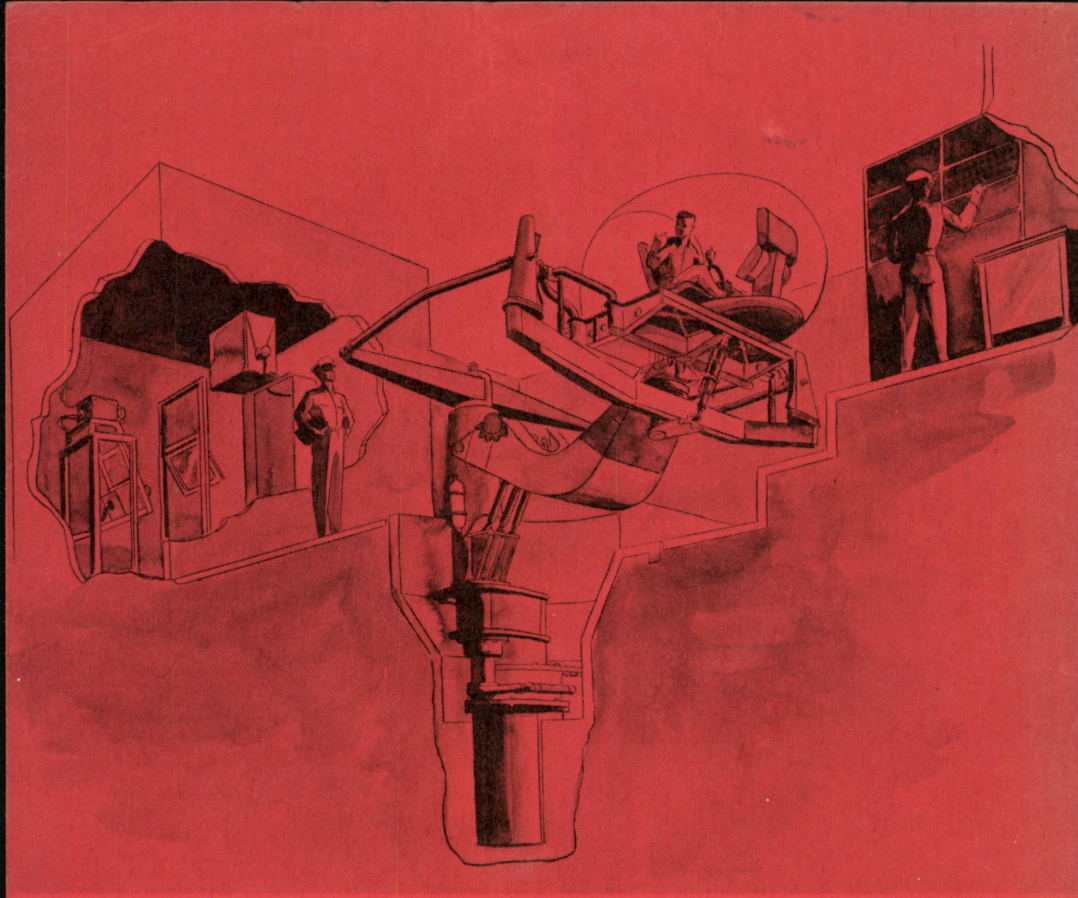
The first YH-41, of an evaluation quantity to be delivered to the Army, was scheduled for delivery in late August to Edwards Air Force Base in Muroc, California, where an engineering study will be conducted. A second unit will also go to Edwards at a later date, while the remaining helicopters on the contract will be sent to Fort Rucker, Ala.

The YH-41, named the "Seneca," is a four-place helicopter which can be used for utility, reconnaissance, command-liaison, instrument training, basic flight training, medical evacuation, rescue operations, and other diversified missions, says Cessna.

The helicopter, according to Cessna, has a maximum gross weight of 3,000 pounds and a useful load of 950 pounds. It is powered by a 270 hp Continental engine and has a maximum speed of 124 mph at 8,000 feet. With a cruising speed of 100 to 124 mph, the Seneca has a sea level rate of climb of 1,350 fpm and a hovering ceiling in ground effect under standard conditions of 14,500 feet at 2,600 pounds gross weight. Its anticipated range is 290 miles and an endurance of 3.8 hours.

Cessna officials said the Senecas scheduled for Fort Rucker will go to the U. S. Army Aviation Board for user's tests, the Transportation Supply and Maintenance Command for tests to determine necessary logistical support, and the U. S. Army Aviation School for tests to determine its adaptability as a trainer.



The Army and Navy long range instrument program for rotary-wing aircraft will soon use this Bell-designed helicopter flight simulator to test the responses of human beings to new flight information displays.

The objective of the program is to fit aircraft to man's capabilities rather than fit man to increasingly complex aircraft of today and tomorrow.

During testing, the subject will sit in the cockpit placed atop a dynamic platform that can be made to simulate the pitch, roll, yaw, and heave of a helicopter. It will provide a sensation of realism lacking in older simulators.

A contact analog display is set in front of the pilot. By means of a synthetically televised picture it presents the same visual cues the pilot uses in normal flight.

An operator feeds new flight conditions to the "pilot" via the contact analog and makes flight corrections while his reactions and speed are recorded and evaluated.

Ultimately these studies will determine what information is necessary for all helicopter flight conditions and in what manner the information can best be presented.