AUGUST 1959

UNITED STATES ARMY AVIATION DIGEST

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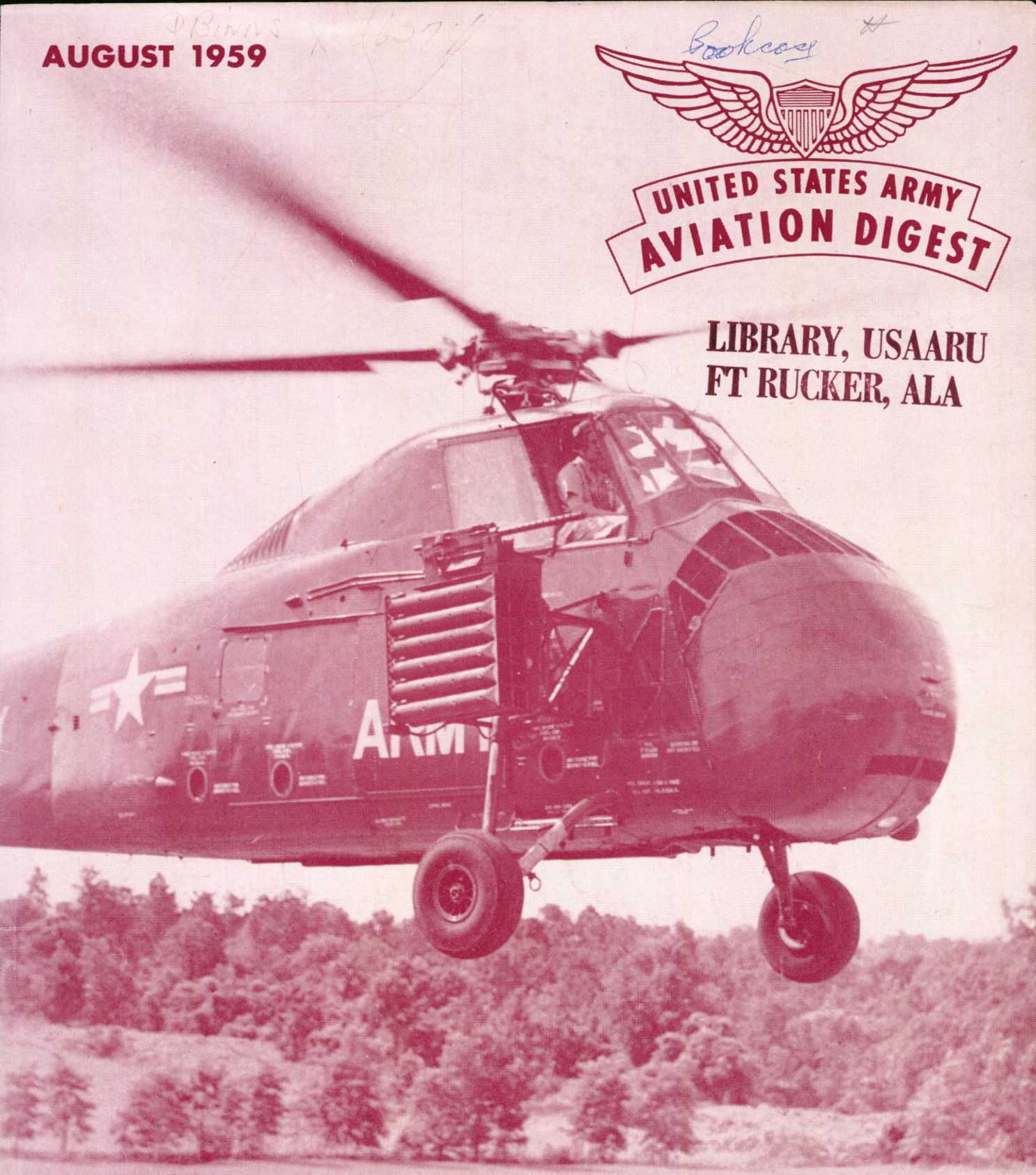

Complete In This Issue -- THE STORY OF ACR

United States Army

AVIATION DIGEST

EDITORIAL STAFF
CAPT JOSEPH H. POOLE
WILLIAM E. VANCE
FRED M. MONTGOMERY

AUGUST 1959
VOLUME 5
NUMBER 8

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

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

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

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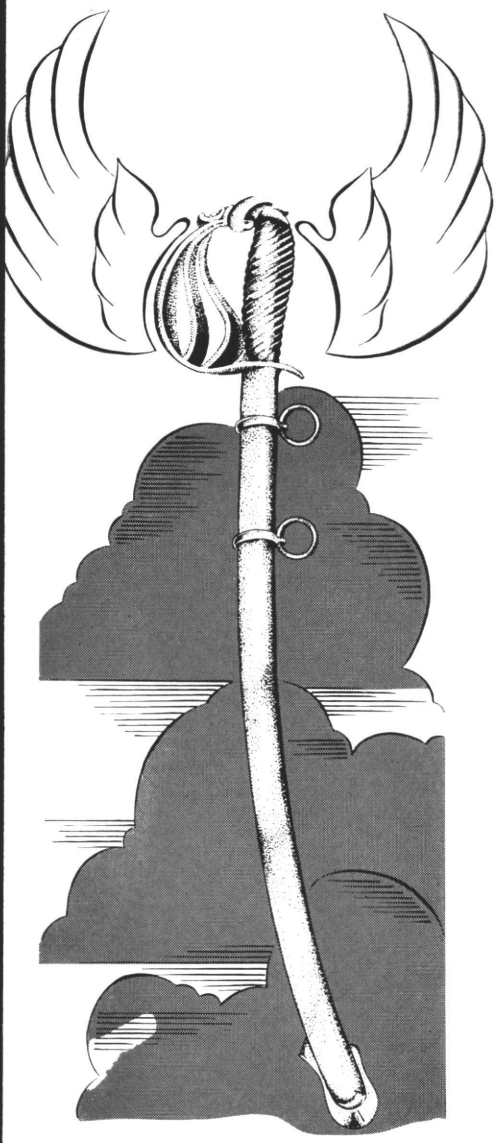
The printing of this publication has been approved by the Director of the Bureau of the Budget, 22 December 1958.

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

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

Saber IN THE SKY



William E. Vance

A GENERAL ELECTRIC engineer, Thurlow "Turtle" Mayhood, looked up from his desk at Burlington, Vermont, one day to see a stocky, crewcut bird colonel. The colonel wanted GE to build a rocket kit for a helicopter. He had no money, only a drawing on a paper napkin. There was no market for such a kit, he admitted. None had ever been built before. In fact, an Army field study had said that "helicopters cannot serve as a weapons platform. They're too unstable." But after talking to Col Jay D. Vanderpool, GE's Jack Harding and Turtle agreed to do it. The Colonel has that kind of persuasion. He's alive today, partly because of it.

This story had its beginning at the Officers' Club, Fort Rucker, Alabama in June 1956. The dilettantes had long since departed and the stalwarts had covered the field of Army Aviation except for one fascinating facet: active participation in the shooting aspects of combat by Army flight personnel. When this area was reached, Brig Gen Carl I. Hutton said to Col Vanderpool, "I'd like you to take on a special project, Colonel."

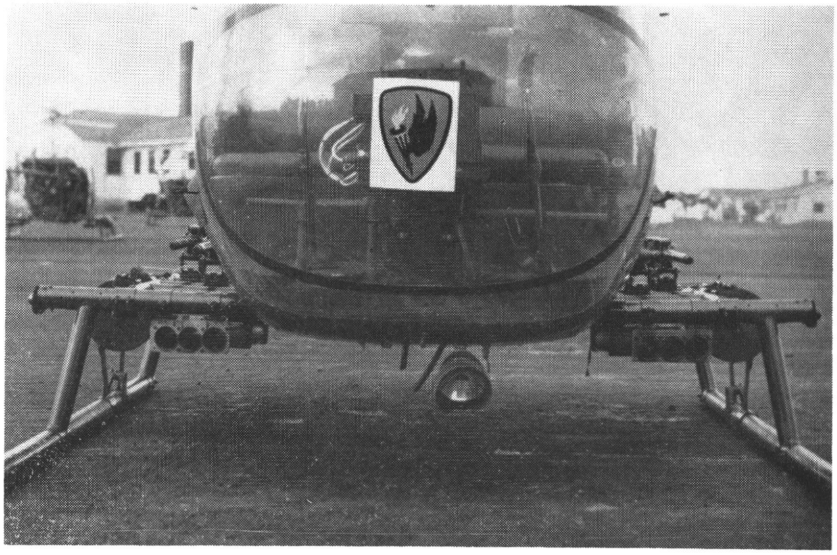
Although not an Army Aviator, the Colonel thinks and talks like one. He has said, "The flying machine hasn't been exploited as a **ground warfare** vehicle. Necessary emphasis on bombing and intercept dictated development at odds with ground use."

Col Vanderpool has served with guerilla forces in the Philippines and in Korea. Stationed at Schofield Barracks, Hawaii, in 1941 when the Japanese attacked, he was at the time an artillery staff officer. During the next few years he saw action under Admiral Halsey and General MacArthur, and participated in battles in the Central and South Solomons, Guadalcanal, New Guinea, and the Philippines.

He was engaged in guerilla operations with the Philippine forces from late 1944 until the liberation of Manila in 1945. Performing intelligence work from 1946 to 1950, he was assigned to a guerilla unit during the Korean conflict and worked

behind the North Korean lines. At the time he began work on the armed aircraft and other experimental projects, he commanded the 337th Field Artillery.

This background eminently qualified him to head a project to explore the possibilities of arming helicopters for combat. Before the night was out, in characteristic manner he had begun the planning that was to take him into ordnance and aircraft factories across the nation.

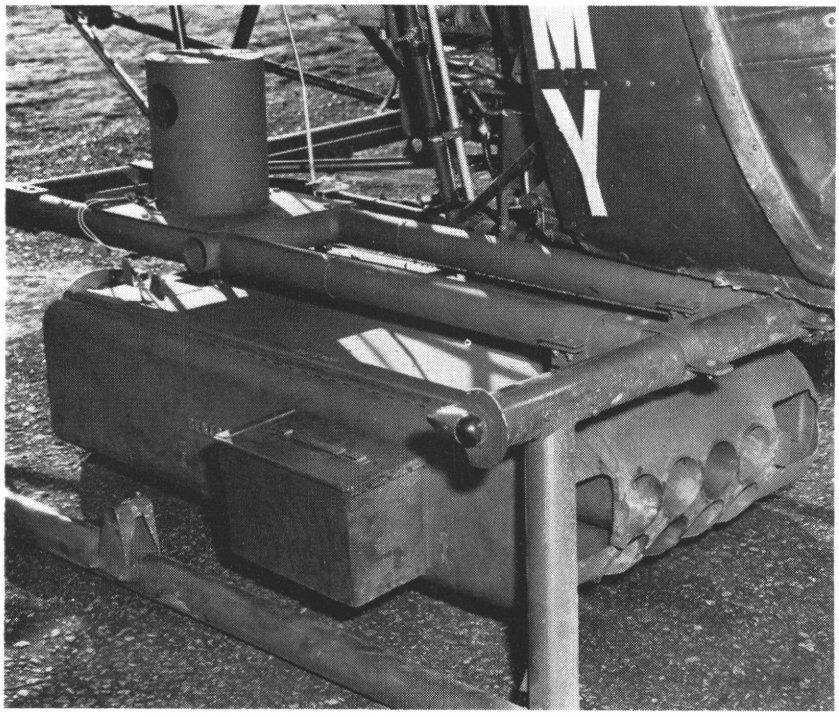


A Sioux ready for the warpath

SUPPORTING FIRE

By coincidence, at this time a similar project involving fixed wing aircraft had stalled out in the vast spaces between Fort Rucker and the War Room of the Pentagon. This was due primarily to the fact that some circles feared encroachment upon the mission of the Air Force. In this respect I point out that AR 95–100 clearly precludes the Army "providing aircraft for interdiction of the battlefield or close combat support." The current armed helicopter concept does not envision fighter/bomber attack missions but is concerned primarily with providing supporting and suppressive fires of a defensive nature.

First helicopter kit made by GE

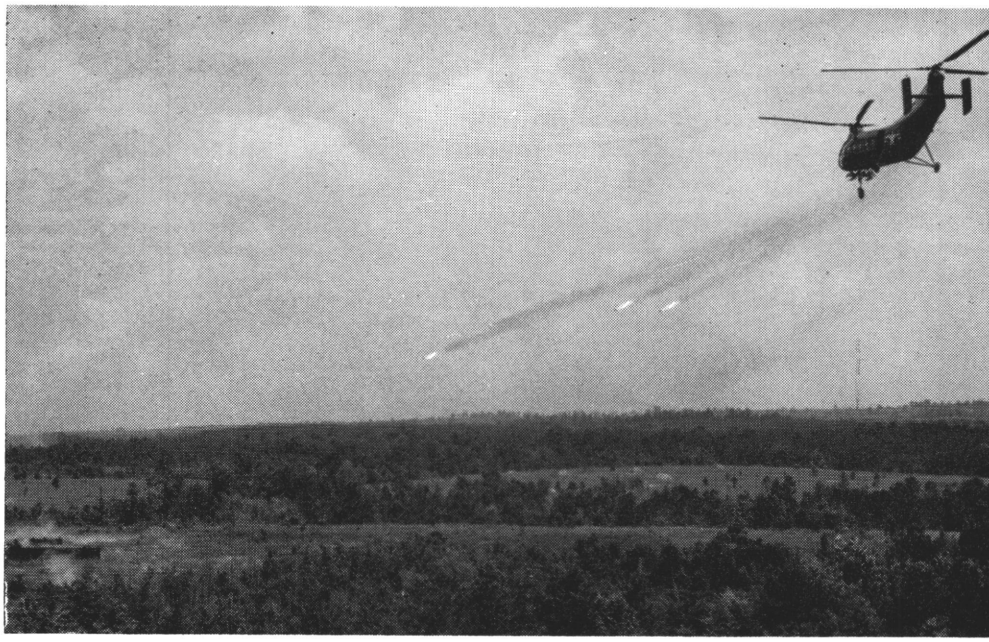


This need for suppressive fire was recognized by the Army and the concept was acceptable at all levels to include the lieutenants who would fly the missions. It was the opinion of these flying officers that no one has any business on the battlefield unless he is ready — and able — to fight. Being able meant being armed.

The L–4s and L–5s of World War II were not armed or armored, but frequently an enthusiastic aviator would make a pass with a hand grenade, or whatever else he might have at hand, including a .45 pistol. No confirmed record exists of any hits being scored by such methods, but the spirit for fight was there. Only the equipment was lacking.

"For several years now Army Aviators have been toying with the idea of arming our aircraft for special missions,"

Major General Hamilton H. Howze wrote in the September 1957 issue of the ARMY AVIATION DIGEST. "During the peak of World War II, a few one-feather Indians were dreaming of 'L-fighters' to keep the enemy observation aircraft on the ground. During the Korean campaign, the Communists were launching their attacks spearheaded by one to three tanks, which made it rough on our doughboys.



A concept acceptable at all levels

EARLY EXPERIENCE

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

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

The tests were dropped until 1954 when it was revived at Fort Rucker under the title of ABLE BUSTER. When this project also went under, General Hutton called on Colonel Vanderpool to survey the use of helicopters in combat.

The Marine Corps, earlier, had conducted a few tests but no reports were available. About the only paper extant was an AAF Board Project that stated: "The helicopter is too unstable to bear consideration as a suitable weapons platform."

General Hutton did not think so and neither did Colonel Vanderpool and the project burgeoned under the Colonel's aggressive leadership.

HOW MUCH PUNISHMENT?

His first act was to tour the country, asking airframe manufacturers how much punishment a helicopter airframe could take. He got more than simple answers; he encouraged the aircraft engineers to give an opinion, and by the end of his tour he had a fairly good idea of the toughness of the machine.

The next assault was on ordnance plants. Although all kinds of armament that could be used on helicopters were sought, the lack of any such equipment was disappointing. He finally made his way to General Electric's Burlington plant and engineer "Turtle" Mayhood, who agreed to produce a kit from the Colonel's drawing. It was delivered in three months.

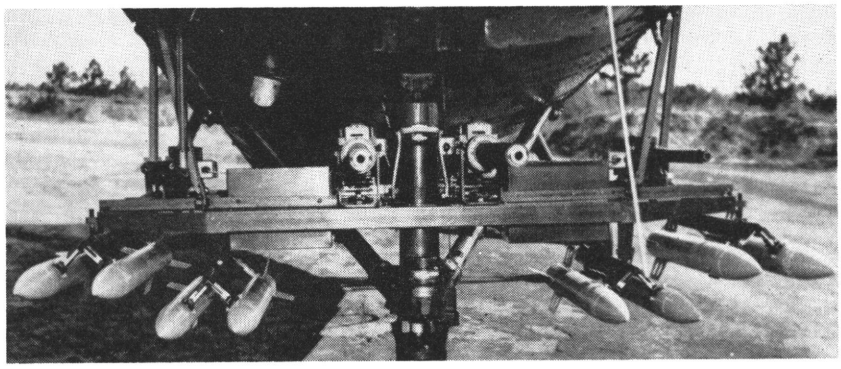
LIMITED ASSETS

Back at Fort Rucker, the situation was assessed: a few helicopters, no guns, no rockets, no gunsights. A big asset was a group of young, able, and dedicated junior officers, all eager to prove their opinion that helicopters could be a potent force on any kind of battlefield.

In Operation Sagebrush the idea known as SKY CAV shook

Left: 30 each 2-inch folding fin rockets on the Chickasaw or . . .

Below: Eight 80mm Oerlikons on call 24 hours with the Shawnee



some observers to the toes of their combat boots and raised a hue and cry that finally reached the Office of the Secretary of Defense. Sky Cav, a catchy word with mass appeal, became an image with many faces. The U. S. Army Aviation School concept is a provision of a "completely airmobile, air-mounted, fast-moving, hard-hitting, flexible means of cavalry at an accelerated rate on the battlefield of tomorrow."

GETTING DOWN TO BUSINESS

A need for such a unit had been recognized for some time. The eager young aviators were sure Army Aviation could provide such a force, with a capability limited only by the imagination. A wide area existed between imagination and hard-proven concepts, and the Colonel and his eager beavers got down to business.

The hardware came painfully slow after many scrounging trips. The pilots of the Aerial Combat Reconnaissance Unit, as it came to be known, flew their Beaver out to Air Force Depots, Navy Supply Dumps, and wherever the relics of war were held for survey. Back they came with bombsights, machineguns, and pieces of old scrap iron that could be machined down to make a kit, any sort of kit that would hold a machinegun or rocket launcher to a skid or fuselage.

OF USER MAKE

Capt Harold Hennington and Capt Charles Jones became expert machinists. They forged the weapons of war for a helicopter on a lathe set up by a kindly technician who showed them how to operate it. They worked days, and around the clock, trying to beat deadlines and cutoff dates. Captain S. E. Ballantyne and the enlisted men worked with him. Capt James Montgomery was the chief test pilot for all early models.

Sometimes in the early hours of the morning, Colonel Vanderpool would appear in the armament shop, bearing hamburgers and coffee. Removing his coat the Colonel would roll up his sleeves and turn to with a will, assisting where he could.

TROUBLE AREAS

There came a day when the first unit was mounted on a Sioux. It was flown to the range and test fired, and the plastic bubble burst into a thousand fragments. Captain Hennington brushed off the pieces of plexiglass but even before he was finished, the

trouble shooters were prying into the reasons.

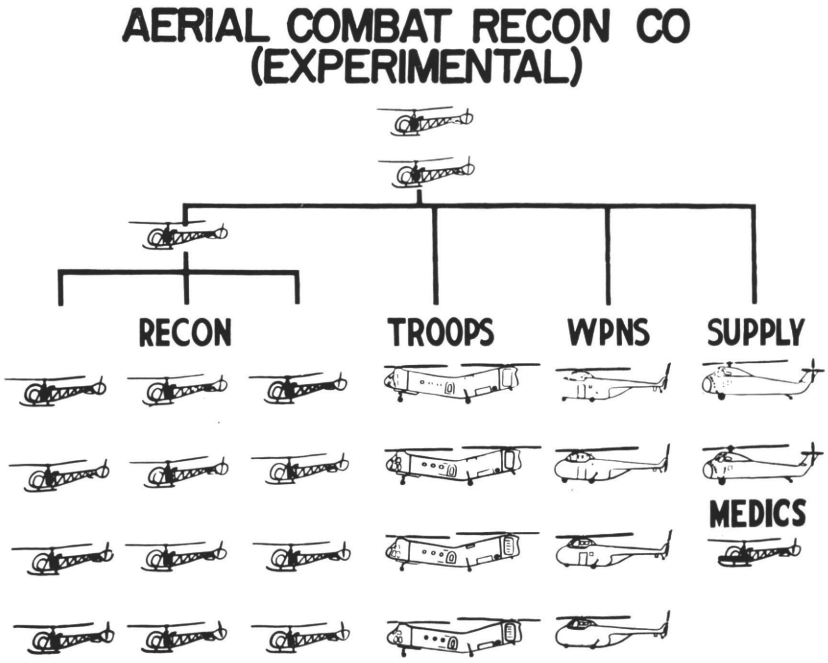
"It was the rivets," the Colonel explained. "The plastic bubble was in direct contact with the rivets, and vibration set up by the machinegun caused the bubble to break. We soft-mounted them and solved the problem."

"We never did solve the problem of the trees breaking them," Captain Ballantyne observed. It developed that the tests had included using trees as screening cover for helicopters. Soft-mounted bubbles were no answer to this. "They just don't chop trees down very well." They did, however, chop down small pine trees very effectively.

Facing the fact that helicopters are not optimum in performance, reliability, or ease of maintenance, the team that came to be known for a time as "Vanderpool's Fools" adapted armament equipment to fit the vehicle, using existing weapons designed for ground troops or sister services. Sighting and alignment of weapons was relatively primitive. A gunsight was once improvised by taping a cross of "bandaids" on a Sioux bubble. Again a helicopter pilot, firing a machinegun and getting a bullseye, took a wad of gum from his mouth and thumbed it onto the bubble to score more hits. After another foray with the Beaver to a Naval station, a higher performance fixed wing gunsight was used. Later, more refined optical reflecting gunsights were tested and are now standard. Remote controlled servos have proved quite feasible.

The work went apace with a dedication not often found in the field. Weapons mounted and tested included .30 and .50 caliber machineguns and rockets varying in size from the 1.5-inch NAKA to the 5-inch HVAR. The standard armament package on the reconnaissance helicopter varied from two .50s and six 2.75-inch rockets to four .30s and six to twelve 2.75-inch rockets. The larger helicopters, whose primary mission is the provision of suppressive fires, were armed in varying stages of firepower, from thirty 2-inch folding-fin aerial rockets for the Chickasaw and 132 1.5-inch NAKA rockets for the H–25 to a combination of machineguns and eight 80-mm or fourteen 2.75-inch rockets for the Shawnee. At present these armaments have offered no sure-kill antitank capability, primarily because of inaccuracy. Helicopter fire is more accurate from forward flight than from hover, as small deflections in the attitude of the aircraft at hover will cause wide dispersion of rounds fired.

Closeup of EH-34 on cover showing imposing firepower potential



Also, the rockets are more accurate when launched into a slipstream in forward flight. The firepower is adequate, however, for antipersonnel suppressive tactics.

These discoveries were not made without incident. Capt J. D. Roberts can lay claim to being the first rocket-powered helicopter pilot. His claim became valid when his rockets on the Sioux fired then hung up in the firing kit. He was started on a fast ride straight for outer space until the whole works exploded. The Captain landed without incident.

The same officer, firing machineguns mounted on the Sioux, sustained minor leg wounds when the helicopter doors flew open and deflected bullets into the cockpit. Undaunted, the team dismissed the dangers and became extra careful. No major accidents were suffered during the testing done day and night.

All this and more was uncovered by the group in their race against time, in a role complicated by lack of funds and equipment. What they lacked in these respects they made up in 18-hour days. When the work at the lathe with the machineguns and rockets and at the controls of the aircraft was finished, they carried on over coffee cups, making diagrams on paper napkins, and talking out the problems. Carried away with the enthusiasm of the moment, they would often rush back to the armament shop and work around the clock, proving or disproving some point in question. This is how the hardware and its use were developed by the Aerial Combat Reconnaissance unit.

There was a need for haste in perfecting this entirely new concept, because an expanding vacuum existed in the vast area termed mobility.

"As potential enemy bombers flew higher and faster, our fighters were developed for greater speeds and altitudes," Colonel Vanderpool points out. "As fighters improved, bombers were driven further aloft and to greater speeds. Each advancement our Air Force makes separates it further in speed and distance from the Army. The necessary differences in missions of the Air Force and Army have left a partial vacuum between ground and the fringes of outer space."

ACR BUILDING BLOCK

This area was covered in the study developed by "Vanderpool and his Fools," using the Aerial Combat Reconnaissance Company as a basic building block. All agencies contacted in coordination prior to submission of the ACR concept to CONARC have indicated general concurrence and provided appraisals that resulted in improvement.

In the capable hands of a dedicated group of Army Aviators, a new concept of warfare was evolved using experimental craft. The helicopter, of aerial observation and tactical transport fame, took on a new lethal sting. The day of the demonstrations was near.

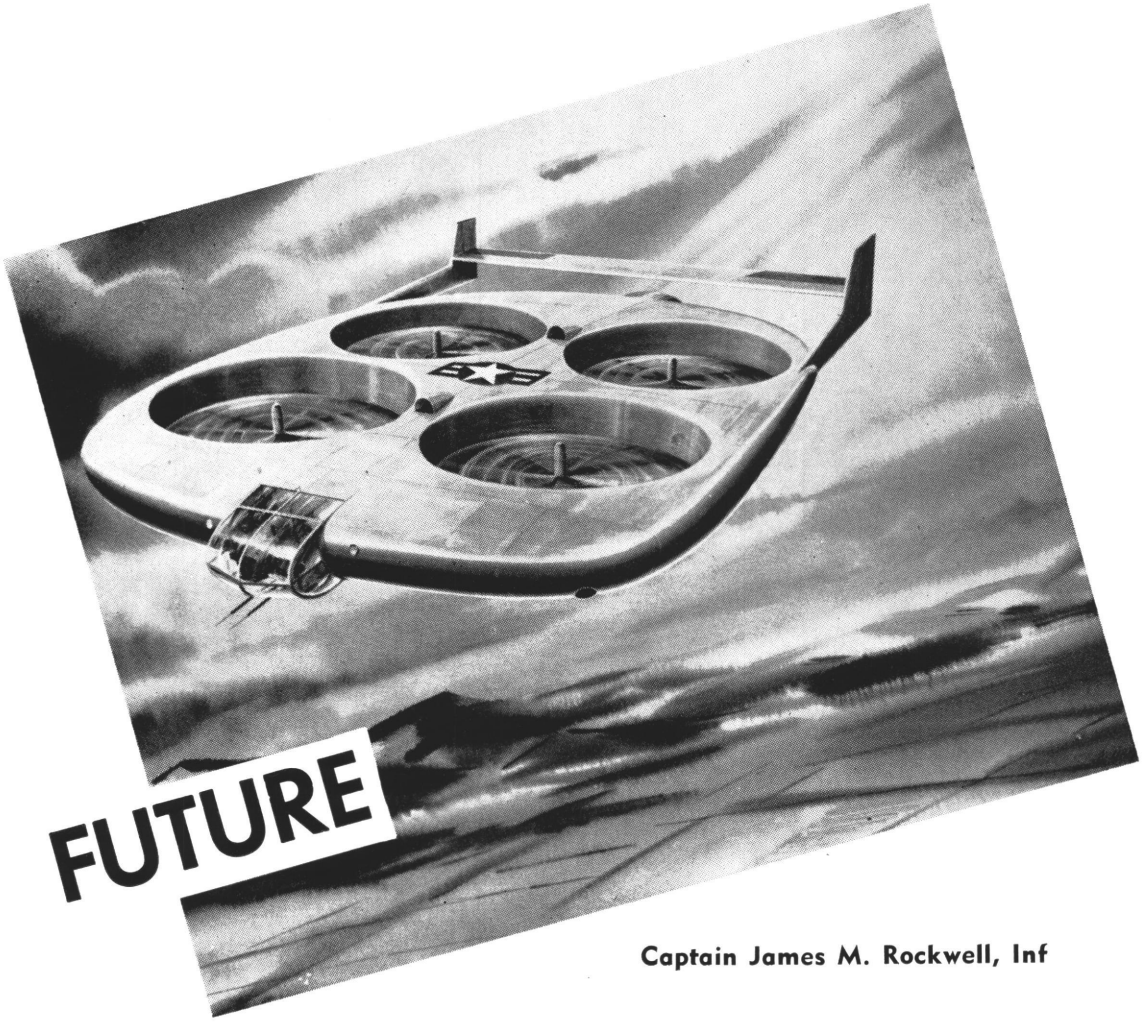
This was a day of discovery for general officers and high-level civilians from the Pentagon. Time after time, under the critical observation of "VIPs," the platoon of 12 armed helicopters flew the terrain around small hills, through draws and trees, to unloose their suppressive fire and to disgorge combat-ready troops.

The idea of the new capability caught the imagination of the planners and leaders and the word went out. Such outstanding officers as Gen Maxwell D. Taylor, Lt Gen James M. Gavin, and Lt Gen C. D. Eddleman have seen the Armed Helicopter Demonstration and have commented favorably.

ACR proposes a completely air-mobile combined-arms unit incorporating as major elements an aerial combat reconnaissance group and a conventional infantry battle group. It is intended that this unit be capable of performing all the conventional missions of cavalry with an air-to-ground and a ground-to-ground fighting capability. All unit personnel and equipment will be air carried, to include administrative support. The U. S. Army Aviation School feels that a test organization of this type should be activated by the Army following completion of proposed testing of the Aerial Combat Reconnaissance Company.

Said the late Brig Gen Bogardus S. Cairns, "The Army Aviation Center can man and equip **now** an Aerial Combat Reconnaissance Unit to fight in an engagement and fulfill the traditional missions of the cavalry."

Now there's a new kind of fighting from helicopters being taught at the U. S. Army Aviation School. It has been a long time coming. In the beginning it had to fight for its very existence against the traditional ideas of warfare and a few nonbelievers. Once it got rolling, it came roaring into the thinking of every Army man from West Point to the Far East. There isn't an idea in the Army today that isn't influenced by it. Aerial Combat Reconnaissance is here to stay. It is a Saber in the Sky.



FUTURE

Captain James M. Rockwell, Inf

THE ARMY REORGANIZATION ACT OF 1950 abolished the Cavalry and created in its place the Armor branch, sometimes called "a continuation of Cavalry." Thus, the United States Army officially recognized a fact which had existed for 50 years, i.e., the horse had been outmoded on the battlefield.

For all practical purposes, the Cavalry era ended with our Indian Wars. Certainly Cavalry was used in minor roles through World War I, but the termination of the Indian Wars marked its end as a decisive branch. The United States Army was slow to recognize the eclipse of Cavalry, and even slower to admit it. The primary reason for this was **empiricism.** The dictionary describes empiricism as "the doctrine that all knowledge is derived from experience." Empiricism is the basis of evolution used by all armed forces.

Experience had shown that the Cavalry had a role to perform, a very important role. This was: "To furnish full terrestrial information of the enemy while screening the movements of its own Army; to pur-

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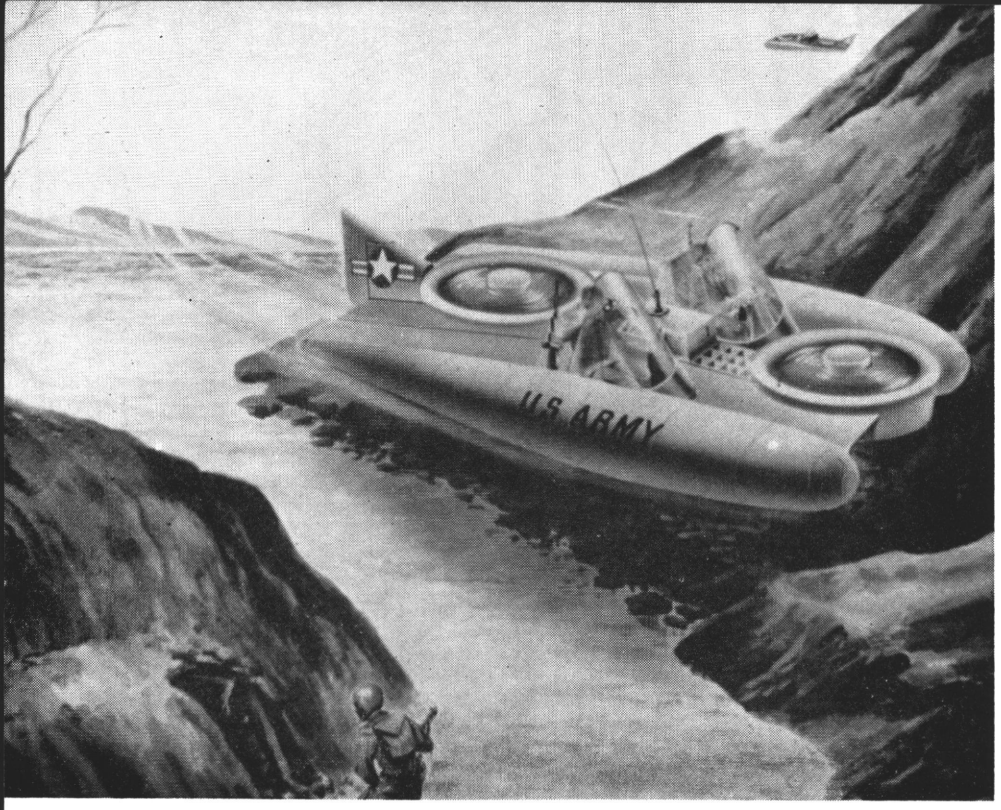
Captain Rockwell is a Project Officer in the Combat Development Office of the U. S. Army Aviation School. Commissioned in 1951, he graduated from jump school in 1952 and served with the 40th Division in Korea in 1952 and 1953. He graduated from fixed wing school in 1955 and helicopter school in 1957.



The smallest will be extremely versatile

sue and demoralize a defeated enemy; at all times to threaten and intercept his communications (lines of supply and command); in battle to strike suddenly and swiftly at weakened points, turn exposed flanks or force or exploit a penetration or breakthrough." (Encyclopedia Brittanica) Experience had also shown that a speed differential was necessary in order to successfully accomplish this role. For over 2,500 years the horse was the vehicle which produced the necessary speed differential.

The advance of tracked vehicles offered promise after World War I, but sufficient experience did not exist as a basis to retire the horse and rely entirely on tracked vehicles. Therefore, the horse remained on active duty.

The German Army was the first to exploit the full potential of the tank. By the end of World War II, the tank had proved its usefulness, to varying degrees of efficiency, in the traditional cavalry role. In addition, tank teams comprised strong striking forces in themselves. Consequently, the horse could be officially retired, using the doctrine of empiricism as a sound basis.

EMPLOYMENT OFFERED

Thus we see that from 1890 until 1939 there was a vacuum in our Army, indeed, in every western army. This vacuum was created when the Cavalry was rendered obsolete. The Cavalry role was there, but a suitable vehicle to produce the speed differential was lacking — **cross-country** speed differential. During World War II the vacuum was adequately filled by armor teamed with conventional type aircraft.

The helicopter became a practical reality during World War II, but its worth and versatility went unproved until the Korean conflict. Since that time a new and radically different concept of employment has been investigated — Aerial Combat Reconnaissance. What initially appeared extremely impractical is now proving to be altogether feasible.

ACR is here to stay. It has the capability of assuming the traditional cavalry roles and performing them better than Lee or Napoleon could have dreamed possible. This is primarily so because we are now operating in three dimensions and have a versatile vehicle which possesses an ever-greater speed **differential** and unlimited cross-country mobility.

CRYSTAL GAZING

Now I will give some of my personal ideas about the future of Aerial Combat Reconnaissance within the next 10 to 15 years.

First, I believe there will be a major "breakthrough" in the field of VTOL aircraft. This should come within the next five years and will make our present helicopter seem like a "model A." The future VTOL aircraft will have little or no resemblance to current VTOL aircraft and will be free of many rotary wing limitations, such as low speed and high complexity. The general configuration may well be that of a "flying saucer." Whatever the configuration, such craft will be aerial vehicles, and I refer to them as such.

FAMILY TYPE

A variety of vehicles, all having the same basic configuration and using the same type powerplant, will evolve. The smallest will be powered by a single gas turbine, the larger by multiple engines, all fueled by low-grade oil which has been only strained and thinned.

A family of vehicles having three or more members will be necessary in order to economically and efficiently accomplish the ever-increasing types of missions. All vehicles will have a true all-weather capability. By this I mean that they will be capable of operating at treetop level under **all** conditions of visibility.

VERSATILITY NECESSARY

The smallest member of the family will be extremely versatile. It will be capable of carrying between one and five passengers. Although it will have the capability of making near vertical takeoffs and landings, it will cruise at speeds greater than those characteristic of fighter aircraft of the World War II period. It will have a cruising time of about three hours. It may or may not be armed depending on its mission. When armed it will have rapid-fire cannons, machine guns, rockets and missiles. It will also have the capability of delivering an atomic punch. As an armed vehicle it will be useful in fire support and fire suppression, armed reconnaissance, and as an anti-vehicle vehicle. In this last role, it will be used to destroy any vehicle, ground or air supported. Unarmed, it may be utilized as an OP, CP, trainer, or for electronic surveillance, command liaison, utility, and target acquisition.

The medium vehicle will be capable of speeds somewhat slower than the reconnaissance vehicle and will have a cruising range of three hours. Normally, it will be capable of mounting suppressive fire kits. It will be capable of carrying 12 combat-equipped troops internally or an external load of up to five tons. This will be the organic means of tactically transporting troops and equipment for combat units.

The heavy vehicle will have a speed comparable to the medium vehicle and a three-hour cruising range. As with the medium-sized vehicle it normally will not be armed but will be capable of mounting suppressive fire kits. Capable of lifting 40 combat-equipped troops internally, or a 10-ton external load, it will be used for the tactical transport of troops and equipment and will be organic to corps or army.

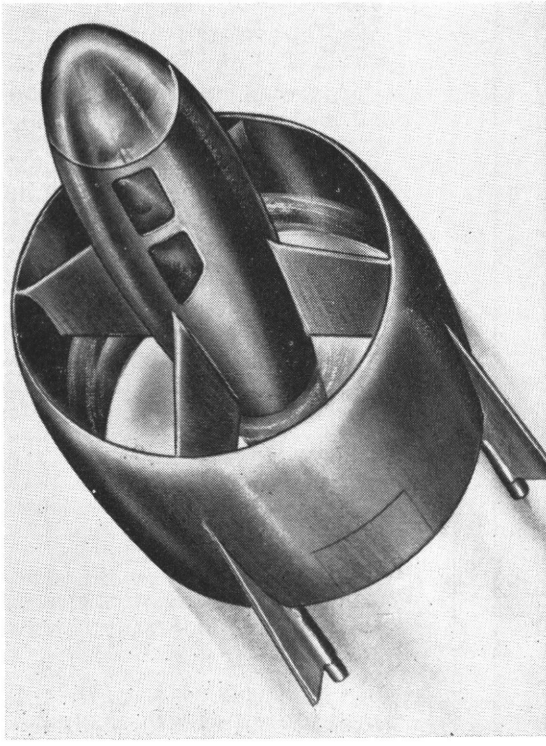
ACR POTENT TOOL

The battlefield of the future will have no clearly defined lines because units will be so widely dispersed. Such dispersal will result in decentralization of command. The massing of troops on a future battlefield will be nothing less than catastrophic unless a relatively simple but foolproof means is devised to preclude the lightning-like destruction of the force by mass destruction weapons. One of the primary means to accomplish this will be by the effective employment of our Aerial Combat Reconnaissance unit. It must be capable of observing every movement of the enemy, as well as screening our own movements.

To accomplish this, relatively small teams of company size will be employed. Each team will be responsible for maintaining constant surveillance over a certain area. These areas will extend as deep as 200 - 300 miles toward the enemy rear. Larger teams may be formed to dominate large areas of terrain for days or even weeks at a time. They would move about quickly, frequently destroying enemy installations and personnel by organic means or by directing short- and medium-range ballistic and guided missiles. Another capability would be the laying of minefields and emplacing atomic demolitions.

The future of Aerial Combat Reconnaissance is unlimited. Individuals of great vision and daring have already pioneered the field in their "model A's." We must now plan for the fullest exploitation of this new "saber" in case of future need. I believe the main limiting factor will not be the state of aircraft development, but rather our own lack of imagination and resourcefulness.

Organic means of transport?



I FLEW FOR AERIAL COMBAT RECONNAISSANCE

Warrant Officer Harold D. Wilcoxen, TC

LAST SUMMER I FLEW with the Aerial Combat Reconnaissance Unit. I shall always remember it as my first unusual experience in Army Aviation.

I was out of rotary wing school only a month when I was selected to fly in a demonstration for the West Point cadets (Class of '59) who were coming to the Aviation Center for an introduction to Army Aviation.

I had seen the demonstration as a student, and I had also flown copilot in a Chickasaw on previous demonstrations. I always marveled at how the pilots maneuvered the Sioux around; it looked like a lot of fun. My previous experience was 200 hours of flight around the "idiot" circle. This looked like an opportunity to get out and really let off some steam.

I was assigned to a Sioux which was equipped with four rockets and four 30-caliber machineguns. There were three flights of four Sioux each in the ACR Company. I was assigned to Red flight.

The show also had one Chickasaw, one Raven, four Shawnees, and a company of Choctaws.

During the following week, I began to find out a lot of things I had never even thought about before. Our flying was strictly treetop level and fast. It required a great deal of precision, as each part was perfectly timed to keep it well organized, to control all aircraft positions to prevent collisions on entering the area, which would be under artillery fire during the show. This meant that all transmissions must be short and no idle chatter, as the entire production was radio controlled.

With the aircraft armed it was just heavy enough that you knew it was loaded. I had flown loads before, but not under field conditions. This was my first encounter with downwind takeoffs in a semiloaded condition, as we were required to take off in whatever direction we were going next due to time and terrain. After I had settled back to the ground on one takeoff I saw that I would have to use more planning and judgment than I had used previously. It required a lot of thinking, planning, and then some. Normal flight in this demonstration with the Sioux required about 29" manifold pressure. The only time I pulled under 25" was on the ground.

The wind entered into the picture more than anything else. We had to land at certain positions during different parts of the show. In a crosswind it meant careful piloting because in some areas we had to hover at 35 feet to clear the trees to fire.

Another big factor, rpm, required a lot of concentration, too. I was skeptical about overreving, since it had been drilled into me at school not to overrev. It didn't take me long to find out that if I wanted to hover at those altitudes with the load I had, I was going to have to overrev. I usually broke ground at 3400 and by the time I stopped climbing to fire I would be at 3100. After a few seconds of firing I would start to descend from loss of rpm. It would usually be at 2700 then. On straight and level flying over the trees I usually ran at 3200, because if the occasion called for power to climb I had it.

The gunsights were mounted directly in front of the pilot on the left side of the radio console. If adjusted right it was very accurate. The trigger was on the front of the cyclic stick and the control box mounted on the floor between your feet, which would let you fire your rockets or guns either automatically or semiautomatically. There wasn't too much recoil. The noise was worse. The rockets went so fast you could hardly tell you had fired them; but the firing guns dulled your senses because of the violent noise they made.

I don't recall looking at the airspeed very much. We usually flew as fast as we could and

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CWO Wilcoxen graduated from helicopter school in May 1957. He is an instructor in the Choctaw (H-34) Branch, Department of Rotary Wing Training, USAAVNS, Fort Rucker, Alabama. He has logged more than 1,300 flight hours.

as fast as the ship would go. Our groundspeed was the most important, except for takeoff and approaches. Each approach was usually a flare before reaching an open area and dropping it down to the ground. Each takeoff was just a matter of pulling full power and hoping to hit translational lift right away.

The aircraft held up surprisingly well despite the hard work required of it. Only minor things went wrong, such as instruments, grease boots and rotor blade dents.

One of the major points of safety was to refrain from hurrying too much. The overall safety was well taken care of by your higher personnel, such as the direction the aircraft would approach with the armament (away from the stands and direction of fire with respect to civilian property). The small points were the pilots' responsibility. An incident in the case of one pilot in a hurry to leave illustrates this. As soon as he was gassed he took off without checking the fuel tank. The serviceman hadn't put the cap on tightly; it jarred loose on takeoff and gas started spilling out over the exhaust stacks. An alert wingman saw the smoke and radioed the pilot before the aircraft caught fire.

Another important point was reloading. This was usually done in a hurry, and the pilots had to help make sure it was done correctly. Also he had to get out of the ship after each phase of firing to manually clear each gun and rocket. It would have been easy to land on an uneven spot and jump out to clear the weapon, or forget to loosen a control, or not put on your safety belt getting back in. I was always following Red Leader who was experienced in doing this type of flying, and I had to hustle to keep up with him. When he had his weapons clear and was ready to go, I was supposed to be ready also.

The demonstration is a terrific firepower display on the part of the helicopters, showing they are capable of doing almost anything.

After a week of rehearsing was over and the show was done, I was glad to have been included in it; it gave me an opportunity to gain a wealth of knowledge. This, plus the experience and self-confidence in flying the helicopter, has been of enormous value.

PILOT JOE DOAKES filed an instrument flight plan from Cairns AAF to Tallahassee with Cairns AAF as an alternate. He flew to Tallahassee and, after executing his second missed approach and following all clearances and regulations properly, requested a clearance to Cairns AAF as an alternate. He requested, "Route V–7 to Dothan direct to Cairns AAF; altitude 3,000′, true airspeed 120 knots, 3 hours fuel aboard." Tallahassee radio accepted his request and advised him to stand by.

The pilot received the following clearance: "ATC clears Army 12345 to Cairns AAF via V–7 Dothan, direct Cairns cruise 3,000′."

The pilot proceeded en route via V–7 maintaining 3,000′. After passing Dothan and making a position report to Dothan, he contacted Cairns approach control and reported leaving 3,000′, reported initial, and then on final, contacted the tower for clearance to land.

The pilot made an error in one of the following:

☐ (a) He should have maintained 3,000′ until over the Cairns facility before starting his descent.

☐ (b) He did not need clearance from the tower for landing as he was cleared to the airfield in his initial clearance.

☐ (c) He did not request Flight Service be notified of his change in destination when proceeding to an alternate.

☐ (d) He did not need to report to Dothan over their facility as he was on a cruise clearance.

☐ (e) He should have made only one missed approach before requesting clearance to an alternate, even though he was cleared for the second approach.

The recommended solution to the PUZZLER may be found on page 26.

Aerial Combat Reconnaissance Company

DOCTRINE AND TACTICS

Major Karl S. Patton, Arty

A STUDY of the earliest records of warfare indicates that reconnaissance tactics and missions have changed very little over the centuries. Basic principles are as important now as ever. The principle of basing the mission on the capability of personnel and equipment is also as old as recorded history, but so much has been done to improve equipment that it merits additional comment.

Biblical history tells us that Noah sent out a dove from the ark with the mission of finding land. He was using the best available means. We are further told that this method, after several "negative reports," resulted in "material intelligence" — in the form of an olive leaf. The book of Genesis places this event around 5,000 years ago. The reconnaissance methods we will have 5,000 years from now cannot accurately be predicted; however, it is apparent that electronic equipment will be used in ever-increasing amounts. But until such equipment replaces visual expedients, the U. S. Army is continuing development of Aerial Combat Reconnaissance Companies. This concept gives promise of being one of the most efficient means the present-day commander has for obtaining overall battlefield intelligence.

Again going back into history for incidents to illustrate a point, the Great Wall of China was built to protect the Chinese from the Tartars of the North. Now, obviously, a wall that long cannot be adequately defended, and presumably it was not built with that idea in mind. It was built to stop, or at least retard, hostile cavalry. The Tartars could not conceive of fighting a war without cavalry. Therefore, the Chinese were safe from a major invasion until Genghis Khan bribed his way through a gate in the wall in the 12th Century, avoiding a direct attack on the wall, as Hitler by an end run avoided a direct attack on France's Maginot Line in the 20th Century.

Anyone proposing construction of such a barrier against modern war machinery in this atomic age would be ridiculed. Certain types of barriers do have value for varying degrees of protection against hostile ground forces. These are useless against aerial forces such as the Aerial Combat Reconnaissance Companies. This unit recognizes no barrier except weather, and even this is being constantly lowered by continuous improvement of navigational facilities.

The purpose here is to draw attention to two facts: the necessity for reconnaissance and the importance of aerial cavalry — and to present currently taught concepts of employment of Aerial Combat Reconnaissance Companies.

Visualizing the classical role of cavalry to be reconnaissance and exploitation, aerial combat reconnaissance was developed to greatly increase the Army's capability in this field. Depending on maneuverability for protection, rather than massive armor, Aerial Combat Reconnaissance Companies are provided three basic elements: a reconnaissance and surveillance element capable of reconnoitering, in a matter of hours, large areas that would take days for ground patrols; a troop force that can move rapidly to vantage points without regard for barriers that would seriously hamper earthbound forces; and a "heavy weapons" element to provide artillery — antitank backup. These elements are armed with machineguns and rockets.

These three elements are based on the doctrinal and organizational concepts proposed by the United States Army Aviation School. Proposed doctrinal concept provides for use of armed Army helicopters in support, since mo-

Major Patton is Chief of the Doctrine Division, Combat Development Office, USAAVNS, Fort Rucker, Alabama. He is fixed wing qualified, instrument rated and has logged approximately 3,300 hours.

bility and firepower are essential to successful offensive operations.

The three elements mentioned follow both this concept and proposed organizational concepts which provide rapid reconnaissance, intelligence collection, a considerable mobility differential over ground elements, immediate firepower, and airmobile infantry troops in the battle area.

With these capabilities, the following missions are then suitable for assignment to Aerial Combat Reconnaissance elements in support of a division in the attack: reconnaissance by fire, airlift of patrols to make detailed ground reconnaissance for those missions requiring dismounted observers, collection of battlefield intelligence, exploitation of atomic fires, action as covering force in attack or in retrograde movements, seizure of critical terrain features, flank guard action, and counter-reconnaissance on wide frontages.

This listing cannot be construed as the only missions Aerial Combat Reconnaissance Companies can be assigned. Like all other tools of combat, the only limiting factor is the imagination of the commander, within the capability of man and his equipment.

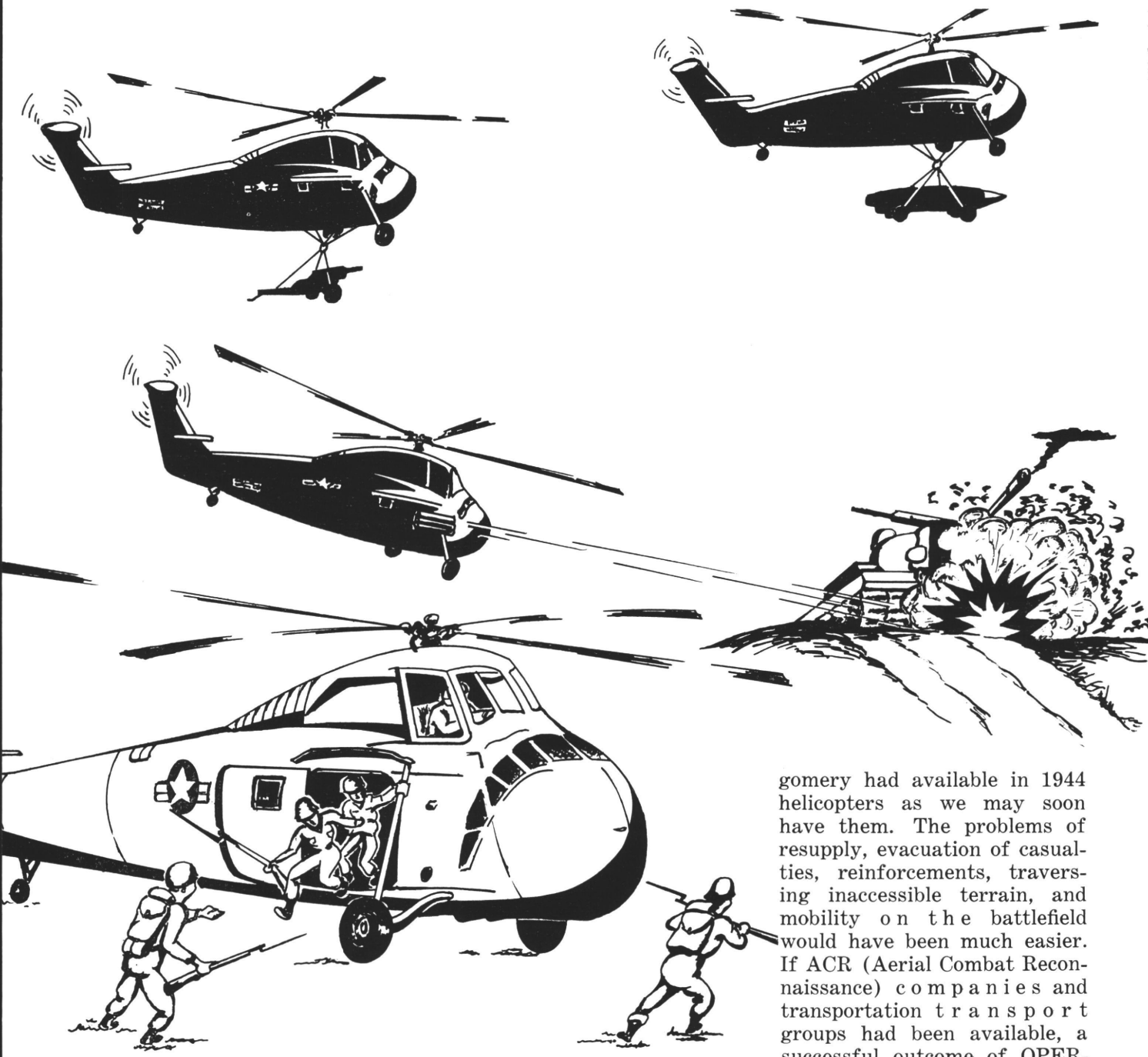
Back to history for a moment: On the day before the Battle of Waterloo, Wellington is supposed to have told Uxbridge that he had no idea how he would fight the battle the next day. After all, Napoleon would attack first and had not advised Wellington as to how he would do it; consequently, the battle would be fought as the situation dictated.

This episode demonstrates Wellington's recognition of the need for flexibility, which is certainly far more important on the atomic battlefield than it could ever have been in early 19th Century combat. If there is a more flexible fighting force than an Aerial Combat Reconnaissance Company this writer has yet to hear of it. For those who would disparage this flexibility on the ground that aircraft are too vulnerable to small arms, the answer at this time is that experiments are being conducted on a priority basis to determine "just how vulnerable is a target that is bobbing up and down and firing machineguns and rockets in opposition." Available experience to date, that of the French use of helicopters in Algeria, seems to indicate that this vulnerability is not nearly so formidable a restriction as was once believed.

Nevertheless it is a consideration and since a direct hit in a vulnerable spot, such as a burst of fire through the cockpit of the aircraft, may cost the commander a squad of infantry, combat tactics are in a continuous state of review and test to develop better methods of employment. Current thinking has these aerial vehicles using mountains and hills much like the Navy uses islands to keep in the radar "blind zone" until the last possible moment. Many faults of terrain that are deadly to ground forces may be used as defiladed routes of approach by Aerial Combat Reconnaissance elements. Wide, deep draws and narrow valleys are ideal for this type of approach. Even when a narrow valley leads right to an enemy strong point, the elements can approach from a course parallel to the valley until time to launch their attack.

In a troop-carrying and surveillance role, the aerial vehicles again provide invaluable support. These two missions are combined in certain operations, such as rapid massing for an attack, then dispersing again. It immediately becomes apparent that rapid mobility is a necessity when the importance of timing and the distances involved in operations in atomic warfare are considered. Positioning is no less important than timing. The advantages of being able to place troops on any desired site around the perimeter of an objective, to include either side of a barrier, natural or otherwise, is well recognized. Since this positioning and timing cannot be effected without knowledge of where and when, reconnaissance is required; and any extensive unoccupied areas, both forward of the battle position and within the battle area, must be kept under constant surveillance to give early warning of enemy movement. With earlier warning, counteractions, such as road blocks and reduction or bypassing of hostile positions, can be more effectively carried out.

As the Chinese militarist, Sun Tzu, wrote in 500 B. C., "The way to avoid what is strong is to strike what is weak," and Aerial Combat Reconnaissance Companies can stand ready and able to assist the commander in outmaneuvering numerically superior forces.



HISTORY HAS A WAY of pointing out obvious mistakes and subjecting to debate mistakes that are not so obvious. Looking back over the span of 14 years with 20-20 hindsight and reviewing the facts of an operation can cause one to wonder why such and so was not done, why they didn't do it this way or that, and what if. Reflections of this nature by military men can be highly rewarding in new and revealing glimpses of changing tactics.

What if Field Marshal Montgomery had available in 1944 helicopters as we may soon have them. The problems of resupply, evacuation of casualties, reinforcements, traversing inaccessible terrain, and mobility on the battlefield would have been much easier. If ACR (Aerial Combat Reconnaissance) companies and transportation transport groups had been available, a successful outcome of OPERATION MARKET-GARDEN in Holland during World War II is in the realm of possibility.

THE PLAN

OPERATION MARKET-GARDEN, conceived and executed by Field Marshal Montgomery, was planned in three

ARMY AVIATION and The AIRBORNE

Captain John H. Richardson, Arty

phases: the airborne landings, to be made simultaneously on 17 September 1944 in the vicinity of Arnhem, Nijmegen, and Eindhoven; the link-up, to be effected by the Second Army, XXX Corps making the penetration, by driving north from a line along the Meuse-Escaut Canal to link up with the 101st, 82nd, and 1st in that order; and from this salient to drive clear to the Zuider Zee, thereby achieving all objectives.

The First Allied Airborne Army was composed of the American 82nd and 101st Airborne Divisions, the 1st Airborne Division (British), and a Polish Brigade. The mission of OPERATION MARKET-GARDEN was to land deep in German-held Holland — just as the German paratroops had done some four years earlier — and drive a wedge from Belgium to the Zuider Zee. Thereby, they would outflank the West Wall, provide a base from which to attack the vital Ruhr area, and cut off the German troops in the north of Holland.

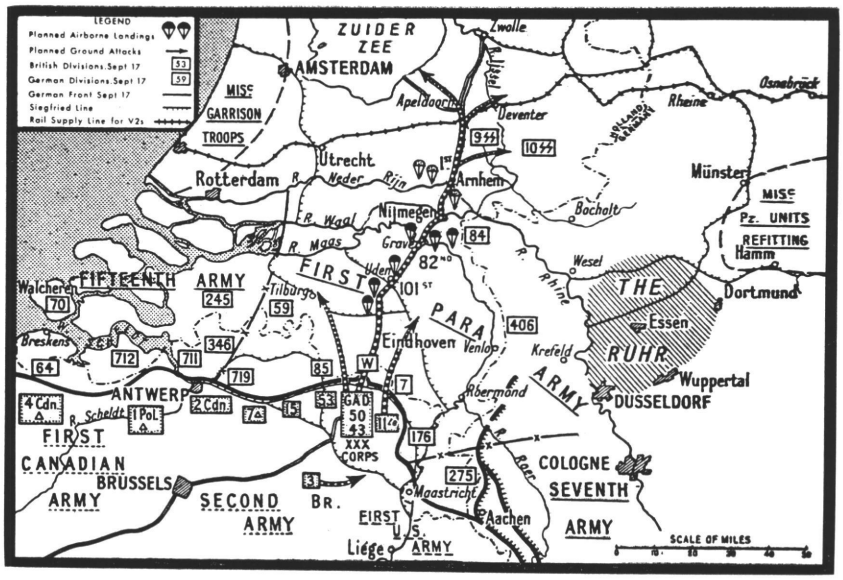
WHAT MIGHT HAVE HAPPENED

The skies over Holland darken as 1,500 troop transports, 500 troop-carrying gliders, and more than 1,200 fighter escorts make their way to the drop zones. German garrisons, complacent with the front so remote, are startled by the sight of 20,000 parachutists descending into the heart of the German-dominated Dutch homeland. Armed helicopters arrive simultaneously. The British 1st Division lands 6 miles west of Arnhem. Organization of the airhead is begun immediately as the 11th ACR Company assists with suppressive fires.

WHAT HAPPENED

The British 1st Airborne landed, as planned, 6 miles west of Arnhem. This was subsequently acknowledged as a tactical error. With the British landing so far from the objective, the shocked German garrisons had time to regroup. Unfortunately, the German general responsible for the defense of Holland, Field Marshal Model, was in the Arnhem area.

ARMY AVIATION AND THE AIRBORNE was suggested by Col Daniel H. Heyne, former Chief of Staff, U. S. Army Aviation Center, and written by Capt John H. Richardson, Assistant Secretary, USAAVNS. Captain Richardson is a dual qualified Army Aviator.



Area of violent action

Utilizing his knowledge of airborne tactics, he was able to rally the disorganized Germans into a strong defensive force.

In "the outstanding independent Parachute Battalion of the war" (Gavin's AIRBORNE WARFARE, p 120), Lt Col J. D. Frost's 2nd Parachute Battalion made its way north along the Neder Rijn to the objective: the Arnhem Highway bridge. Frost's leading unit, Company A, was able to reach the north end of the bridge just as a party of SS troops reached the south end. Six hours had been required to cover the 6 miles from the drop zone. Joined at the north end by fragments of the battalion, Frost was cut off from the remainder of the division. With less than 600 men, Frost held the north end of the bridge for 3 days, preventing its use by the Germans. The division, meanwhile, was becoming heavily engaged in its attempt to maintain the airhead.

WHAT MIGHT HAVE HAPPENED

Elements of the 1st Transportation Transport Group arrive minutes after the drop, unload ¼-ton trucks, gassed and ready for use, supplies and antitank weapons. The 2nd Parachute Battalion, under Lt Col J. D. Frost, was predesignated to move by helicopter from the drop zone to the objective of the Arnhem bridge. As soon as loads are dropped, light cargo companies embark the 2nd Bn and rendezvous with the reconnaissance platoon of the ACR Company for the assault on the bridges.

Frost directs Company C to the railroad bridge and companies A and B to the highway bridge. Just as the heliborne forces reach the railroad bridge, it is blown by the Germans. Following the prearranged plan, Company C diverts in midair to assist in the capture of the highway bridge. Making a frontal assault, hiding behind buildings and trees lining the river, the ACRs fan out from both ends of the bridge, forcing the defenders to keep down. A safe landing is made, and the 2nd Bn goes about the task of securing the bridgehead.

Delivery of Frost's Bn takes 6 minutes from takeoff in the division drop zone to the bridge; 10 minutes to debark, and the transports are on the way back for the remainder of the brigade. Something like 30 minutes has transpired since the Bn dropped.

The defenders, now under the personal command of Field Marshal Model, began to rally. Tanks and SP guns in the vicinity are ordered forward. Anticipating this, the second lift brings forward antitank weapons and ammunition in addition to two more companies of paratroopers. Following the capture and security of the bridgehead, the transports ready for the return trip by loading early casualties.

WHAT REALLY HAPPENED

To the south the Americans were enjoying more success. One battalion of Gavin's 82nd Airborne captured the vital Maas bridge within an hour. Before dark, the route into Nijmegen was secured by capturing one of the bridges over the Maas-Waal Canal, and establishing a cordon across the neck of the rivers along the Grosbeck Ridge. Having secured this airhead, Gavin sent the only Bn he could spare to test the defense of the massive bridge that spans the Waal in the vicinity of Nijmegen. This Bn was stopped some 400 yards short by the Germans, who had thrown a strong protective cordon across the south end of the bridge.

WHAT MIGHT HAVE HAPPENED

To the South, the American 82nd lands in the vicinity of Nijmegen, seizing the bridge over the Maas-Waal Canal at Heuman and the vital Grave bridge by mid-afternoon. One regiment captures the town of Grosbeck, and the route into Nijmegen is completed. While

this action is taking place, the last objective, the Nijmegen bridge, is assaulted by the 12th ACR Company. It consists of 12 reconnaissance type helicopters, armed with .50 cal MGs and 2.36-inch rockets; 4 utility helicopters, bearing aerial rockets and bazookas; and 4 light cargo troop transport helicopters, carrying a platoon of heavily armed infantry. The ACR Company sweeps down the river. The infantry elements, supported by suppressive fire from the helicopters, drive the small German garrison from their position.

Suppressive fire aids attacking troops

WHAT REALLY HAPPENED

South of the Maas, the 101st, under Taylor, landed and seized the four nearby bridges with little opposition. The southernmost objective, the bridge over the Wilhelmina Canal at Zon, was demolished just as the attacking parachutists approached.

While this action was taking place in the north, General Harrocks' XXX Corps made final preparations to attack at 1435 on the 17th. The highway to Eindhoven, leading north into Holland, was heavily defended. Harrocks anticipated only a defensive crust and then a free road to Taylor's 101st. Link-up was made as planned on the afternoon of the 18th. A delay of 12 hours was required to rebuild the blown bridge at Zon.

This delay was sorely felt in Arnhem. Weather delayed the second lift by 5 hours. Unaware of the delay, General Urquhart, commander of the British 1st, led a furious battle to maintain the airhead, losing the better part of two battalions in the action. On D plus 2 (19 Sep) major elements of the third lift could not leave the ground. The Polish Brigade, scheduled to land very near the Arnhem bridge, was held on the ground. Of the total number of aircraft able to leave the ground, less than half could find the drop zone. DZs, planned prior to D day, were still in enemy hands; and of the 1431 tons of supplies dropped that day, it was estimated that less than 200 tons were recovered. The remainder fell into enemy hands.

D plus 3 was a total "hold." On D plus 4, although the aircraft were able to leave the ground, less than half arrived to give any relief to the beleaguered 1st. On D plus 5 the England-based ships were grounded again; by the 7th day the situation at Arnhem was beyond redemption by airborne forces.

WHAT MIGHT HAVE HAPPENED

Landing between Eindhoven and Grave, Taylor's 101st seized four bridges with little opposition. Within a few hours the 502nd Regiment took the village of St Oedenrode, the Dommel River bridge, and a highway bridge near Best. As the 506th worked south, the 21st ACR Company crossed its start point near the XXX Corps front line, some 25 miles to the south. German defenders of the Wilhelmina Canal bridge weaken under the devastating cross fire of the ACR Company and the 506th, but succeed in blowing up two of the bridges before they can be captured. The third, the bridge at Zon, falls to the 506th.

Harrocks' XXX Corps attacks at 1435 on the 17th. Making a narrow armored penetration along the Eindhoven highway, its flanks are given additional strength by choppers from the reconnaissance platoon of the 10th ACR Company. Flying just above the tree tops, wooded areas and farm houses are searched out by the highly mobile reconnaissance helicopters. Transmitting warnings of enemy action to the armored column provides speedy intelligence to supporting infantry and artillery.

WHAT REALLY HAPPENED

The 1st Division was whittled down slowly. By the 21st, the 3,500 survivors (of over 10,000 troops landed) had been compressed into an area of 1,000 by 2,000 yards. Several attempts to give relief resulted

Firepower and mobility win fire fights

in failure. The situation appeared hopeless. During the night of 25-26 September the evacuation of the remnants was begun. Wounded were left behind to give an appearance of continuing defense. At dawn the evacuation was stopped by the German machineguns sweeping the river. By then 2,163 men of the 1st had reached the safety of the south bank. Of the 10,000 landed, only these few were rescued.

Capture of the Nijmegen bridge by the 82nd had taken three days. By making a daylight assault across the 400-yard river, a concerted attack from both north and south had succeeded in wresting the prized bridge from the Germans. Simultaneously, the valiant defenders of the Arnhem bridge were being driven from their last strongholds by the Germans. At nearly the same time that the first British tank was crossing the Nijmegen bridge going north, the first German tank was crossing the Arnhem bridge going south.

During the night of the 20th the Germans made good use of the bridge; and before the Allied column could resume the attack, the Germans had effectively blocked the path. After the withdrawal of the 1st Division from the Arnhem area, there were seven months of bitter struggle before British troops once again entered Arnhem.

WHAT MIGHT HAVE HAPPENED

D plus 2 dawns with a dark, low-overcast sky. Preplanned resupply missions appear impossible from fog-bound England. Aware of the need for supplies, HQ signals the XXX Corps to start resupply by helicopter immediately. Loading plans, approach routes, and check-point lists are put into effect. Supplies, packaged and arranged prior to D Day, are loaded into aircraft of three transportation transport groups, the force from three field armies. Pilots receive last minute briefings, make final load checks, and over 1,200 tons of supplies are on the way. The longest flight is to the 1st Division at Arnhem, 65 air miles, well within the capability of the transport choppers and fixed wing aircraft.

The weather is ideal for helicopter operations — low ceilings, moderate temperatures, and a slight breeze. Flying at treetop level and navigating by check points determined prior to D Day, the 1st transport group made the flight to Arnhem in one hour. Little ground fire is encountered, since flight paths center over the marshy areas. German defenses are grouped about communications and road networks. Although planned drop zones are still held by the enemy, no supplies are lost as the transports land squarely within the perimeter. Pathfinders, sent in ahead of the transports, direct each wave to the desired area. Supplies are carried forward to the fighting units themselves; few if any additional troops are called back to recover the supplies. Casualties of two days of close combat are loaded for the return trip. Turn-around time: 3 hours!

WHAT REALLY HAPPENED

1. **About eight tanks lying about in sub-unit areas; very untidy but not otherwise causing us any trouble.**

2. **Now using as many German weapons as we have British. MGs most effective when aiming toward Germany.**

3. **Dutch people grand but Dutch tobacco rather stringy.**

4. **Great beard growing competition on in our unit, but no time to check up on winner.**

5. **Have to release birds owing to shortage of food and water.**

This message, sent by the last carrier pigeon brought from England, is symbolic of the steadfast endurance and abiding courage of the gallant defenders of Arnhem. Without relief, out-numbered, heavily out-gunned, the 1st was forced to withdraw the night of the 25th.

The withdrawal of the British 1st Airborne Division from

the Arnhem area brought to an end the last major airborne operation of World War II. Although valuable ground had been gained and the over-all position of the Allies had been improved, the major objectives were not accomplished.

WHAT MIGHT HAVE HAPPENED

D plus 3, the England-based aircraft are completely grounded. The Polish Brigade, scheduled to land very near the Arnhem Bridge, is unable to leave the ground. Urgent messages, delivered by helicopter since the communications failure, urge immediate assistance for the British at the bridge. One infantry battalion from the American 43rd Division is rapidly outfitted to reinforce the vital bridgehead. Training heliborne forces is but a matter of hours; no special equipment or conditioning is necessary, and unit integrity is maintained during the landing. Engagement of the enemy is possible immediately after landing.

Airborne forces are especially vulnerable to armor, and all available tanks and SP weapons are thrown against the troops in Arnhem. Utilizing the light cargo helicopters of the transport group, a 105 mm battalion is lifted to the Arnhem area. With two helicopters per howitzer section, three companies of light transport and one company of medium transport helicopters make the lift in one flight. All available space is used for additional ammunition. The use of artillery spells the weary paratroops and affords that force necessary to effect the link-up with division main.

The Guards armored division moves at top speed, exploiting the route laid open by the airborne attack. By D plus 5, link-up with the British 1st is made and the route to the Zuider Zee is wide open.

Supplies are the bloodstream of battle

CONCLUSION

Had this operation been as daring in tactical execution as it was in strategic concept, it might have been a complete triumph. Many facets of the operation went amiss, communications failed, weather closed in, time and distance from objectives made swift capture impossible, but the primary hindrance was the weather. A continuous flow of supplies and reinforcements were required to maintain the vast operation of the ground, but weather, both in England at the air bases and in Holland, dealt the crucial blows.

Yes, had it happened this way the end of the war may have come considerably sooner, and tens of thousands of Allied lives might have been saved. Shortening of the war was just the thought in Montgomery's plan.

Tactics have varied with every new development, every new idea. Often the change in tactical execution is so slight that realization of the change escapes the mind. Occasionally the advent of a new weapon such as the nuclear bomb (or the bow and arrow or gunpowder in their day) brings sweeping changes to tactical planning. History has provided us with a tactical example to show what one weapon of today could have done for an operation of the past.

Objectives were lost for the sake of a few minutes travel time; mobility was hampered for lack of a suitable vehicle. Untenable terrain and weather prevented timely resupply and reinforcement; the absence of artillery support made the troops particularly vulnerable to armor. ACRs and transport helicopters would have solved many of these problems.

Only a few of the limitless uses for the helicopter has been applied here. The uses and capabilities of the helicopter are bound only by the imagination of the commander; and the commander must rely on the Army Aviator for his source of information — you!

The Horse Cavalry Is Gone
But the Spirit Survives

FLYABLE and FIREABLE

SOME OF OUR LEADING Army Aviators have vigorously advocated a type of maintenance that originated with the cavalryman who cared for his own horse. If an aviator and his crew chief live with an airplane, they should know it better than a crew assigned randomly. The argument for the aviator, crew chief, and aircraft to be a tightly knit unit is sound.

There's a solid basis for promoting a program for maintaining Army aircraft in a manner demanded of the old time horse soldier. It follows the traditional Army system in all the combat arms of caring for equipment.

John C. Cremony in his book LIFE AMONG THE APACHES tells about the care a trusty horse received after a particularly hard and dangerous journey from Socorro to Dona Ana, New Mexico in the 1850s. The distance traveled measured 125 miles but the last 70 miles were at a dead run, escaping the savage Apache. Cremony safely reached his destination at midnight. "So soon as I arrived, I rubbed my horse down dry with good, soft straw. This operation required about two hours. I then washed him all over with strong whisky and water, and again rubbed him dry. This was followed by taking off his shoes and giving him about two quarts of whisky and water as a draught. His whole body and limbs were then swathed in blankets, a mess of cut hay, sprinkled with water and mixed with a couple of pounds of raw steak (cut in small pieces) was given him to eat, and a deep bed of clean, dry straw prepared for him to sink into. These duties kept me up until five o'clock a.m., when I refreshed my inner man with a wholesome toddy and sought repose." Cremony sought his bed some five hours after arriving, those five hours having been used to care for his horse. He notes later that the animal suffered no ill effects and "on many a subsequent occasion he served me with equal zeal and capability."

ARMY SYSTEM

Cremony's type of maintenance of his horse is the kind that appeals to Army Aviation personnel for their aircraft. It's the Army system of maintaining all types of equipment and is based on two important premises: the individual's responsibility and his sense of pride and ownership. The task commander and his crew keep their tank in excellent condition, not only because responsibility is clearly defined but because all are proud to have a smooth-working and efficient piece of equipment.

Fixed assignment of crews, including flight personnel, to each aircraft and the assumption of basic maintenance responsibility by each aircraft commander is the only solution to combat utilization of the Army flying machine.

8305TH CONCEPT

This is the concept of maintenance adopted by the 8305th Aerial Combat Reconnaissance Company* (Experimental) at Fort Rucker, Alabama, insofar as is possible. Because of the nature of the company's mission, it is policy to cross-train all pilots in all aircraft and weapon systems; so it is not always possible for the same pilot to fly the same helicopter. The requirement to perform several "shoots" at once prohibits "one-pilot" control of a certain helicopter. Because of the demands on enlisted me-

**Originally activated as 7292nd Aerial Combat Reconnaissance Unit (Experimental).*

chanics for KP, guard, and other duties, they sometimes must leave their assigned helicopter in other hands. But as far as is possible, Cremony's type of maintenance is followed by the 38 assigned helicopter mechanics. These mechanics work on armament, too.

The 8305 ACR Co, a part of the 2nd BG, 31st Infantry, has 26 helicopters assigned: 15 EH-13 Sioux, 1 EH-13-H model, 4 EH-19 Chickasaw, 4 EH-34 Choctaw, and 2 EH-21 Shawnee. These aircraft, armed to the hilt with rockets and machineguns, are used in a manner more akin to combat than those of any other unit in the Army. These are the machines used in the firepower demonstrations at Fort Rucker and other installations throughout the country. They also play a part as the precision flight team, or "Square Dance Team," for airshows and airpower demonstrations.

AVAILABILITY HIGH

The company may be called on at a day's notice to put on a "shoot," as the demonstrations are called. This calls for a high availability rate, and no show has ever been postponed for lack of aircraft. No spares are carried on the TD. In fact, there is no TD; this is an experimental company feeling its way, under close scrutiny of the entire high command, in the manner of equipment and employment of it.

The helicopters are used to the maximum. Added weight of armament and ammunition makes maximum power necessary for taking off and landing, particularly in summer heat and humidity. This practice of maximum performance has not created any unusual maintenance problems. In fact, the experiments conducted at Fort Rucker indicate that helicopters can take even more punishment than the most avid manufacturer's representative claimed.

ACR Co flight and maintenance personnel do not keep regular office hours. They may be called upon to perform a demonstration at the Infantry Center one day and the following week appear at the Armor Center. After these shoots they return home to take care of the red-lined conditions; no one rests until the machines are flyable — and fireable. They consider maintenance and armament as one. If the machine can't fire, it's of no tactical value; normally it is administratively grounded until it again functions as a weapons platform.

The postflight shows particular attention being paid the tail rotor system. Shell casings from machinegun and rocket blowback sometimes damage tail rotor blades. Very little damage occurs to the bubble, although some have cracked under concussion of machinegun and rocket fire. On occasion the ADF cover has received damage from rocket blowback, and the Grimes anticollision has received light damage. Spot painting and work to stop corrosion accounts for more time than in conventional maintenance.

COMBAT TYPE FLYING

With the type of flying being done, at treetop level, "give or take six inches," as one ACR Co aviator said, there's no avoiding some damage. The rate of blade cap damage is high, due to the necessity for going into confined areas at a high rate of speed and descent and hovering in confined areas and then rising to let loose a blast of suppressive fire.

In spite of this rigorous use, the operating cost of the Sioux used in demonstrations and experiments is lower than those in which instruction is given by the U. S. Army Aviation School. High flight hours account for this. As with all aircraft, high utilization means lower cost.

When there's no shoot, the unit tests experimental equipment and even builds its own kits. They test present equipment and armament items for varied civilian companies. They are now testing and developing hydraulic chargers for recharging machineguns, including NATO M-60 7.62 machinegun. Weapons systems of local manufacture are continually explored. "We can make our own kit for about $200," one armament officer said, "that would cost us $10,000 at a manufacturer's plant."

Also being evaluated is a helmet-mounted reflex sight system for firing machineguns and rockets. This experimental sight system gives the pilot a complete target sight picture regardless of the location of his head. Normal sights require the pilot to restrict his head movements to a minimum. Every little thing like this helps an aviator to fire when he's flying.

The maintenance personnel like their job in ACR Company. They like the newness and the exciting feeling of things happening. That's why they work longer and harder to keep the helicopters flyable — and fireable. They baby their sensitive flying gun platforms, just as Cremony cared for his horse — that very personal attention that makes the machine "serve with equal zeal and capability."

• *Number Five of a Series*

SURVIVAL--A Gun and A Machete

Fred M. Montgomery

IF ARMY AVIATORS could predict the time, place, and date of their next smashup, the matter of survival would be of less consequence. But the fact remains that the pilot of any aircraft would be wise to think about survival techniques and what procedures he would follow should an emergency landing be made.

While on duty at most stations in the United States, it is possible that a crackup would occur within close proximity to well traveled highways and airlanes. But what about duty in the states on the eastward slopes of the Rocky Mountains where so much of the terrain is extremely rugged or barren? Or duty in Korea, Alaska, the Philippines, North Africa, or Malaya? Would the same survival techniques be applicable in polar regions as in the jungle? Suppose you were forced down in a Central American jungle and had to hack your way out? Would you have the vaguest idea of what to do? How to do it? When to do it? Which direction to take? Would you have the tools necessary to help you get out?

Shortly after noon one day, an Army Aviator took off from an airstrip near an extinct volcano in a Central American country. With him was a passenger whose job was to verify name data in the vicinity of a tidal estuary some 15 miles to the east. A normal takeoff in the Raven was made, and no difficulties were noticed for a quarter of an hour or so. Then the aircraft began to gradually lose power and rpm due to a faulty carburetor. The pilot decreased pitch and increased throttle setting, but the rpm still dropped. At about 350 to 400 feet he turned on the auxiliary fuel pump. Feverishly, he worked the throttle, checked his fuel shutoff valves for correct setting and the mixture control for fuel rich, and verified that the carburetor air temperature was "in the green."

There was not enough altitude for an air start. With rpm down to about 2,800, the pilot started an autorotation. A full flare landing to zero ground speed was made at about 25 feet over the only available landing spot, a stretch of mangroves. As he gently maneuvered the Raven down to his selected site, he kept the aircraft level; directional control was maintained and a very easy touchdown was made on top of the springy, interlaced mangroves — 12 feet above the ground!

Neither man was injured, and they had no trouble getting clear of the aircraft. Once on the ground, however, survival did not seem so inevitable. Yet, they did not consider their plight desperate, even though they were about 100 miles from the duty station; were down in a little traveled, sparsely settled area; had no radio contact with the outside world; and were certain that no one had seen them go down.

Two factors that play big parts in successful survival stories are familiarization of the territory within the flier's duty station and equipment useful in case of a forced landing. Fortunately, the pilot had become familiar with the topographic and hydrographic features of the operations area. These two men had exemplified unusual foresight in providing a machete and loaded pistol for this trip, and it was these two items that helped them get out of a tight spot with minimum delay.

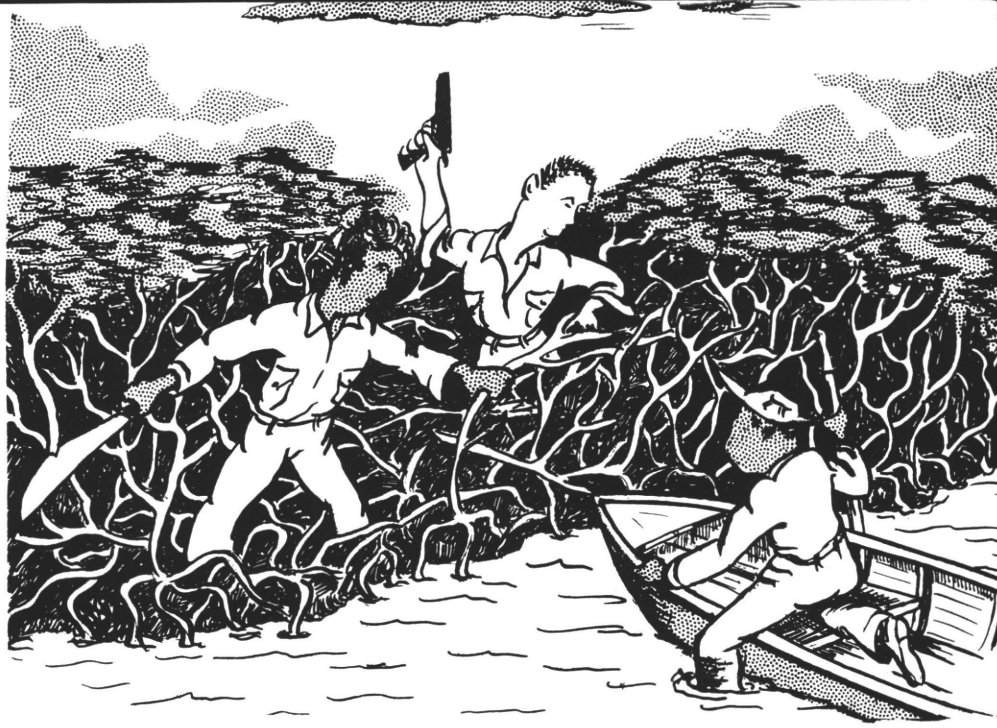
After getting out of the aircraft, the first thing the men did was take stock of their surroundings. There was no panic, just discomfort in the hot, sticky, steaming air. Fortunately, it was not the time of the year for the heavy almost-daily rain. Their greatest danger was the fast rising 12 to 14 foot tides which would make traveling through the mangrove swamp slow and dangerous. Even though they were only 15 minutes by air from the landing strip, they decided that their best course would be in the opposite direction, toward the estuary. The tide was beginning to rise as they tucked their trouser legs into their socks and shoes to protect themselves from ticks and snagging branches. Then, with the 2,776-foot-high volcano directly behind them for reference, they started hacking their way eastward. It was not

easy, and they made many an unnecessary stroke before they caught on to the trick of stroking upward to cut the bushes and creepers.

Almost silently they moved through the mangrove swamp. Only the swish-swish of their legs moving through the knee-deep water and the ka-nip-nip of the machete blade was heard. There was no talking. They had to preserve their strength for the machete. About 30 minutes after starting through the tortuous swamp, they paused and fired their pistol three times in slow, regular blasts. The sounds echoed through the still undergrowth. They listened intently, hoping for some answer. Nothing. The rising tide was now swirling above their knees. They must hurry on.

The two men moved cautiously through the water, not always taking the straightest course, but avoiding obstacles that would hinder their pace. Alternately swinging the machete and leading the way, each soon developed a "jungle eye," the method of disregarding the trees and bushes directly in front of them and focusing the eyes beyond the immediate front — in a way, looking **through** the underbrush rather than looking **at** it.

By turning their shoulders, shifting their hips, bending their bodies, and shortening and lengthening their strides, they found that walking was less tiring. Periodically they rested and listened for the sound of help coming. About one and a half hours after firing the first signal from their pistol, they stopped and repeated it — three shots in slow, regular blasts. This time the signal was answered by a yell from someone out in the estuary. They could not see their rescuer, but sighs of relief escaped their lips. They answered with a series of howls and rapidly moved toward the voice. In another 15 minutes they caught sight of an old fisherman rowing a boat toward them. Their story would have a happy ending.

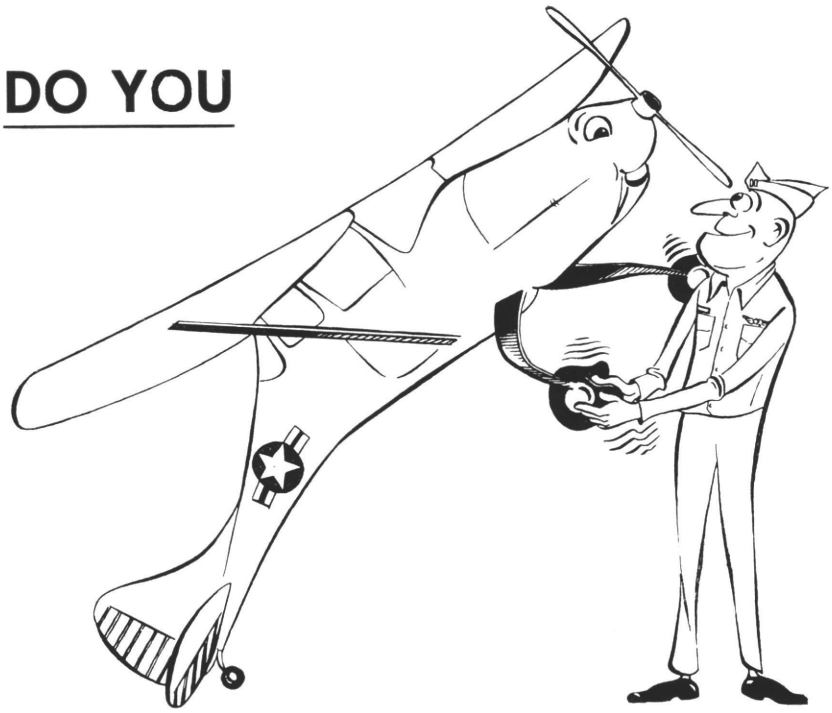


They learned how close to disaster they had been

They learned from the fisherman how close to disaster they had been. He had been fishing all day in the flats; when the tides had begun to rise, had hauled in his nets and started across the bay to his home. He had been almost halfway across when he heard the first three shots! He paused to listen for another signal. Then he recalled that three shots meant someone needed help. By the time he had rowed back toward the mangroves and picked up the fliers, the tide water was almost up to their hips. Within another two hours he would have been out of earshot of their signal. When the pilot returned to his Raven at low tide the following day, high tide water marks were in the cockpit floor!

Admittedly, it is easier to survive when there is more than one person to share the hardships. But don't forget that these two men would have shared compounded hardships if the pilot had not known the terrain in which he operated, and if they had not had the foresight to put the machete and loaded pistol in the aircraft. Certainly, these are not items of equipment normally found in a Raven, or in any Army aircraft for that matter. Training and experience are invaluable aids to survival. These men are no doubt wiser after this episode; their experience should help every Army Aviator to be more conscious of survival procedures and knowledge.

DO YOU



Know Your Aircraft?

Major Clifford S. Athey

HOW MUCH do you know about the aircraft you fly?

That's a silly question? Everyone knows that you received a private license in 1940 and you finished Army flight training in 1944. Since then you've completed helicopter and instrument flight training. As a matter of fact, we could spend the next five minutes enumerating your many excellent qualifications. Still I ask, "How much do you know about the aircraft you fly?"

Are you ever guilty of saying, "What do you mean that's only a 3½ g aircraft? Why only yesterday I pulled over 4 g's and it's not hurt a bit." Or, "What do you mean, 1000 lb cargo capacity? Why if you can close the doors on the load, that monster will fly."

We could go on and on stating all these little gems that are uttered every day out back of the hangar by the "old pros," but do you honestly know the truth?

For instance, do you know what is meant by and why many fittings, attachments, nuts, and bolts are assembled with a specified amount of "torque"? Is it true that torque is simply applied to prevent the parts from loosening during operation? If so, why the safety?

Why do the tech orders require you to be careful not to leave tool marks on parts or the structure? Why should you be careful not to have a burred thread or "rounded" bolt head? Why should you not walk on the wing with hobnailed shoes? Is it just because the scratches are so unsightly?

What do the performance charts in the -1 mean? How much do they tell us? What is the TAPS (turbulent air penetration speed) for your aircraft? How and why is this the established TAPS? If you don't know, it just might some-day mean taps to you, your passengers, and your aircraft.

Is wingtip vortex of any interest to **you?** Sure, I know the usual answer: "Don't get behind the big boys because the WTV will try to put you on your back." Is it true that knowledge of wingtip vortex and downwash can actually aid in extending the range of an

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Major Athey is the assistant aviation officer, 18th Airborne Corps. He is a Senior Army Aviator, qualified in both fixed and rotary wing aircraft, and has flown more than 3,000 hours. He is a graduate of the Army Aviation Safety Course, University of Southern California.

aircraft? Does this have any relation to why an aircraft tends to pitch up on takeoff and nose down on landing?

HOW MUCH DO YOU KNOW ABOUT THE AIRCRAFT YOU FLY?

Answers to all of the above questions, plus many more, are obtainable at the Aviation Safety Course offered by the University of Southern California. This information may also be obtained in almost any aeronautical engineering course. But how many Army Aviators are aeronautical engineers, and how many can get quotas to the Safety Course? The answer is, "Not many." So . . .

You ask, "If this is so all-fired important, and I don't already know it, why wasn't I given this information at the Aviation School? They taught me what I know about aeronautics, and I figure I don't need to know anything they didn't teach. Besides, you haven't even checked my answers to your questions." True, and I am not accusing you of not knowing. However, let's face it, very few of us do know these facts; we just think we do.

How about sticking with me a little bit longer? Let's get a short answer to each of the aforementioned questions just to check our knowledge.

WHAT IS G?

Basically, g is the force of gravity acting on any object, whether it be 1 g for a man standing on the ground or many g's as a result of aircraft pull-up, banking, acceleration or deceleration.

Most Army aircraft are designed to specifications that require them to withstand a minimum of 3½ g's at **maximum gross weight.** Let's say an aircraft is designed for a maximum gross of 4,820 pounds. Next we pull 3½ g's on this airplane. That means the wings must be able to hold up a total (limit load factor) of 16,870 pounds. Therefore, if we pull 4 g's, the wings are required to hold up a resultant weight of 19,280 pounds. Think they'll stay on the beast? They might, but we surely didn't increase the life of the aircraft any.

Now, we'll take the same aircraft and leave off some of the passengers and cargo, say about 1,000 pounds worth. This time, in order to reach that design limit of 16,870 pounds, we can actually pull 4.2 g's. Simple arithmetic, even though the pilot feels as if his teeth are going to fall out. The wings don't care how many g's you pull, provided the ultimate weight they have to hold up is within their design capabilities. Conversely, if you take off with a gross weight of 5,620 pounds, stay below 3 g's or you may end up with more dihedral than you really need.

TORQUE

I'm not going into the scientific, mathematical proof of this field; so you'll just have to believe that it is true, or go get an engineer to spend a day or two explaining. Suffice it to say that, if a part-member-bolt which operates under a tension or compression load is preloaded (torqued) to the proportional limit of the material, there will be no fatigue of the part during operation if the loads are no more than the preload. Too little torque is just as bad as too much. Too little torque will allow the operating loads to exceed the preload and cause fatigue, whereas too much torque will, by itself, damage the part.

STRESS CONCENTRATIONS

Have you ever heard of stress concentrations? They are even harder to understand than torque, but are so important to all of us. What are they? Scratches, nicks, dents, shoulders, bolt and rivet holes, burrs, etc. They cause trouble in any structural member. Structural members? Wing spars, engine mounts, landing gear, skin (monocoque construction), any part which is going to carry a load. Any deformation, including rust and corrosion, which changes the design construction weakens that part.

AIRPLANE PERFORMANCE CHARTS

There are many performance charts in the back of every -1. They give us the best cruise airspeed for different weights and altitudes, takeoff and landing information, turbulent air penetration speed, and many other bits of information.

Let's take this TAPS. What should we know about it? Should we slow down from cruise or speed up, and why? It is normally computed for maximum gross and is that speed at which either a vertical gust or the pilot pulling on the controls can result in the limit load factor (maximum allowed g) just at a stall. Below this speed, the aircraft will stall out too soon; above this speed, you can pull the wings off, or at least bend them pretty badly. Still satisfied with your "hangar established" turbulent air penetration speed?

WINGTIP VORTEX

We should all be familiar with the phenomenon of wing-

tip vortex. It doesn't pay to get behind another aircraft, especially the big boys. We can put the vortex that our own aircraft generates to work **for** us. Every helicopter pilot has heard of "ground cushion" which is merely wingtip vortex. Every airfoil (in flight) has an area of lower pressure on top from that on bottom. It seems there is a law somewhere that says in effect, "a fluid tends to flow from a higher pressure to a lower pressure," or "if there is a difference of pressure within a volume of a fluid, it tends to equalize these pressures." Since the pressure on top of the wing is less than the pressure on bottom, we have an unstable condition which the air tries to correct. It does this by flowing in a circular pattern from the bottom of the wing out around the tip to the top of the wing. At approximately one chord width behind the wing and at a downward angle (dependent upon several other factors) the velocity of this air is twice what it was at the wing. That gives us a pretty powerful force of air. Thus, with a helicopter we hover in "ground effect." This ground effect is strongest within a vertical distance of approximately half the "wingspan."

Now we get to the question, "How can this help me in fixed wing aircraft?" To answer this we must realize that there is quite a bit of induced drag attached to wingtip vortex. Therefore, if we can eliminate the vortex we can either fly forward faster or use less power. Do you think either of these last two "aids" would improve cruise speed or range? How do we take advantage of this fact? Fly closer to the ground! The best height is somewhere between a vertical distance of one-half the wingspan down to just before rolling the wheels.

I am most definitely not advocating we always fly close to the ground. First, there are wires, trees, and other obstacles in the way. Second, regulations restrict this type of flying. It just happens to be good information to have "in case." It will also help if you are ever making an overwater flight and need every drop of gas to reach your destination.

It has not been my intention to give you a course in aeronautical engineering. Neither have I intended to criticize anyone. Rather my desire has been to help prevent a state of complacency as the result of thinking, "I need know only what they teach at the school."

I do believe that the matter should be looked into. Possibly a few hours of instruction added to the course of instruction at the Army Aviation School to include basic aircraft structures, metal properties, and more basic aerodynamics would be helpful.

Solution to the Puzzler

On the basis of the factual information contained in the PUZZLER on page 11, the recommended solutions are as follows:

The correct solution is c.

Choice a. The term "cruise" in the clearance authorized the pilot to depart 3,000′ at his discretion without further clearance from ATC. Reference: TM 11–2557, page 10, Air Traffic Control section.

Choice b. Cruise clearance to destination airfield does not constitute landing authority at a controlled airfield. References: ANC Manual, pages 37-38; TM 11–2557, Air Traffic Control, page 10, para 21.

Choice c. This is the correct solution. The pilot did not request Flight Service be notified of his change in destination.

Choice d. This is not a true statement as all points named in an instrument clearance are mandatory reporting points. Reference: TM 11–2557.

Choice e. This is a false statement. The pilot in command has the option of attempting more than one approach if he so desires, as long as he does not violate regulations and ATC procedures.

THE NEXT DECADE In Army Aviation

Brigadier General Richard D. Meyer, USA

THE PRIME MISSION of the Armed Services, and of the Army as a member, is to deter aggression. A time-tested deterrent is strength.

Since World War II, there have been numerous limited wars. These have ranged from actions in Greece and Malaya to the conflict in Korea. There is no reason to believe such wars will not continue. Now, though, with each new one we have a dread fear. We must assume that every action contains the seed of an atomic war. Therefore, within the framework of our national objectives, we must strive to end any conflict quickly.

Thus, the Army, acting with the Navy and the Air Force, must have the posture and ability to:

be a deterrent in a cold war, win a limited war quickly, and be ready for a general war.

This calls for an Army that can place military force where it is needed, when it is needed. This calls for mobility. Battlefield or tactical mobility calls for Army Aviation.

Army aircraft will be found only within the battle area. In effect, they will be using and distributing retail some of the men and equipment that the Navy and Air Force will be transporting wholesale. Wholesale transport is strategic mobility.

Besides **mobility,** Army aircraft will be used for **observation.**

In the observation role, you can expect to see the vehicles functioning as all-seeing eyes regardless of weather or terrain. They will be surveying the battle area for information about the enemy. They will be observation platforms for missile and artillery units. They will serve as probes for detecting radiation fields or gas.

For their work, the vehicles will be carrying sensory devices designed specifically for Army tasks. Such devices will include aerial cameras, television, radar, and infrared. Let's take these one by one.

Aerial photography has been of limited usefulness to tactical commanders because of the time and facilities needed to process the film. However, in the next decade's Army you will find mobile field laboratories where film will be automatically developed in multiple prints. Within minutes, these will be distributed to the officers requesting them.

Airborne lightweight television equipment will be used for general battlefield surveillance. However, because of lighting conditions and camouflaging activities of the enemy, we cannot expect that TV will be able to pinpoint specific targets. For this function, we shall be relying on airborne radar and infrared equipment.

Now radar is able to finger a metallic object in the sky easily enough. But when it

ABOUT THE AUTHOR

General Meyer is the Deputy Chief of Transportation for Aviation. He holds a Bachelor of Science degree from the U. S. Military Academy and a Master of Science degree from the University of California. He is also a graduate of the National War College. General Meyer is an instrument rated Army Aviator.

tries to pick up a similar object on earth, it's a different story. There is so much ground clutter — manmade and that of nature. Therefore, we shall be using radars employing moving target indicators. These will be able to spot objects traveling across the ground and can be used to make radar maps in all kinds of weather. We hope that this technique will give us a greatly increased surveillance capability.

As you know, infrared devices detect radiations lying in the region just beyond the visible light spectrum. The intensity of these radiations depends in part on the temperatures of the objects being observed. Those "hot targets" such as vehicles with temperatures higher than the earth's will be easily "seen."

In the long run, we hope to achieve a high resolution mapmaking capability using infrared.

The observation methods outlined will be used with other techniques to give field commanders the ever-changing battle scene. Thus, motion pictures will be replacing the snapshot.

All along, we have been assuming a marriage of the operations of the combat **intelligence** functions in the Army. This is exactly the way it should be. Although each function will retain its identity, the two will be working almost as a unit. The fleeting nature of many targets calls for a quick interchange of data — and for action.

Action calls for mobility. If the wish could accomplish the deed, this would be the type mobility needed in the battlefields of the future. It means bringing troops and supplies where they are needed, when they are needed. It means removing casualties from the combat zone the instant they become casualties.

The vehicles best able to fulfill the Army's mission will have to fly close to the nap of the earth. This is not only for their own protection but also to avoid intruding into a sky already filled with bullets, missiles, and jets. The Army has little need or desire for that crowded airspace. If it were practical, ground soldiers would like to be able to fly with one foot on the earth.

Here are some of the things we hope air vehicles will do to add to our battlefield mobility:

Serve as command vehicles. I never met a field officer yet who didn't want to assess the battle situation for himself — and this despite our host of electronic eyes. This is admirable because eyes and a brain work best when they are together.

Lift heavy loads. When the Army moves by sea, the Navy takes our troops and supplies to the shoreline of a theater of war. It is then the Army's responsibility to unload the vessels. This takes time, especially in unimproved ports. Therefore, we hope to develop aerial vehicles able to lift about 20 tons of cargo. What they could save in manhours at the shoreline could win us a victory at the battlefield.

Flying cranes have other strong mobility uses. They could help repair breaks in surface lines of supply. They could expedite movements of large equipment over difficult terrain. They could lay railroad track. They could carry in their claws the structures for 30- and 40-foot bridges. For the armored divisions, they could transport volumes of fuel to the forward combat areas.

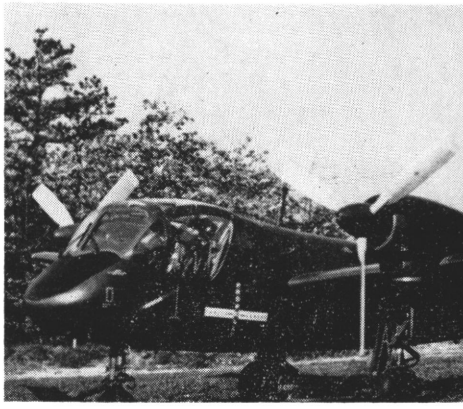
Another mobility concept is that of the **Air Mobile Task Force.** Today, our airborne divisions are strategically mobile and tactically immobile. For tomorrow, we have to add tactical mobility. To do this, we must let flying machines take over many of the functions and, yes, replace many of the current surface vehicles in the battle area. This means giving a new dimension to the Army, a vertical one.

The Air Mobile Task Force might be traveling in aerial jeeps or in other types of ground/air vehicles. They would probably be armed with machineguns and rockets.

Their bases might be anywhere. They could use their mobility to be in several different places in a short span of time, thereby multiplying their effectiveness. They could move to and over the operational area, overcoming enemy strengths and exploiting enemy weaknesses. In other types of combat, they could be aerial shock troops reinforcing those on the ground.

In a typical Air Mobile Task

Number 1 priority



High priority Iroquois scheduled for combat arms

Force, there would be assigned cargo-carrying vehicles. Thus, having supplies on hand, the Task Force would be truly independent of terrain within its area of operations. In Korea, we had to build about 1100 miles of hard-surfaced roads to give us comparable mobility. There, terrain independence was bought at a very large cost.

Army aircraft will be used for two purposes: observation and mobility. They will be seeing clearly enough and traveling well enough to react to modern weaponry.

Now we come to particulars. What will our aircraft look like in 1970? I wish I knew. The best that can be done is to point out that they will have family resemblances to aircraft being developed by the Army today. On a priority basis, there are four such aircraft:

First, and on priority 1, we have the **Mohawk.** This is a twin-turboprop fixed-wing observation aircraft. It will cruise at 225 knots and have a range of 625 nautical miles. Thus, the Army's target acquisition and surveillance capability will be greatly extended over what it is today. For example, the vehicle will be seeking out targets for missiles such as the **Honest John,** the **Lacrosse,** the **Corporal,** and with Air Force help, the **Pershing.** An added benefit is that the Mohawk's turbine engines promise to reduce our maintenance load significantly.

On priority 2 is the **Iroquois,** a turbine-driven helicopter. This has a utility and light transport mission. It will be the first turbinized Army helicopter larger than a 2-place aircraft with sufficient ruggedness, simplicity and reliability to permit its assignment to our combat formations, the infantry airborne, and armored divisions.

Next priority is the **Caribou.** This is a 3-ton-payload STOL. The craft will be able to operate out of slightly longer than L-19 strips. It will be our air express vehicle for light cargo and troop transport. The Caribou will be able to carry 32 passengers or 14 litters.

On priority 4 is the **Chinook,** a new transport helicopter. It will be a multiple-turbine affair able to carry 2 to 3 tons payload and will be replacing the transport helicopters H-21, H-34, and H-37.

Shown above is a sample chart of today's family of Army air vehicles, their mission use, and their probable replacement to fewer models and types of VTOL/STOL vehicles as they are developed in the foreseeable future.

This chart plots payload weight versus maneuverability, which is a function of size. The left of the mission curve represents today's conventional or STOL type aircraft; to the right are the current helicopters in the inventory. To the far right are listed the possible replacement air vehicles within the four major areas of the mission spectrum as represented by the curve. A possible new role for air vehicles, as a three dimensional weapons platform,

The Caribou needs a "little" longer strip than an L-19

is introduced. The HU1–B helicopter and the so-called aerial jeeps under Army sponsored development fit this category.

It is clear that with guided missiles and rockets seeking out prime targets, there will be no future in concentrating supplies and installations in the battle area. They will have to be dispersed, maybe overseas, and brought back according to need by support aircraft.

The battle area itself will be large and the troop density small.

High-tonnage supplies will be carried through the area to disbursing points by surface vehicles. Here, VTOL and STOL vehicles will airlift the supplies to widely scattered small general depots. Airlifting supplies to advanced units will be routine.

Not so significant in a modern war will be the need to acquire dominating terrain. An elevation may be the worst place to go because of its vulnerability to atomic attack.

There will be new meanings to the concepts of obstacles. We now may have radiation fields to traverse, gas fields to survive, and scorched earth and atomic blast damage to skirt. On the other hand, we cannot count on obstacles to halt the enemy nor can we let them stop us.

Tactics therefore will change. An atomic war will be fought by dispersion and diffusion of battle units, by elusiveness and concealment, by feints, thrusts and parries. The best time for maneuvering will be in foul weather and in darkness.

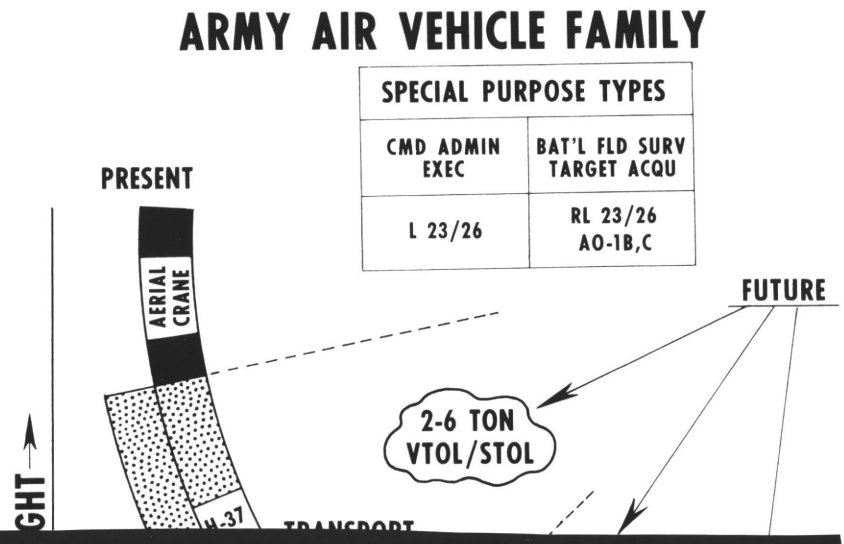
It used to be that when a formation was attacked, it either held fast or retreated. Now the formation may slither sideways while other units advance. The enemy may reply by backing off some of its units and jumping others over our heads. The object of these maneuvers, like that in a chess game, will be to disperse fighting units in such a way that the enemy's forces are destroyed or neutralized. Thus, the king is checkmated.

In the peripheral or brush fire war, we would rely on our Air Mobile Task Forces almost entirely. These would be strategically and tactically mobile — no ground transportation needed. They would be able to reconnoiter and hold a large area of battleground because they would be able to cover a large area.

As an instance, today a given number of men under certain circumstances can hold a 3- to 4-mile battle perimeter. With the same number of men under the same battle circumstances, an Air Mobile Task Force would be able to hold more than a 100-mile perimeter. This means that we could take on a mission with few men and high effectiveness.

The Army's objectives, as we have said before, are to: **be a deterrent in a cold war, win a limited war quickly, and be ready for a general war.**

These are the only items that I foresee not changing within the next decade.



Memo from Flight Surgeon

WHAT DOES THE annual physical examination mean to YOU? Is it a necessary evil that confronts you as something that has to be suffered, like the annual written examination; or do you take it cheerfully, realizing that it is part of a maintenance program aimed at keeping you physically fit for flying duty?

Periodic inspection (examination) of aircraft is recognized as an important aspect of a program devised to ensure that flying equipment is capable of performing its missions. It is at least of equal importance to ensure that YOU, the operator of this equipment, are in such physical condition that you too are capable of performing your missions.

The annual physical examination of pilots is a very important part of the Army Aviation program. One of its functions is to help you maintain good health and ensure your satisfactory physical status. The value of this procedure will be proportional to the thoroughness of the examiner, the cooperation of the examinee, and the proper recording of findings.

The following items are probably minimum procedures for the annual physical examination:

1. notation of age, height, and weight;
2. dental check;
3. eye examination;
4. ear, nose, and throat examination;
5. blood pressure and pulse determinations;
6. heart and lung examination, including chest X-ray;
7. electrocardiogram when indicated (required on initial examination for flying training and on personnel over 40 years of age);
8. urinalysis;
9. rectal examination and prostate examination after age 40 and/or when indicated by symptoms;
10. interview of the examinee concerning the incidence of any illness or injury suffered since his last evaluation;
11. review of history, clinical, and laboratory findings by the examining physician and discussion.

WHAT IT REVEALS

Age, height, and weight — Correlation of these factors has significance from two principal standpoints. A recent monograph from the Surgeon General's Office on Army medical statistics concerned with biometric studies on U .S. Army Officers states, "Those individuals who were overweight after 30 years of age had a much greater disease expectancy than those of average or less than average weight — excess weight results in physical impairment and shortening of life." Weight control is important to maintenance of physical fitness.

On the other side of the ledger, any significant unexplained progressive loss of weight may be indicative of a serious health problem which will require further investigation.

Dental check will reveal tooth decay, tumors and/or diseases of the gums or mouth cavity.

Eye examination — Since vision is the most important sense used by the flier, the importance of this procedure is obvious.

Examination of ears, nose, and throat is done to ensure individual capability to hear adequately and that there is no impediment to clearing the ears as necessitated by changes in barometric pressure associated with altitude variations in flight.

Blood pressure and pulse evaluations may reveal the first evidence of heart and kidney disease, and to some extent the efficiency of your circulatory system.

Heart and lung examination may produce clues to disease conditions requiring further investigation by laboratory methods. Chest X rays may reveal lung diseases such as tuberculosis and tumors, or changes in heart size or shape indicative of heart disease.

An electrocardiogram may provide a clue to some cardiac abnormality and indicate a need for further investigation or observation.

Urinalysis may reveal some cases of early or mild diabetes and some types of kidney disease.

Rectal examination will reveal hemorrhoids or anal fissures. Palpation of the prostate gland will reveal abnormalities of size, consistency, and shape which indicate infection, overgrowth of the gland, or early malignancy.

Detection of other disorders will depend largely upon the frankness and honesty of the examinee during the interview. Many disorders can be detect-

ed if the physician is alerted by the examinee. Conversely, many things may be concealed if the individual sits silently, thinking, "If the Doc can't find it, it can't be very bad," or if the interview is hastily done or omitted.

Review of history and findings by the flight surgeon is the basis upon which he assures you of your continued good condition or makes recommendations for changes in your activities.

WHAT IT DOES NOT REVEAL

Without full cooperation of the examinee the annual examination may fail to accomplish one of the principal reasons for its being done: namely, to ensure your good health and the prolongation of your flying career. Except for some of the disorders mentioned, it is not of great predictive value.

Chest X rays may not reveal early cases of lung disease unless special techniques are requested on the basis of symptoms reported. A normal electrocardiogram does not ensure that the examinee may not drop dead with a heart attack a day or week later. Many diseases of the digestive system and of metabolism may be missed unless symptoms are revealed. In brief, symptoms **may be** the clues which lead to discovery of disease.

WHAT YOU CAN DO

Your active cooperation is essential in the interview. Here you should freely discuss any persistent or unusual symptoms which you have experienced. Here, too, is your opportunity to obtain advice on your personal medical problems.

In these interviews you may hesitate for fear of being considered a hypochondriac. It has been said that everyone has a few pains most of the time, particularly in muscles and joints. Usually these are below the level of consciousness, but if one dwells upon the pains he can possibly raise them to a level where a great deal of discomfort is experienced. Obviously it is not desirable to record, classify, and recite every ache and pain noted.

On the other hand many indications of really serious disease may be fairly easily recognized. A discussion of all possible symptoms would fill volumes, but here are a few important ones, every one of which at one time or another has been overlooked, neglected, or concealed. Report such things as:

1. Any blood discharged from the body in stools, urine, or sputum.

2. Any dizziness or loss of consciousness.

3. Any unexplained change in weight. Everyone should check his weight periodically. An unexplained progressive loss of weight may be indicative of serious disease and is as worthy of consideration as is any other persistent symptom. If you are overweight this is the time to request advice on bringing your weight back to normal and maintaining it. Self-imposed crash program diets are to be condemned. The management of weight reduction is a medical problem of interest to your flight surgeon, and he may well be able to help you over the "rough spots" to reach the desired goal.

4. Any changes in sleeping habits such as insomnia, frequent or disturbing dreams, or the requirement for additional pillows for comfort.

5. Unexplained weakness or fatigue. This does not apply to the deskbound individual who once a year goes on a hunting trip and finds himself exhausted from walking a few hundred yards across the hills. Such a person should improve his condition by some form of regular exercise.

6. Any persistent, unexplained headache or neck stiffness.

7. Persistent cough. Heavy smokers often have a chronic cough, particularly noticeable in the morning. If you are in this category you probably smoke too much. "Smokers cough" may conceal the presence of serious lung disease. If you don't propose to cut down on your smoking, you should at least be alert to any change in the cough associated with pain and an occasional check of your sputum for the presence of blood.

8. Pain or difficulty associated with normal body functions such as swallowing, urination, or bowel movements.

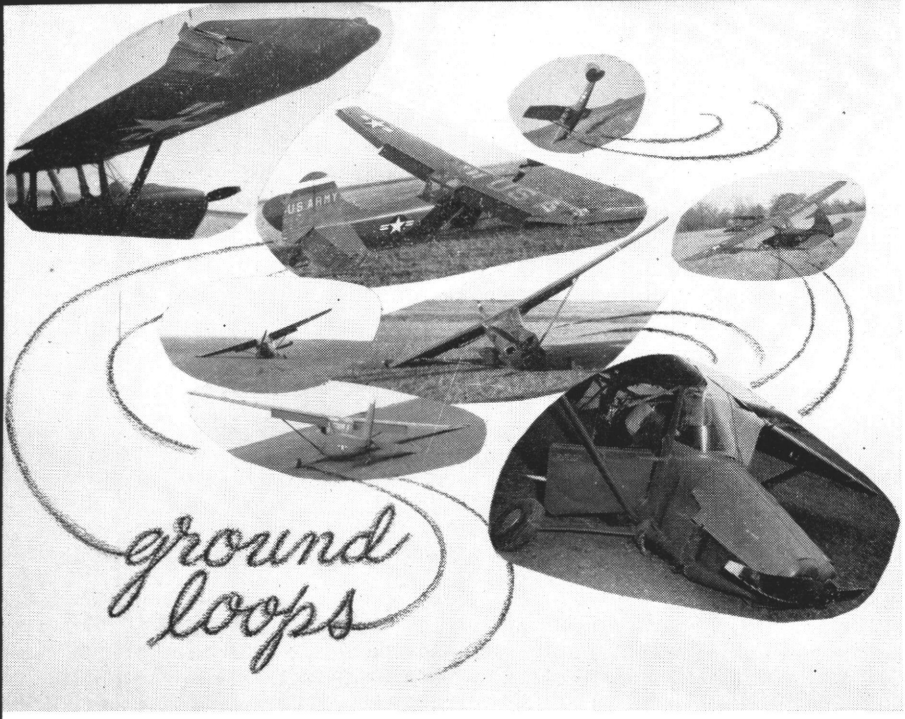
9. Persistent unexplained "indigestion" or recurrent abdominal pains.

10. Unusual shortness of breath, and chest pain if severe or if it radiates into either arm.

11. Any mass or lump in any location. Women are currently being instructed in the matter of self-examination of the breasts. Occasional self-examination of the testicles is probably of equal importance to males.

12. Any sore, anywhere, which does not heal.

13. Any other symptom which has caused you serious concern.

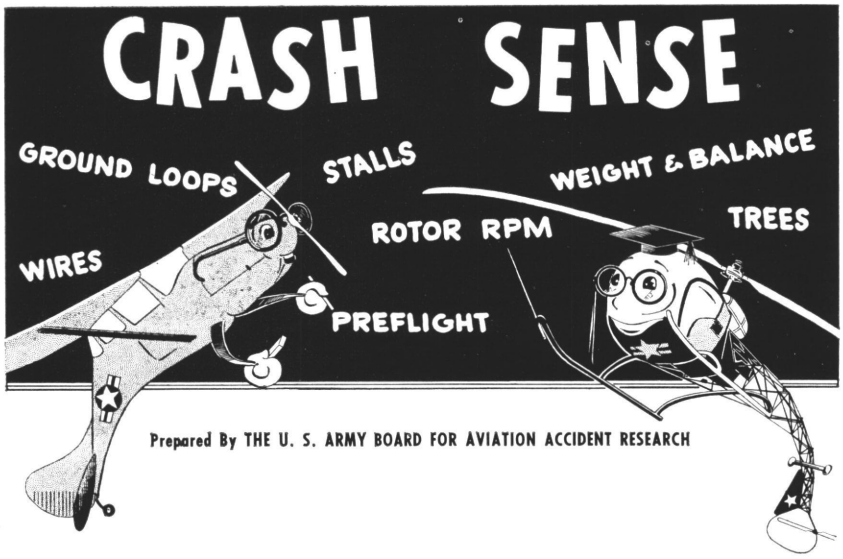


"BIRD DOG GROUND LOOPS? **Get off my back! I'm sick of hearing and reading about them. I started hearing about ground loops way back before I got to San Marcos and they've been bending my ear about ground loops ever since. There's nothing new you can tell me!"**

Mister, you are so right! You're tired of hearing about ground loops and we're tired of writing about ground loops. More has been written about this one subject than any other single phase of operations in Army Aviation.

Remember the **Bird Dog Classics?** First, there was the knight who bounced his craft and forgot that the spur is quicker than the rein. Then came Sir Normal who made a perfect landing and began filling out his Form 1 during the landing roll. Next, was Sir Heffie Foote, who trod mightily on brakes and toes. After this, came the knight who slew his direction for the port wind and all directional control was lost to him. Finally, there was Sir Stauling Bhounce who reared his nose heavenward, thinking to climb above the barrier. These five classics pretty well covered the range of causes for Bird Dog ground loops.

How have all the thousands of written and spoken words affected the problem? Searching the records, we find that 91 Bird Dog ground-loop accidents were recorded for 1958. During the first three months of 1959, 17 similar accidents have entered the record book. Too many words? It would appear that not half enough has been said!



SOMEBODY GOOFED

We all know that when a ground loop happens, somebody goofed. Whether the man who made the airplane, the mechanic who looks after it, the instructor who trains the pilot, the supervisor who commands the pilot, or the pilot himself, somebody goofed! It then remains to search our ground-loop accidents and find who goofed and, more important, **why.**

DESIGN?

A great deal of suspicion exists about the L-19 aircraft. It has been intimated by many that the ground loop was designed into this aircraft. At first glance the number of these accidents would lead you to believe that this is the case. **Yet, hundreds and hundreds of Army Aviators have flown and are flying the L-19 daily with no problems involving directional control.** In any event, if design is a cause factor, the only successful solution is a new aircraft. Although production has stopped, it appears the Army will be flying Bird Dogs

for some time to come. Since this is the case, successful solution of the ground-loop problem must come from other sources.

MAINTENANCE?

The mechanic can be quickly eliminated as a major cause factor for ground-loop accidents. A study of 86 ground-loop accidents that occurred during 1957 showed that less than 1 percent were caused by maintenance factors.

PILOT?

Let's be honest! Let's admit that the great majority of ground loops happen because the pilot goofs. **BUT,** let's not adopt a pious attitude and stop here: let's dig further and find out **why** these pilots goofed.

Was it because of training?

5 February 1959 — An Army Aviator, who had graduated the previous September, ground-looped during landing. This aviator's statement reads: "As the ground loop began, I knew that the application of power for a go-around would only tighten the loop; therefore, no power was applied. After applying full left rudder with not the slightest effect on the ground loop, I realized that any attempt by me to straighten the aircraft would probably result in a worse ground loop. **Therefore, no brakes were applied and my hands and feet were removed from the controls. To the best of my knowledge and belief, this is the proper technique once the ground loop is in progress."**

A similar accident occurred 25 February 1959. Examination of DA Forms 759 for these two aviators reveals a striking similarity. Both graduated from fixed wing training during September 1958. One had a total of 261 flying hours; the other had 267 flying hours. Both went through instrument training after graduation. During the more than 4 months between graduation and ground loop, one had flown the L–19 for 6½ hours; the other had flown the L–19 for 6 hours. Can you expect the newly graduated aviator to maintain L–19 proficiency while flying other types of aircraft over a long period of time? From these and similar accidents, the answer must be an emphatic **NO!**

SOLUTION?

This phase of the ground-loop problem suggests its own solution. Either the newly graduated aviator should be scheduled for continued L–19 flying while he is undergoing instrument training, or he should be given a period of training before he is considered proficient following a layoff of this type. Maintenance of proficiency, then, is one positive approach to the ground-loop problem. This applies not only to the newly graduated aviator, but to Army Aviators in all positions. Any art or skill is lost to some degree without constant practice.

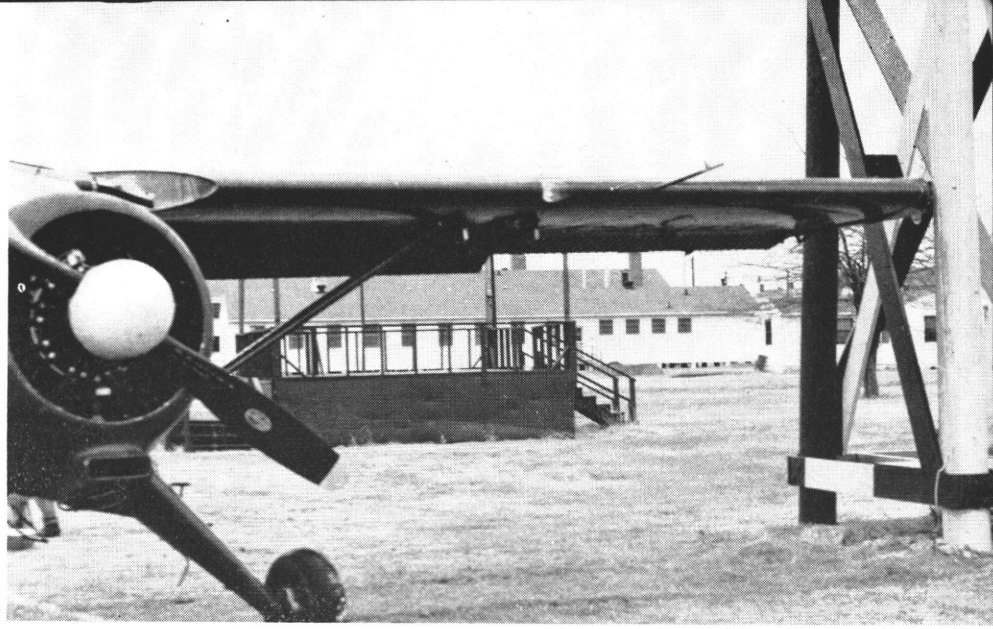
BUDDY?

Some days it would pay to have "stood" in bed. Sometimes you can't even trust your best friend.

The Beaver pilot was on a courier flight. He landed at another base, completed his business and made ready to depart. He performed his preflight, climbed aboard and watched a member of the alert crew drive out in a jeep to stand fire guard. The ground crewman parked his jeep, walked around the right side of the aircraft with the fire extinguisher and returned the pilot's call: "Clear!"

The pilot started the engine, waved to the crewman and began to taxi forward. The aircraft rolled forward approximately 3 feet and the wheel

The alert crew is sometimes not alert



suddenly jammed into the pilot's stomach. This action was accompanied by a loud crunch.

The pilot shut down his engine, got out and found the left horizontal stabilizer and elevator jammed against the side of the jeep.

Did we say **alert** crew?

YOU BET YOUR LIFE

Professional gamblers are seldom known to place a bet unless the odds are in their favor. These men know the odds for every type of gambling from rolling bones to racing horses. They don't always win, but then they're only gambling for money.

An H–21 aviator filed a VFR flight plan with a direct route through a mountain pass. The Flight Service weather forecaster advised disapproval of the plan, since a portion of the route weather was below minimums for VFR flying. The aviator then filed for a circular route to avoid the weather and this plan was accepted.

At midmorning, the Shawnee took off. Aboard were an aviator, a copilot, and two passengers.

The aviator disregarded the circular route filed for and set course for the mountain pass on a direct route to destination. As the Shawnee approached the pass, the weather forecaster was proved correct; weather conditions **were** below VFR minimums. The aviator lost ground contact and the aircraft crashed and burned.

This gamble cost four lives and $250,000. What were the odds?

Weather — against.
Advice — against.
Instrument rating — none.

What motivation could possibly tempt an aviator to gamble against these odds? Only the aviator knows, and this one won't be telling. There was no emergency, either operational or private, to demand that this flight be made through IFR conditions. It can only be assumed that the aviator had become so familiar with this route that he believed the odds in his favor despite all evidence to the contrary.

Are **you** a gambler?

BUT, DEAR —

"But, dear, I was **sure** it was in reverse!" So said the little woman, trying to explain to her apoplectic spouse why their new convertible had crashed through the garage wall.

Thinking is a procedure which must **precede** action. Knowledge is a characteristic which must **accompany** action. Obviously, the little woman had

This gamble cost 4 lives

The cure is to stay away from huge aircraft

used neither thought nor knowledge.

And then there was the Army Aviator who **thought** he had enough clearance to taxi a Beaver past the control tower. In fact, he was so sure of it that he was busily replacing a chart in the map compartment while taxiing. It must be granted that a control tower is a small object which can easily be overlooked by even the most cautious. Besides, they had no business building a control tower in a location where it can reach out and grab your wing-tip.

The apoplectic husband was fortunate. Cost of repairs to convertible and garage can be made up by returning the new mink stole. Uncle will have to shell out $1,800 to repair the Beaver.

THAR SHE BLOWS

Politicians and women's socials are not the only means of producing strong hot air currents. We've all read and heard many times about the dangers to be found in front of and behind jet aircraft. Sometimes, we forget that danger lurks in the wake of any large aircraft.

The oil filler cap must be checked for security

A Bird Dog aviator taxied out and parked approximately 80 yards behind a Constellation. When the Connie began its pre-takeoff runup, the Bird Dog promptly flipped into the air and came to rest on the right wing, right wheel, and engine cowling.

Small aircraft cannot be controlled in turbulence created by large four-engine aircraft.

The cure? Abstinence!

OIL CAP

One of the items most forcefully impressed on young Bird Dog aviators is that the oil filler cap must be checked for security prior to flight. The young aviator learns that if the cap should come off during flight, the oil **will** siphon out, Without oil, he knows he'll soon be flying a glider.

The Bird Dog was on a cross-country flight and the pilot watched his oil pressure drop to zero. As he turned toward the nearest airport, he watched cylinder head and oil temperatures. Shortly after, the aircraft shuddered and the engine stopped completely. The cockpit began to fill with smoke and the aviator started a turn toward the nearest open area. The aircraft landed in a plowed field, struck a fence and came to rest inverted.

The extra few seconds required to open the cowling and visually check oil cap security is money in the bank, in this case, worth $5,500!

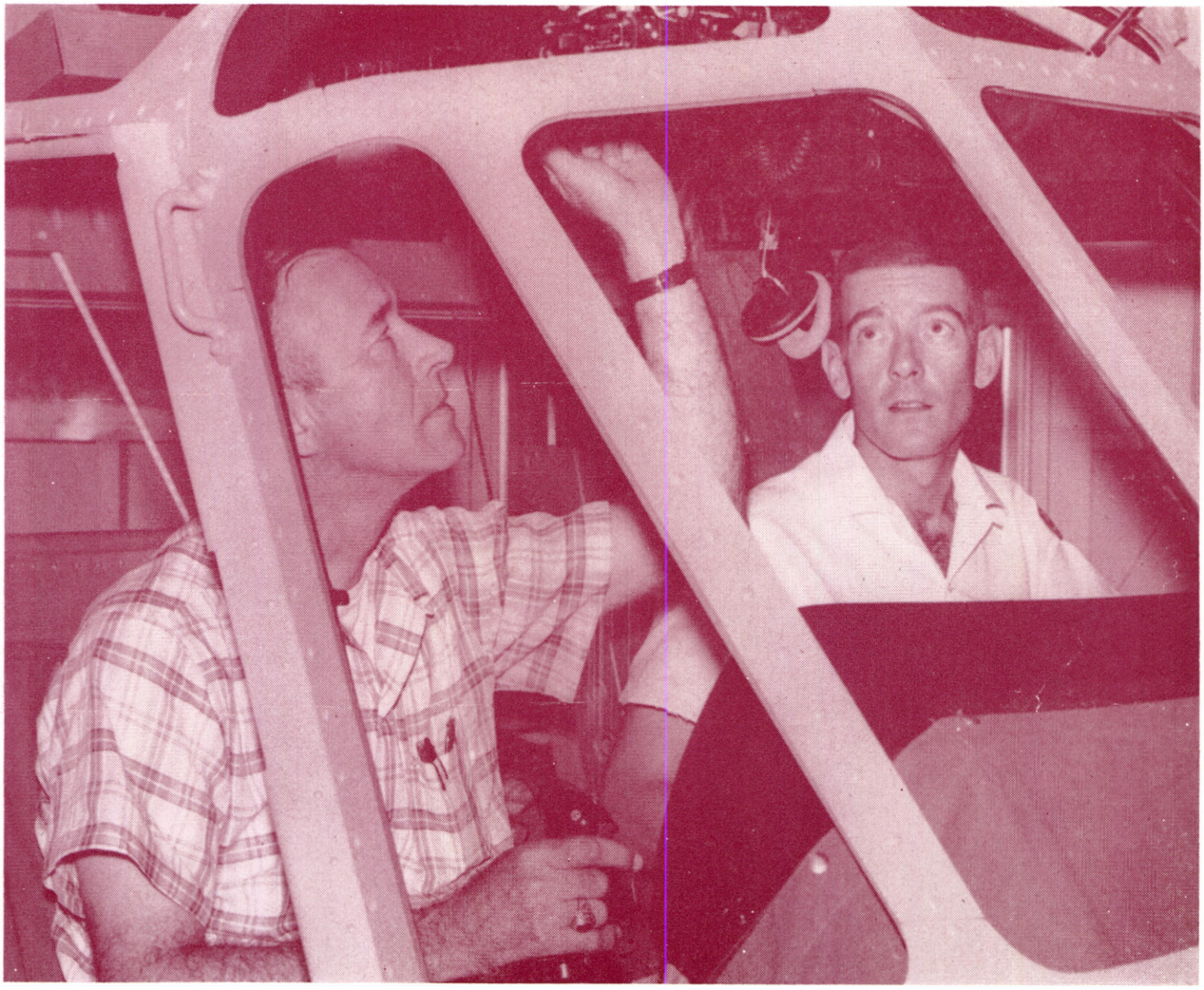
BIRD DOG STATISTICS

1958 — 91 Ground-Loop Accidents

1959 (1st 3 Months) — 17 Ground-Loop Accidents

1960 — ?

ARMY-FAA COOPERATION



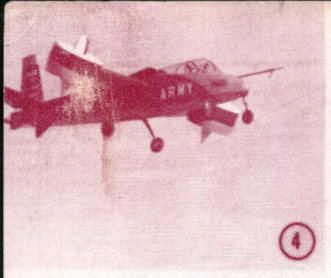
Currently enrolled in the helicopter instrument course at the U. S. Army Aviation School are Jerry W. Davidson and Jack Wilburn, aircraft test pilots from the Federal Aviation Agency.

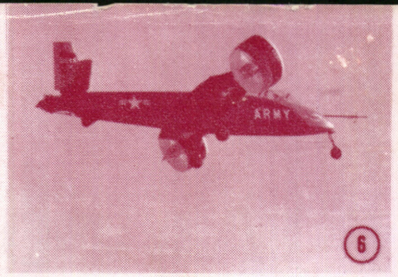
Mr. Davidson explained that they are taking the special training to gain firsthand experience in the flight characteristics, techniques, and operations of helicopters flying under instrument conditions.

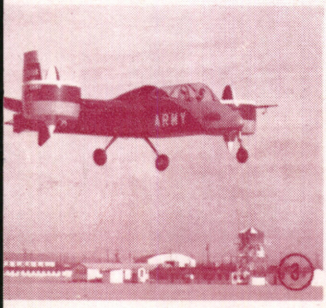
At present there are no commercial helicopters certified to fly on instruments, but two helicopter manufacturers have requested approval for instrument flying certificates from FAA.

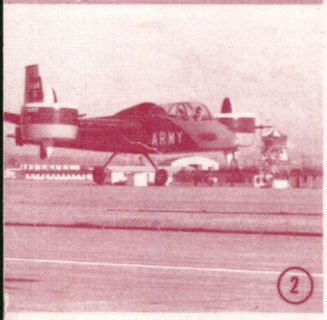
Since only proposed instrument regulations exist today, the knowledge gained at Fort Rucker will enable Mr. Davidson and Mr. Wilburn to formulate FAA instrument flying regulations that will become standard for all rotary craft: helicopters, rotodynes, ducted fans, convertiplanes, etc. These new regulations should be completed and approved during FY 1960.

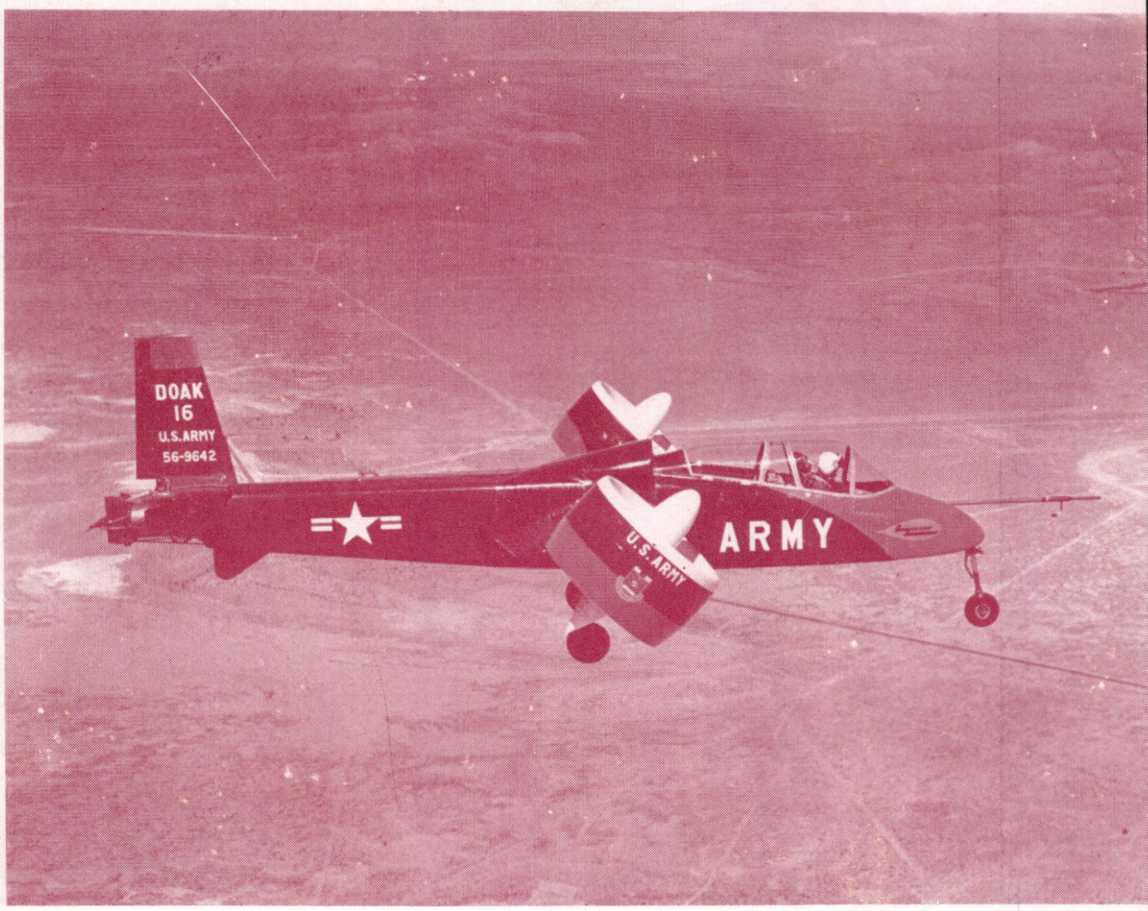
Mr. Davidson is a brigadier general in the Air Force Reserve, and is rotary wing and jet qualified. He is shown with instrument instructor, Mr. John Hickey.











Army Sponsored Test Bed in First Flight

First vertical takeoff and landing with mid-air transition to horizontal high speed flight is made by U. S. Army's new VTOL aircraft, (Doak 16) Army VZ-4DA, over Edwards Air Force Base, California. Ducted fans rotating on the wingtips point straight up to lift the Doak 16 vertically like a helicopter (photos 1, 2, 3). Then test pilot James B. Reichert swivels the ducts and the novel craft moves into forward flight like a conventional airplane (photos 4, 5, 6, 7). To land, the procedure is reversed.

Operational aircraft based on this design may have longer range and higher speed than helicopters, and, by varying the angle of the ducts, also can make conventional running and short takeoffs and landings (STOL) in order to carry even greater payloads and more fuel. Shown in large photo with ducts at 45°, the aircraft is slowing down to hover stationary at 3,000 feet over desert, then return to normal flight.

This has been done successfully at pressure altitudes of 6,000, 5,000, 4,000, and 3,000 feet.

Remaining in horizontal attitude at all times, the Doak 16 maneuvers on the ground as easily as an automobile, turning and even backing up under its own power. It has a single Lycoming T53 shaft turbine engine.