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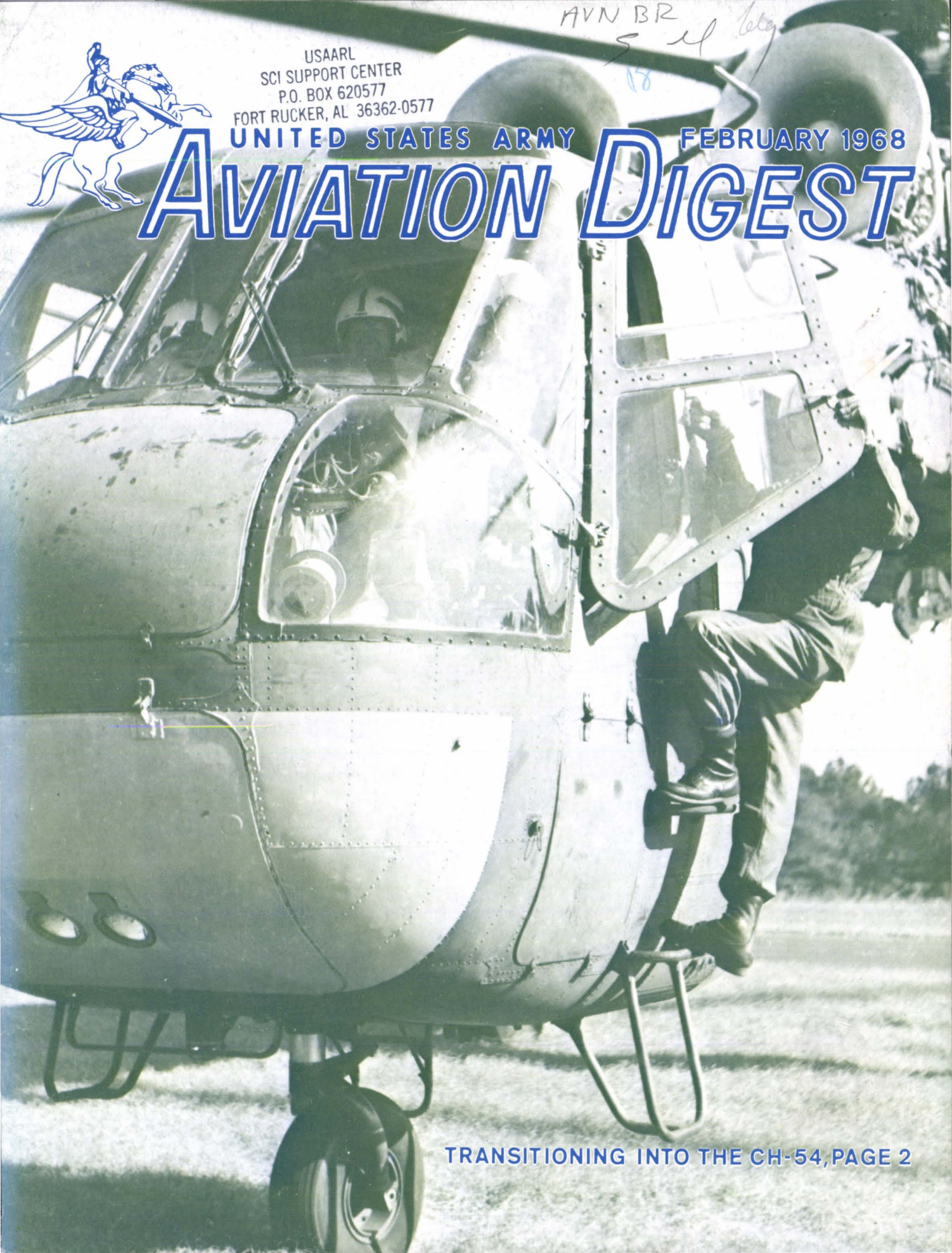
UNITED STATES ARMY
FEBRUARY 1968

AVIATION DIGEST



TRANSITIONING INTO THE CH-54, PAGE 2

UNITED STATES ARMY AVIATION DIGEST

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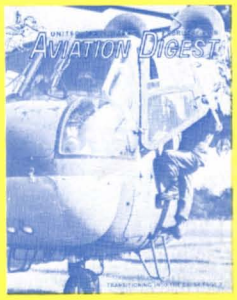

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The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other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

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VIEWS FROM READERS

Sir:

. . . In the October issue someone wrote a letter concerning the excessive TH-13T night instrument instruction in the Tactical Instrument Training Course. As a former IP in this course, I can only say AMEN! to his comments about reducing the night time in the course. One hour in the advanced stage and none in the basic stage would be sufficient.

The necessity for periodic night proficiency flying has been established beyond the shadow of a doubt. The chances for successfully coping with just about any emergency are reduced at night. For example, I would estimate that my ability to successfully complete a forced landing in the TH-13T in the Fort Rucker area would be four times better in the daytime than at night. Therefore, I would say that anyone who becomes a fanatic about night flying in a single engine aircraft when the same mission can be accomplished just as well in the daytime is a candidate for the couch (psychiatrist).

I participated in some of the first airmobile night operations in Vietnam. The probable reason night airmobile operations have slacked off in RVN is because of the results (or lack of results) of these early operations.

The theory that practice would make perfect night airmobile operations deserves careful consideration. First of all, we must consider lighting. Since we wouldn't have prep fires we couldn't very well use landing lights or flares. What about the battery powered pathfinder lights in formation in the landing zones? In a contested area this would be about like the proverbial belling of the cat. Assuming, if we can, that the foregoing would be no problem, let's consider the rehearsals or dry runs. Let's assume that we are the commander of a ground unit. This afternoon we submit a request to our supporting aviation unit for aircraft to carry out a probably profitable (based on past results) daytime operation. The answer is "no." The reason is that the aircraft are tied up rehearsing for a night operation several days from now. What about tomorrow? Same answer —we need lots of rehearsals so this night operation will go off without a hitch.

Airlift capability in RVN is a valuable asset and in some cases at a premium. The ground commander should be informed of the facts of aircraft availability so he can wisely decide how to use what is available for the best results.

CW2 CARL L. HESS
Co B, 228th Aslt Hel Bn
1st Cavalry Division (Airmobile)
APO San Francisco 96490

Sir:

It was with interest that I read the article "Firefly," appearing in the November issue of the AVIATION DIGEST. We in the New Jersey Army National Guard have been working on a high powered light for civil disturbance or riot control. The light we have developed is mounted on a M113 APC.

This light uses a system similar to the Firefly in that we used 6 each aircraft landing lights, sealed beam, GE #4591, 28 volt, 100 watt, 90,000 MBCP for a total of 540,000 candle power. The light is installed on the APC by using a salvaged 50 caliber pintle and then into the 50 caliber machinegun mount. Light is then plugged into slave receptacle. The vehicle's 100 apm system handles the additional load without problems. Lights are connected in parallel, so that if one light is shot out, the balance will burn. We estimate effective range at 300 yards. By better adjustment, this range will increase. At the present time, we are trying an improved model, using 6 each aircraft sealed beam landing lights, GE #4559, 28 volt, 600 watt, 600,000 MBCP for a total of 3,600,000 candle power.

We would appreciate receiving more information and blueprints on the Firefly in order to improve our projects.

LTC HERBERT A. MUTZ
New Jersey Army National Guard
Trenton, N. J. 08625

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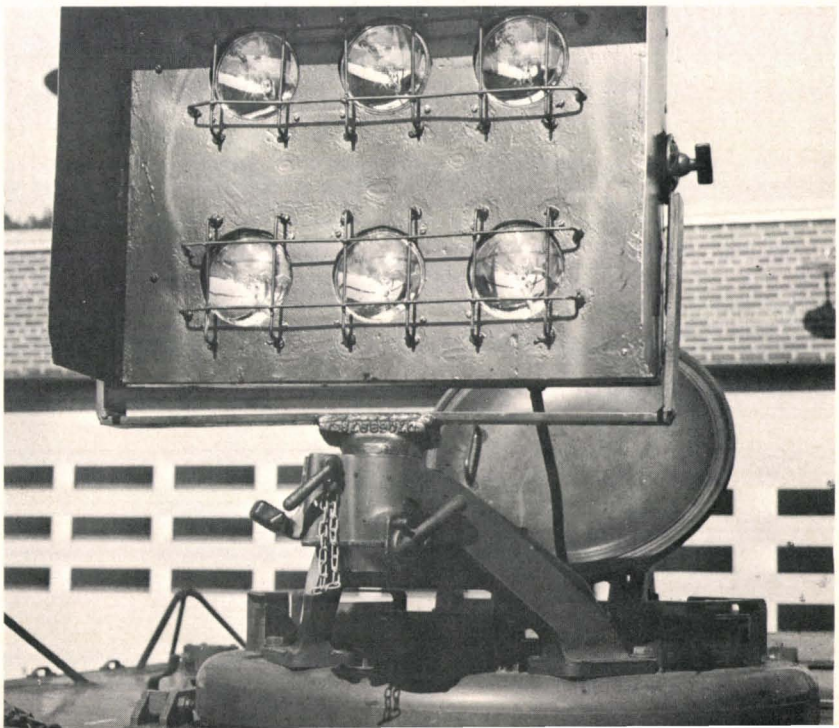


Transitioning Into The CH-54

WITH THE GROWING and organizational pains over and the first class graduated, the U. S. Army Aviation School at Fort Rucker is getting down to the business of producing qualified aviators to fly the CH-54A.

To qualify for transitioning into the CH-54A Flying Crane, an aviator must be assigned to or designated for assignment to a unit using CH-54s. In addition a pilot must be designated a rotary wing aviator (1981) or helicopter pilot (062), be current in annual flight requirements, and have a minimum of 500 hours rotary wing time. He must also possess a current Army rotary wing instrument rating, be turbine engine qualified, and have 250 hours pilot or IP time in utility or cargo helicopters.

In the transition course, the aviator gets 67 hours of academic instruction and 151 hours transition flight training, including 22 flight hours. Twenty hours of the flying time are during the day and two are at night. The helicopter carries net weights up to 18,000 pounds during flight.

At present, student flying time is given at the rate of 3 hours and 40 minutes each week for a 6-week period. The first week is devoted to Basic and Advanced Maneuvers. Gross weight of approximately 30,000 pounds is used during this first week.

Basic flight maneuvers for the CH-54 are about the same as those for other helicopters. During the first week the trainee, in effect, gets the feel of the aircraft and learns its peculiarities. He practices taxiing, takeoff to hover, hover turns, sideward and rearward flight, etc. He also learns single engine operation, maximum performance takeoff, power recovery autorotations, and confined area operations.

The second week is devoted to flying the Crane with a pod attached. During this phase, the gross weight is between 34,000 and 42,000 pounds. A special container similar to a semi-trailer body, like those pulled on highways, is attached to the helicopter. Greater gross weight is obtained by adding ballast to the trailer body. By shifting the weights in the trailer body, the student can practice flying the helicopter with different centers of gravity.

In the third week, training is given in operation of the four point load leveler system. Gross weight varies from 38,000 to 42,000 pounds. Beginning this week and continuing through the course, landing and takeoff over loads is practiced.

The load leveler system is used to sling loads from the helicopter, using four suspension cables rather than the conventional single point. It consists of four units, two on each side of the fuselage fore and aft of the rotary mast centerline. Each unit has a cable wound on a spring-loaded drum. The load levelers are adjusted individually by manipulating controls from inside the cockpit. The student learns to make adjustments for the best flight characteristics and to perform all emergency procedures involving operation of the system.

A jacking and kneeling system on the landing gear of the Flying Crane permits the helicopter to be lowered and raised approximately 8 inches. This feature, along with the capacity of the load levelers to be adjusted 8 inches up or down, allows loads to be raised hydraulically to clear the ground before the takeoff to a hover.

The fourth week of instruction is devoted to flying at night and flying with the aft seat controls. Gross weight during this period is from 34,000 to 42,000 pounds.

Student night flying emphasizes load system operations. He uses the lights and learns the additional preflight inspections necessary when flying at night.

Also during this week he receives instruction as aft pilot in picking up and landing with external loads. In the Flying Crane, the aft pilot can face to the rear to see the load while flying the aircraft during load operation. The aft seat trainee has 20 percent authority from the remote control system and maneuvers the aircraft with his own cyclic, collective pitch, and antitorque control. He learns how to transfer control from and to the forward pilot, using safe voice communication procedures. Since the forward pilot remains in command and monitors the controls at all times, the aft pilot may return control to him instantly during an emergency or can surrender control to him as desired.

A student is checked out in the CH-54 at Ft Rucker

During the fifth week more night flying is given, and flying with the single-point hoist system is practiced. Again, gross weight is from 34,000 to 42,000 pounds.

The hoist is a single-point drum hydraulically driven and located under the main gear box. The hoisting capability is 15,000 pounds. Static lifting can be accomplished up to 20,000 pounds. During this week the student practices recovery operations in which the hoist is used. He receives instruction in loading and unloading and carrying aircraft bodies to and from ridgelines and confined areas.

Towing operations are taught during the sixth week. With the tow kit installed the student learns how to exert up to a 15,000-pound pull on the hoist cable.

To convert the hoist cable to a tow cable, the aircraft has a system which consists of a cable guide and a pully and beam assembly. The guide helps prevent the cable from touching the underside of the aircraft. The cable hoist is run past this guide and through the pully and beam assembly. After mastering the details of converting the cable hoist into a tow cable, the student is then taught the techniques of towing with the CH-54.

To practice towing, the cable is hooked to a concrete "dead man" buried in the ground. The student is taught to exert the required pull with the helicopter by applying necessary power and placing the aircraft in the proper nose-down attitude for the desired pounds of tension. The area around the "dead man" is cleared to give the student a 360° area of operation.

Among the subjects discussed in ground school during the 6-week course are such things as operation of the automatic flight control system, the normal and malfunction indications, responses to indications, and resetting function of the caution and advisory panels. Also included are studies of the procedures, devices, and equipment used in recovery operations.

Such subjects as Precautionary Measures and Critical Conditions in the CH-54, Emergencies Procedures, and Load Operations are taught the students during inclement weather.

Each class consists of 10 students. The first class graduated on 14 August. The fifth class is now in training.

The first group of pilots to undergo flight training in the Flying Crane took their schooling in a special class established at the Sikorsky Aircraft Company at Hartford and Stratford, Conn. They had two weeks of ground school and 20 hours of flying time. This first group to transition into the Flying Crane were all assigned to the 478th Flying Crane Company, 44th Air Transport Battalion, 10th Air Transport Brigade and attached to the 11th Air Assault Division.

Ground to air communication

The Guatemalan Armed Forces

Major David L. Smith

ADOPTION OF A new radio transceiver has made possible communication between tactical ground units and combat aircraft in Guatemala.

Before February 1967 it was impossible for a Guatemalan troop commander to talk directly with the combat pilots who were giving him close air support. All conversations, target descriptions, damage analyses, and reconnaissance reports had to be relayed through an airborne forward air controller (FAC) or through major ground command headquarters.

Guatemala has been involved in counterguerrilla operations for over 13 years. Its armed forces are geared to provide internal security for the country so the economy may develop and prosper. As in all counterinsurgency operations, communications play an extremely important role. The ability to command and use forces effectively over widely dispersed areas is directly proportional to the commander's ability to communicate with his forces, obtain intelligence and initiate reaction. The efficient continuation of that reaction also depends upon the combatant's ability to obtain information about the enemy and coordinate efforts to defeat him. In this latter field the SKY-515 is assisting the Guatemalan commanders.

The SKY-515 is a commercial aircraft radio which has been adapted for military use by making it more rugged, waterproof, and easily portable. The whole set with its rechargeable battery and all accessories weighs less than 15 pounds (less than either the PRC-10 or the PRC-25). It provides up to 380 channels in the VHF-AM band (117 to 135 mHz). This flexibility of channel selection adds to its military value.

A Guatemalan special forces patrol rests. Note SKY-515 radio (arrow)

Guatemalan Air Force tactical aircraft cannot be modified economically to install radios which would net with the tactical VHF-FM radios used by ground troops. In an effort to provide coordination at the scene of action between the Air Force and Army, PRC-10 radios were carried aloft in observer aircraft. The antennas were extended from windows or doors, and the H-33 handset was used by an observer in the plane to talk with the ground troops. The pilot or the observer could talk with the tactical aircraft by using the aircraft radio.

Results of this procedure were far from satisfactory. The PRC-10 did not radiate effectively because of the antenna used and its proximity to the body of the aircraft; the observer could not hear well due to engine noise; and passage of information

---

MAJ Smith has been signal advisor to the Guatemalan Army since March 1966. He has had tactical communications experience with the 2nd Recon Sqdn, 10th Cav in Korea, signal experience with the 69th Signal Bn and electronics experience as an instructor at USMA, West Point.

Paratroopers leave an aircraft after a signal via SKY-515 radio is received from a ground patrol

between the pilots delivering fire support and the troops needing that support was marginal at best. As a result of the relative inability of air and ground arms to communicate effectively at the scene of action, most air strikes were preplanned and unresponsive to the immediate tactical situation.

In the summer of 1966, doublet antennas were installed on the observer aircraft. Each antenna was cut to the operating frequency of the infantry radios in its zone of action, and coaxial cables were run into the aircraft cabins. PRC-10 radios were installed and a headset combination was attached to the handset connector.

With this installation, reliable communications with the ground were established at distances of up to 35 kilometers, and much more efficient air/ground coordination was achieved. It was obvious, however, that use of the airborne FAC left a deficiency in communications, since the man delivering the fire could not talk with the man who needed it except through a middle man. The airborne FAC did, however, provide the valuable service of reliable target identification for the attacking pilot.

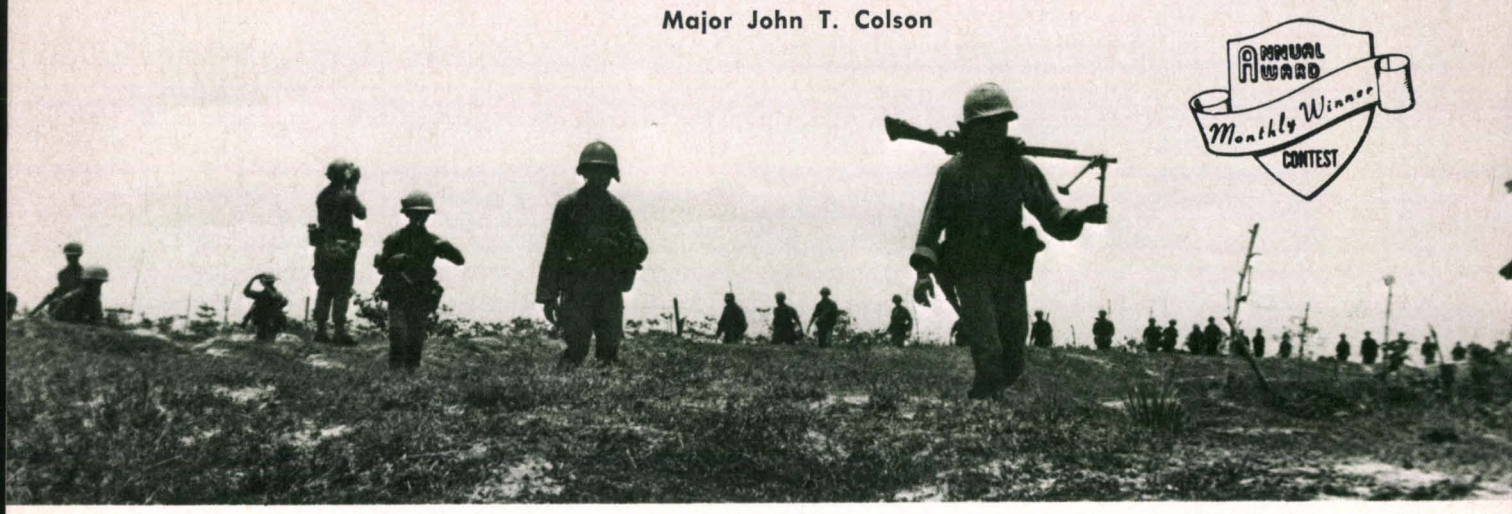
The current U. S. military inventory was surveyed in conjunction with

Continued on page 35

Below, a Huey is being talked into a LZ for a pickup by a member of a Guatemalan ground patrol (right)

Survival of an Airborne Rifle Company

Major John T. Colson

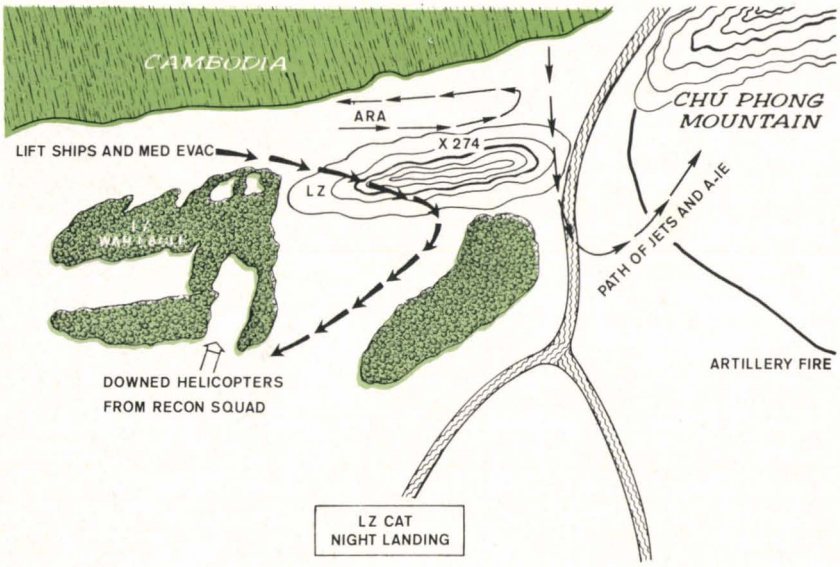


THE SURVIVAL of an Airborne Infantry Rifle Company and the final mission accomplishment of its parent battalion between 30 March and 3 April 1966 can be directly attributed to the flexibility and responsiveness of our brother in arms—Army aviation.

At 1600 on 30 March a platoon from the recon squad was placed in a small landing zone in an effort to determine enemy positions. The scouts were able to identify the area, but the platoon suffered heavy casualties and lost two aircraft. The brigade's reserve infantry battalion was instructed to commit a rifle company to extract the recon unit.

Within 30 minutes after the decision was made, A Company was saddled up and airlanded in LZ War Eagle. The unit made contact immediately, but the company commander and executive officer were lost. After making three attempts, A Company was unable to reach the two downed helicopters from the recon squadron, and the company withdrew back to LZ Eagle. The lift battalion commander, realizing the flexibility of the situation and lack of initial intelligence, had landed a pathfinder team equipped with lights with A Company.

After A Company established a small perimeter around the LZ, a night extraction was attempted. Due to lack of sufficient UH-1D helicopters, a CH-47 was used to supplement the lift. To provide greater security it was sent in first. The VC had encircled the LZ and the CH-47 received 68 rounds, which required it to force land in the LZ with the crew pulling their machineguns and joining the infantry in the defense. The infantry battalion commander and lift battalion commander decided no further aircraft could be risked in the extraction.



MAJ Colson is chief, Special Subjects Branch, Academic Synthetic Trainer Division, Dept of Fixed Wing Training, Ft Rucker, Ala.

A Company was in a precarious position. The aerial rocket people requested and got A Company to establish a landing T in the center of the LZ. The forward observer was able to direct their rocket fire in relation to the T throughout the night. Hundreds of rockets were fired. Because of slow speed and accurate fire of the aerial rocket artillery (ARA), the VC were unable to ever penetrate the LZ. The company was never without rocket cover. At LZ War Eagle the lack of ammunition, food and water was critical. A CV-2 LOLEX extraction was made at 0130, with perfect accuracy, and the unit was successfully resupplied.

At 0200 another rifle company was landed 5 kilometers east of LZ Eagle into an unknown, unreconned LZ. The lift battalion commander landed in the LZ with his landing light on, and directed his UH-1Ds in one at a time to accomplish the landing of the rifle company. The LZ was secured and with the aid of CH-47s an artillery battery was implaced and prepared to begin fire at daylight.

As a result of the aggressive actions of the crippled rifle company, coupled with constant aerial rockets and tube artillery, the remainder of the airborne battalion was airlanded at LZ Eagle at dawn. By noon the downed helicopters had been secured and all bodies recovered. As darkness fell the area around LZ Eagle was secured for 1 kilometer in all directions.

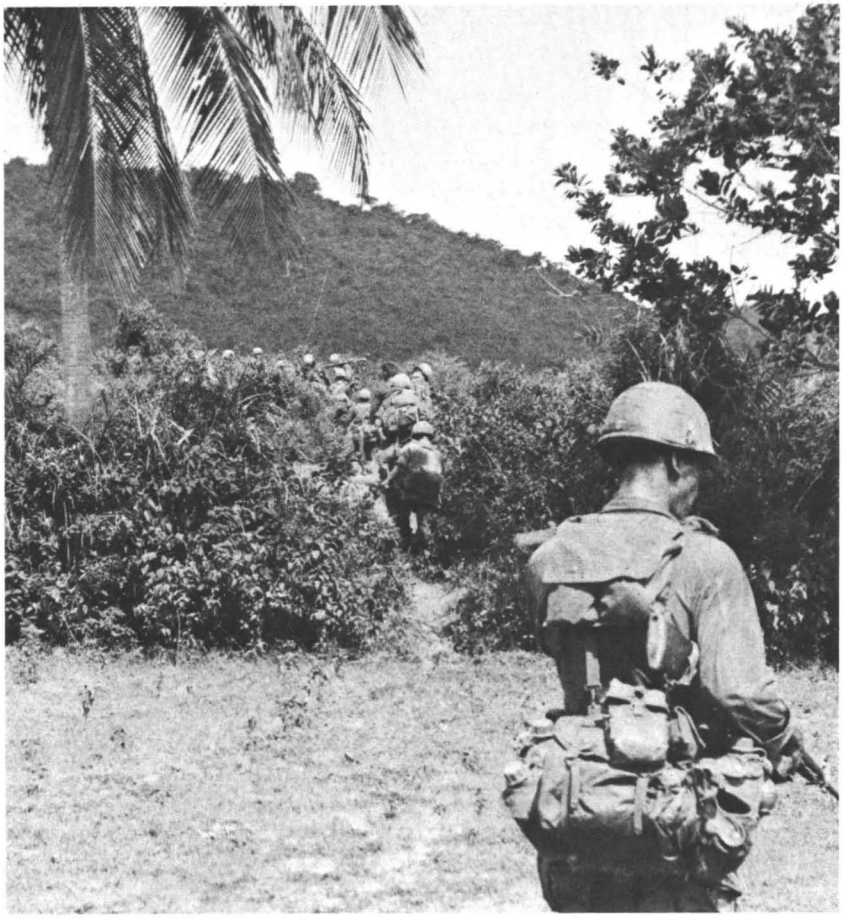
The second full day of the battalion being in LZ Eagle found B and C companies patrolling to the east and south respectively. A Company secured the LZ, and D Company, the weapons company, reinforced its recon platoon under the D company commander, who was patrolling to the north toward Chu Pong mountain.

Two OH-13 armed helicopters were the key to the day's activities. The small helicopters flying directly above the D Company patrol were able to detect individual Viet Cong soldiers. By the use of radio, smoke, machinegun, rocket fire, and M-16, the extremely courageous OH-13 aviators were able to fix the enemy and direct D Company in for the kill. During the entire day the aircraft actually hovered above the trees, often directing artillery and aerial rocket fire.

By 1600, D Company had moved to the base of hill 274, an actual foothill of the Chu Pong mountain complex. Aerial scouting had observed VC soldiers in a creek just north of the hill. The battalion commander felt that the VC were now withdrawing up this valley and crossing back into Cambodia. Artillery fire was placed on the creek and generally to the west to cut off the withdrawal. An airstrike was directed on the creek. D Company was ordered to move up hill 274. C Company, which had been patrolling south of LZ Eagle, had throughout the day moved north and west of LZ Eagle into a position to assault the hill. Hill 274 was long and narrow, running north and south. The south end was open, large enough for four UH-1D helicopters to land.

D Company encountered short-lived resistance on moving up the hill. C Company moved up and over the hill from the west and was very quickly in position on the north edge. The hill dropped off and was bare for the first 100 meters, then dense jungle all the way down to the creek. The scouts reported that the airstrike was very successful, and C Company was committed down the hill to evaluate the airstrike. The company was very heavily engaged

A CH-47 Chinook approaches an LZ in Vietnam with a howitzer



The company was ordered to move into position to assault the hill

approximately 50 meters down the hill, with the company commander being killed, causing the unit to fight its way back to the top of the hill.

The executive officer was busy evacuating casualties on the rear of hill 274 and getting water and a C-ration meal for the company and was not monitoring the battalion command net. The company was stunned by the loss of their CO and the casualties suffered. The battalion commander was unable to receive an accurate report of the situation.

D Company's commander reached the position and assumed command of both companies and directed aerial rocket fire. He asked for an airstrike, which battalion had already requested. Actually three sets of attack aircraft arrived and established a circular pattern for bomb and strafing runs on the woods between hill 274 and the creek. The battalion commander continued to direct artillery fire to the west, just north of the jet and A-1E pattern.

The decision was quickly reached to pick up Company B and move it to hill 274, to have that lift extract the 50-man patrol from D Company and return it to LZ Eagle. C Company was being resupplied and casualties evacuated. The battlefield turned into a three-ring circus. Medevac and lift ships were coming in and out of the south portion of hill 274, breaking east because of the fighter strafing taking place west to east, north of the hill. ARA ships were making firing runs south to north, west of hill 274. This was all coordinated by the battalion commander and his S-3 while they orbited above the battle area in the UH-1D TOC (tactical operations center) ship.

The commander of D Company remained on hill 274 and took command of Company C. Companies B and C went into a defensive position on hill 274 for the night. At daylight of the third day the two companies made a coordinated attack down the hill, clearing the valley and surrounding area and finding evidence that a large number of casualties had been inflicted.

From the initial phase to the conclusion, the Airborne Infantry Battalion was dependent upon Army aviation. Aviation units were an integral part of the combat unit. The pilots in support felt it was their unit involved, and it was their fight as much as the infantryman's. Aviation was the vehicle by which the enemy was discovered and combat power delivered to the area of decision.

Aviation moved supporting artillery and became supporting artillery through ARA. The scouts found and were able to fix and kill the enemy from their small aircraft. Evacuation and resupply was accomplished by helicopters and CV-2. Patrols were assisted in orientation and navigation. The operation was commanded and controlled from an airborne command post. It is doubtful that the battalion commander would have effectively controlled or coordinated the diversified fire support from any point other than his airborne TOC ship.

Aviation is just another weapon and extension of the combat arms to be fully integrated and effectively used as by this imaginative commander and staff — ALL THE WAY!

Aviation Training Program

Management Improvement

Major Olen D. Thornton

PROPER MANAGEMENT of military resources not only results in saving tax dollars but also frequently permits more efficient and effective use of existing facilities. The U. S. Army Aviation School is demonstrating this in the overall Army effort of management improvement.

Several weeks of combined effort and coordination among all school and center agencies at Fort Rucker, Fort Wolters, and Fort Stewart/Hunter AAF have resulted in CONARC/DA approval of a plan that will double the frequency of classes in the initial rotary wing aviator training program. This increase will allow graduation of just as many aviators and will alleviate many problems of not enough equipment and inadequate facilities experienced under the present system.

The Primary Helicopter School at Fort Wolters and USAAVNS presently begin and graduate a class every 4 weeks. Each school has four in-resident classes of initial entry rotary wing students in flight training. The revised plan will change the input/output frequency from the present 4 weeks to 2 weeks. This will allow eight in-resident classes at each installation.

In addition to maintaining the present output of aviators, the 2-week frequency will result in several administrative advantages. The most obvious of these will be in processing, POR qualifications, and physical exam requirements. A minimum loss of training time will be experienced in processing setbacks, and peak requirements for night training, aircraft, classrooms, training aids, transportation and checkrides will be held to a minimum.

At Fort Rucker a significant training advantage will occur in use of facilities. Presently five major five-lane stagefields are required during the 4-week UH-1 transition phase. With current class loads, these stagefields have been saturated at a density of four aircraft per lane. The 2-week frequency will result in a 3:1 aircraft/lane ratio during maximum use of the first two weeks of the transition phase. This will permit the two remaining stagefields to be used for maneuver review and refueling during the last 2 weeks.

USAAVNS' five aerial gunnery ranges are now used exclusively for gunnery familiarization of initial entry rotary wing students. This is done during the first 12 days of each 20-day training cycle. Under the present system each student completes a 3-day cycle with 1 hour of flying time each day.

As a result, the school's other POIs which require aerial gunnery familiarization/qualification must now be scheduled to fire during range availability of the last 8 days of the 20-day training cycle. These include the Rotary Wing Qualification Course, Active Army; M-22 Gunnery Training Course; UH-1 Instructor Pilot Transition/Gunnery Qualification Course; and the LOH Instructor Pilot Transition/Gunnery Qualification Course.

Under a 2-week frequency, each initial entry class must complete gunnery familiarization requirements during the first 8 days of the new 10-day training cycle. Each student must complete a 2-day training cycle with 1½ hours of flight time each day.

By having the M-22 Gunnery Training Course students fire during the midday break — to avoid closing other ranges, one range will be available for other requirements at all times. The other four ranges will be available during the last 2 days of each 10-day training cycle. This will permit greater flexibility in scheduling other POI range requirements. It also will permit a reduction of required weapons systems and, in some cases, a reduction in personnel required.

At Fort Stewart, ORWAC/WORWAC range requirements will be reduced from three to two, weapons systems requirements will be reduced by eight, and enlisted personnel spaces can be reduced by nine.

When the 2-week frequency is fully implemented the result will be a significant step forward in management improvement of the aviation training program.

MAJ Thornton's article tells of a CONARC/DA approved plan that will not only save tax dollars, but also permit more efficient and effective use of existing training facilities.

Improper shutdown procedures and failure to write up a compressor stall caused a "routine" flight to become an

Abrupt Tour Terminator

CW3 Glen W. Mantooth

AS WE SAT talking over the day's flights, the platoon leader walked in and handed my section leader, CPT Bobby Smith, a mission sheet for the next day. We had been assigned to sector duty at Bao Lac which was located at the southern boundary of our operational area in II Corps. The usual routine was to report to the senior sector advisor in that area at 0800 and fly any type missions he had for us until 1700 and then come back to our airfield. I decided to get to bed early as we would have an 0700 takeoff.

I met Bobby in the mess hall about 0600 for our usual coffee and pancakes. As we finished we saw our crewchief and gunner walking out to the aircraft, so we picked up our gear and joined them. They had both been out to the aircraft earlier, got the ship ready and then had gone back for breakfast. They were a good crew.

As we made our takeoff we could see the Air Force inbound to yesterday's assault area ready to give Charlie some more pounding. The weather was beautiful — sun bright in the sky, no clouds except to the southeast around the mountains by Da Lat. We wrote our position report as we passed Gia Nghia, and in about another 30 minutes we had the airfield at Bao Lac in sight.

On short final we saw a loaded jeep driving up to our landing pad. We exchanged greetings with the two American advisors and two RVN officers. As our Huey was being refueled, they briefed us on our mission for the day. They were setting up a new compound about 20 miles to the east at Di Linh and wanted us to take the necessary equipment out. We could make about five trips with our delta model, and it would save them from making up a convoy with security and going by road.

On returning from the last trip at about 1130 hours, we went to the MAAG compound for chow. During the meal, we talked about the two missions they wanted flown that afternoon. One short trip to the north where a new special forces camp was going in, and then we could combine the rest of the missions into a second flight and return to home station about 1700 hours.

The mission to the new special forces camp was uneventful, and we were briefed again on the last mission. We were to take two American advisors to recon a valley to the east for a future assault and then fly back to the west and resupply two small outposts along the highway that leads into Saigon.

We completed our recon of the valley and turned back to the west. In about 30 minutes we were over the first outpost, which was in the middle of a small valley ringed with 3,000 foot mountains. They gave us smoke, and we started our circular approach.

On the ground, as our supplies were unloaded, I noticed that our altimeter read 300 feet. The mountains were so close around us it would take a maximum performance takeoff to get out and to have a small safety margin from VC snipers on the hills. We made a circular takeoff and climb to 3,500 MSL, then over the mountains into the next valley. This outpost at Dac Quai was even smaller than the first one and the hills were even closer. Again a tight circular approach was made into the area, keeping away from the hills.

While the supplies were being unloaded, we looked over our proposed takeoff route. It would have to be another maximum performance takeoff due to high hills surrounding the outpost. The high-

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CW3 Mantooth is presently assigned to the Dept of Maintenance Training, Ft Rucker, Ala. His article is based on a personal experience which abruptly ended his tour of duty in Vietnam.

way going east was the best route; however, sniper fire was usually encountered that way out. We elected to take off southeast into the wind, through a saddle between two small hills, and then circle around and establish a circular climbout to 3,500 MSL and across the larger mountains between us and Bao Lac.

Bobby made the takeoff while I monitored the N1 speed. This was SOP with our unit. He was at max power by the time we were crossing the saddle of the two small hills at an altitude of about 50 feet and had started to lower the nose to increase airspeed. I glanced up and saw the airspeed was about 30 knots and increasing when we heard an explosion behind us. One loud explosion and then silence.

I grabbed the controls, not because I didn't think Bobby could handle the situation but more out of automatic reaction. The pitch was already on bottom, but the rotor was far below operating limits. We were going down the side of the hill about 10 feet above the trees. It took me a fraction of a second to realize that I didn't have any cyclic or pitch control. I still had antitorque control and managed to line up the aircraft with a ravine at the bottom of the hill. I also noticed there was nothing but heavy undergrowth in the ravine. At least there would be no trees to interfere with our sudden stop.

The few seconds before we hit seemed like minutes

The last two to three seconds before we hit seemed like minutes, but the aircraft remained slightly nose low and we hit the ground. We didn't hit and bounce or slide, but just stuck where we hit. I didn't know it at the time, but a small tree had torn off our right skid and the ravine was so steep that the blades struck the sides and were torn off before we hit.

After we hit, the first thing I realized was the dead silence which lasted for a few seconds. My first thought was to get out of the aircraft before it caught fire. My door was jammed shut; however, my helmet had broken out the front windshield as it went out. My foot was jammed under the pedal and it took me a few seconds to work it out. I noticed my head was bleeding but not bad. I crawled out the front windshield and saw that Bobby was unconscious and had some bad cuts on his head.

As soon as I got outside the aircraft I tried to stand up, but I couldn't put any weight on my left foot. I heard a noise in front of us, and saw a group of Vietnamese in black coming through the jungle. I looked back at the aircraft and saw my AR-15 lying on the ground about a foot away. I picked it up and chambered a round thinking to myself, "I'll get a few before they get us." Then I noticed the last man coming into the clearing had a fatigue uniform on and he was directing his men to form a perimeter around us, but they were facing away from us. This was my first indication that they might be friendly.

The next moment one of them

I heard a noise and saw a group of Vietnamese in black coming through the jungle

was standing on top of a small mound in front of us with a bandage in his hand. As soon as I lowered the rifle, he unbuckled his pistol belt, let it drop to the ground and came toward me with the bandage outstretched in his hands. He put it around my head, and when he finished I motioned for him to help me back to the aircraft to check on the rest of the crew and two passengers.

Two other members of the patrol came up and each took an arm and would not let me go back, but started to walk me to the highway which was about 100 meters to the south. I called back to the helicopter and one of the passengers said that he was all right and other members of the patrol were getting everybody out. Once on the highway, they stopped an old station wagon, made the occupants get out and put three of us in and drove us back to the outpost. They carried the other three in on stretchers made out of ponchos.

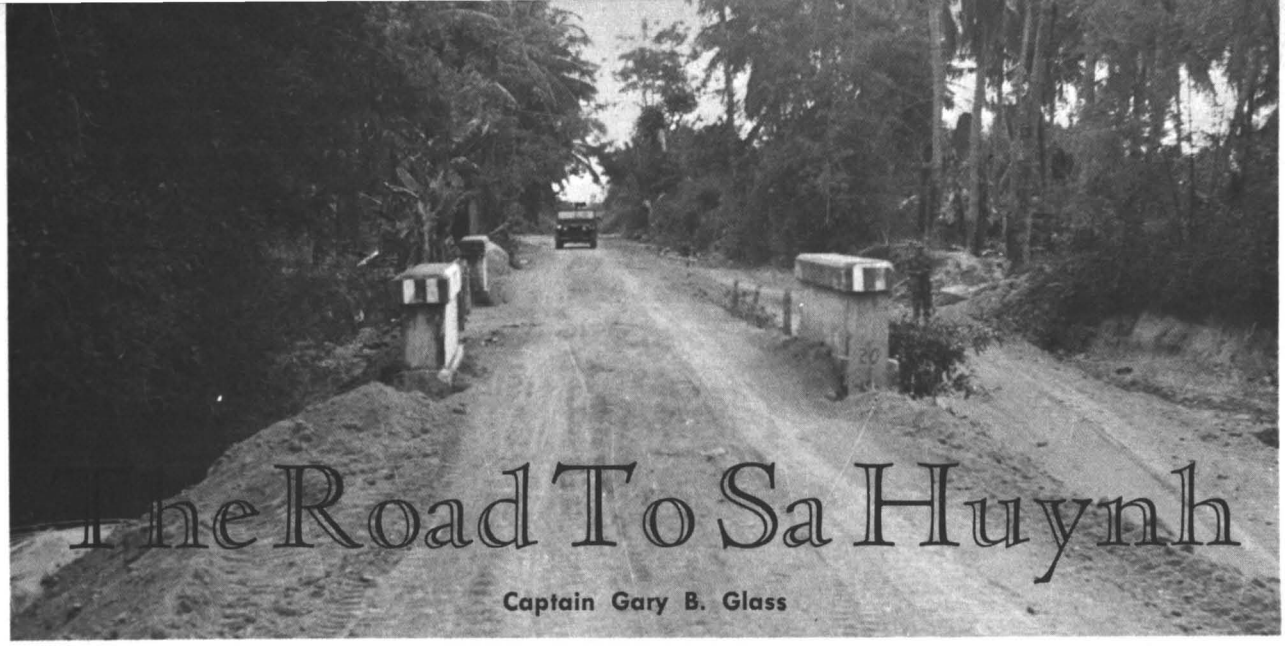
When we got to the outpost, they started giving us first aid. All fuel tanks had ruptured on the aircraft and the crewchief, gunner and two passengers were soaked with JP-4. They got their clothes off and washed them down with buckets of water. My back was hurting (I found out later two vertebrae were broken) so I lay down. As I looked up in the sky, I saw a Bird Dog circling. He had seen us go in and had put out the Mayday call. Within 60 minutes after the accident, a Dustoff aircraft, with the help of a gun ship from Saigon, had us on the way to the hospital at Bien Hoa.

Bobby had some plexiglass lodged behind his eye and a broken leg so he was sent to Walter Reed. I was kept at Okinawa until I could walk and then sent home. The other four were back on duty after about 30 days in the hospital at Bien Hoa.

In the hospital at Bien Hoa I wondered what could have happened to make the engine fail. What was the cause of losing a UH-1D and so quickly ending the tours of two pilots in Vietnam? So quickly, in fact, that yesterday's missions and concern about our immediate operational area did not mean anything now. When you rotate home on your DEROS (date eligible for return from overseas) date, it's a day that you have planned on and expected for a whole year, but leaving so abruptly is a bit confusing to say the least.

An analysis of the engine found that the engine failed due to elongation of the turbine blades, thereby causing them to strike the compressor housing. The report also stated that this was caused by compressor stall on this or previous flights and/or improper shutdown procedure over the last 623 hours.

This is a high price to pay for someone not writing up compressor stall and from not taking the time to perform the proper shutdown procedures.



The Road To Sa Huynh

Captain Gary B. Glass

THE ROAD TO Sa Huynh is actually an 8 kilometer section of highway 1 in the 1st Air Cavalry's Pershing area of operations. Local Vietnamese point out that this road has not been used except by bicycles and carts since 1962. At that time the Viet Cong destroyed nearly all the bridges, dug deep, wide trenches across the roadway, and installed many barricades to limit its usage and to extract tolls. In addition each devastating rainy season continued to carve into the roadway where the roadbed had been weakened.

This was the scene that confronted the first platoon of Company A, 8th Engineer Battalion, after the battalion commander directed that Company A open this road. It was to be no easy task, and what made it even more difficult was the deadline of 4 days in which to complete it. Careful consideration was given to reconnaissance files collected several months before, as they pointed out that a head-on attack would be very time consuming. Since the 8th Engineer Battalion has airmobile equipment, it was decided that a twofold attack on the project be made.

The 1st Air Cavalry Division actually had not operated in this particular section of their area of operations, which meant the northern work party of the divided task force would have to be combat assaulted just above Sa Huynh. The assault was made with elements of the 2nd Battalion, 8th Cavalry. D Troop, 1st Squadron, 9th Cavalry provided ground security for the remainder of the project. Equipment was lifted in by Chinooks and Flying Cranes, without incident, making available the power of one dozer, one grader, one backhoe and eight 3/4-ton dump trucks.

Meanwhile the southern group of engineers convoyed northward. They had with them seven 5-ton dump trucks, another dozer, grader, and backhoe, as well as a front loader. Such was the task organization as the two parties began work, forging a pioneer road opening so that they could join up and work together.

Between the two work parties stood 8 bridges damaged or destroyed, 18 ditches across the roadway, 2 large washout areas, 6 roadblocks, as well as several stretches of roadway that had been so eroded that nothing but a foot path remained.

Within 2 days the work parties joined forces without any sign of enemy activity. It was hot, hard work with temperatures well above 100° throughout the operation. Approximately 2,500 cubic yards of fill were dumped or dozed alongside the bridges, and 354 feet of culvert were emplaced to construct bypasses for the flow of future military and civilian traffic. Many additional gaps in the roadway were filled, widened and graded.

Further complicating the engineers' efforts was the constant vigilance for enemy activity required, especially at night. By the time the road to Sa Huynh was completed, one engineer work party had sustained an ambush, with one casualty. In addition, a vehicle carrying the company commander barely missed destruction by a command detonated mine. Careful mine sweep operations along this entire stretch of road by Alpha Company personnel located several mines that the Viet Cong had emplaced to impede progress and to take their deadly toll.

Hard, backbreaking work opened a road that had been closed for 5 years. Pioneer opening of the road was accomplished in 4 days' time. An additional 2 days were spent in general improvements so local Vietnamese could make better use of the road.

CPT Glass is currently serving in Vietnam with the 1st Cavalry Division (Airmobile).

THEY WOULDN'T BELIEVE ME -- and all I said was, "I flew more than 800 hours OH-13S time on armed reconnaissance missions during my tour in Vietnam." It seems like time for a war story . . .

CW3 Frederick J. Carll

B troop was working out of the oasis the afternoon that A troop ran into what was to prove to be a regiment of fresh North Vietnamese regulars. A troop had been working from Plei Me west to the Cambodian border. After some of the dust had settled that evening, we found that one U. S. infantry company had been committed to assist the A troop infantry platoon, and early the next morning B troop was to move to Plei Me to extend the contact and screen the area for more infiltrators. Resupply and reinforcement missions had been carried on most of the night by the lift battalions using flare ships and sometimes no lights. By first light the next morning a U. S. infantry battalion had closed the area and was ready to push off to regain contact with Charlie.

When Bruce (WO Bruce L. Jackson) and I left the oasis the following morning, we had been given the mission of screening well south of the committed battalion and north along the Cambodian border to prevent or report any movement in or out of the area of concern.

Bruce had a rocket kit installed on his OH-13S with eight 2.75" rockets (a full load) aboard. I had the M-2 kit (twin skid mounted M-60, 7.62 mm machineguns) with 1,100 rounds of ammunition. We bored by Plei Me and headed for our sector south of the Chu Pong mountains. As we made the first sweep across to the border and north to the mountains we spent most of our time familiarizing ourselves with the area. On the second sweep we were looking hard for any sign of Charlie.

Terrain south of the mountains is not heavily wooded except in some large scattered patches and along the stream beds, where the brush is dense bamboo for some 100 meters from either bank. We were crossing one of the stream beds when I caught a momentary reflection in the brush and broke left to keep the spot in sight. Bruce took up the big circle around me and started getting up the spot report for operations.

As we moved back across the

CW3 Carll was administrative officer, Headquarters & Service Company, U. S. Army Aviation School Regiment, Ft Rucker, Ala., when he wrote this article.

brush towards the area my observer started picking out individual North Vietnamese in well-camouflaged holes in the ground; then I started seeing them on my side. We hovered about 400 meters along the stream and were finding North Vietnamese all the way when Bruce told me that he had the spot report called in to operations and that ARA (airborne rocket artillery) and Air Force fighters were on the way.

Warrant Officer Jackson and I were on one of the typical missions given to the scout teams of the 1st Squadron, 9th Cavalry Regiment of the First Cavalry Division. The squadron was composed of the headquarters and headquarters troop, one ground troop and three air cavalry troops.

The squadron's mission is to perform reconnaissance and provide security for the division, engage the enemy as an economy of force unit, and provide limited antitank defense for the division. Of the many sides of this squadron I have chosen to write exclusively of the aerial scout platoon of the air cavalry troop. The troops each had a headquarters platoon, an aerial weapons platoon, and an infantry platoon with organic lift aircraft. The total of my experience has been with scouts, so the scouts get the glory in this article.

With 10 officers and 19 enlisted men the platoon did its job with 10 OH-13S helicopters. The OH-13S was issued with the M-2 (twin skid mounted M-60, 7.62 mm) weapon kit. However, the squadron maintenance officer devised a system of eight 2.75″ folding fin rocket tubes clamped to an M-2 frame. These tubes were fired singly from the cyclic stick trigger switch and a ten-position selector switch on the console. Eventually the rocket kits were removed because they could not be jettisoned in case of a rocket fire in the tube or a hit by small arms fire.

Platoon officers flew in two sections of four aircraft with the platoon leader and one rotary wing aviator forming an extra team. Missions were performed by teams of two helicopters working together. Each pilot was assigned a trained enlisted aerial observer who flew with that pilot unless the platoon was short observers. Teams were most effective if the four team members could work together all the time. This was not a firm line, and pilots or observers could be switched in the platoon if required for the mission.

In the teams the lead and wing positions were switched frequently on missions; it is much more difficult to fly wing than to fly lead. Mission responsibility remained with the team leader in all events. Normal mission reporting was through the troop unless the team was attached directly to a divisional unit. Reporting responsibilities often extended directly to the division G-2 section or advisors to ARVN units.

Let's discuss some of the basic equipment starting with the aircraft.

The OH-13S has an 0-435 turbocharged engine and all the pilots who flew the series had nothing but praise for performance. Loaded as they were with a crew of two and all the personal equipment, plus the weapons system mounted on the skids, the normal endurance was 2 + 45 hours and some have been flown 3 + 15 from refueling to refueling. The 3 + 15 mission was run partly on fumes, I believe.

It was not a fatiguing aircraft to fly when the missions were 1 + 30 or so; but the seats rapidly became harder beyond that time. When flown more than 6 hours in one day, pilot efficiency seemed to deteriorate rapidly.

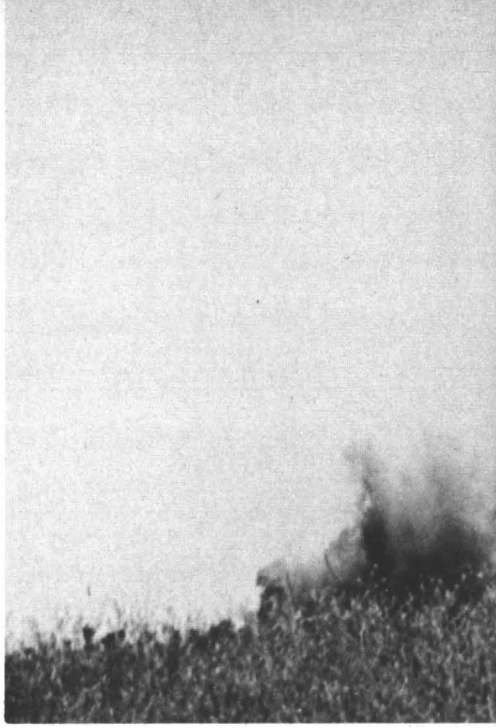
The S series could take a lot of hits and fly away. The only really ruinous hits were in the fan and carburetor areas on the engine, and crew hits. Control hits were seldom, if ever, taken. Fuel cells were vulnerable, but also were rarely hit. Airframe hits were the most frequent and even though they caused a lot of repair work, usually did not prevent the aircraft from completing the mission on which it took the hits.

The S series proved to be an excellent aircraft for the required missions. As an afterthought, the helicopter was not hampered by the blade pop of the UH-1 series. Scouts could easily outfly their noise at 60-65 knots and really sneak up on the Viet Cong.

Next, weapons. The M-2 kits were generally rated as poor until we stripped the nitrogen charging system off them and disconnected the elevating mechanism. Nitrogen was just not readily available in our area and the elevating mechanism never seemed to stop itself at the same point every time. If the weapons were checked for electrical power by using the elevating motors, the bore sight was gone and the weapons never fired where you wanted them to fire.

Weapons were bore sighted at less than the book distance (400 meters +). Ranges of 125 to 150 meters gave good converging fire to the usual limit of firing and were close enough together to give good sighting bursts at 200-250 meters. Weapons were fired by the

The OH-13s were used extensively to mark both enemy and friendly positions with smoke



use of sights grease-penciled on the bubble, and sighting bursts were needed to get on target. They were not flexible and both elevation and traverse were accomplished by aircraft control.

It was a very effective system if clean dry ammunition was used at all times. Ammunition covers were in short supply normally, so many improvised systems were used. No immediate action could be accomplished in flight. If a weapon had a stoppage of any kind, it was reduced by landing and letting the observer step out and taking any action required. Many, many Viet Cong were sorry that this system worked so well.

The rocket kit fired eight 2.75″ folding fin rockets one at a time from the trigger switch on the cyclic stick. A rocket tube was selected by use of a ten-position switch on the console (8 rockets, 2 safe positions). Sights were grease-penciled on the bubble as with the M-2. It was an excellent offensive weapon if the aircraft was flown by the same pilot and he fired rockets frequently. The main shortcoming of this system was that the pilots tended to bore in much too close and the rockets would not arm before striking the target. Arming distance was considered 75 meters and scouts fired a lot of rockets that didn't go off.

The best use that was made of the rockets was the marking of targets with the white phosphorous rounds. This gave scouts the ability to stand off from an area, mark, and then immediately direct supporting weapons or air on the target. With smoke grenades, the pilot was required to climb back to altitude and see where he was. This took a lot of time. The ideal combination of weapons was an M-2 system for lead and a rocket system for cover and marking.

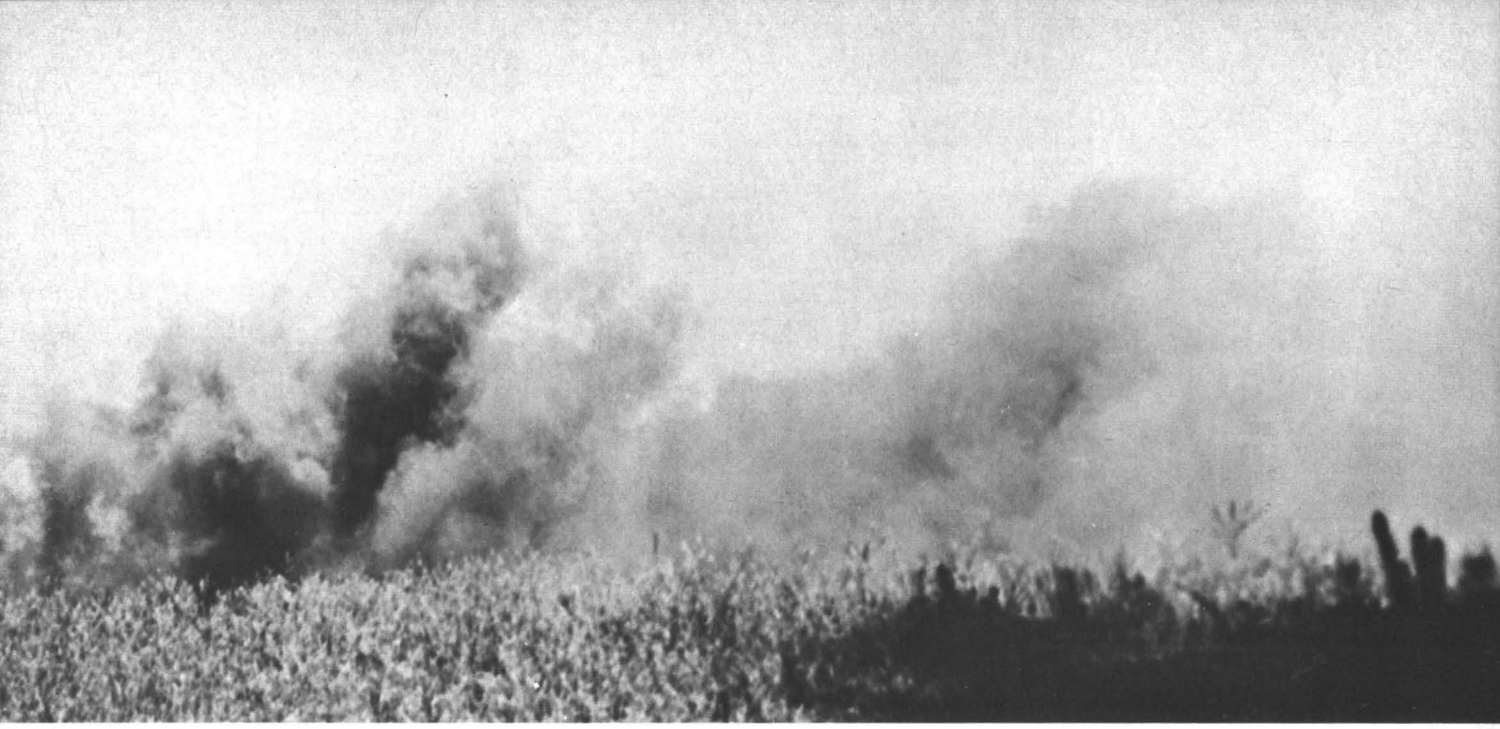
Individual weapons and the side arms scouts carried were as varied as there were members of the teams. Every weapon in the infantry company except recoilless weapons and mortars were used at one time or another from the scout aircraft. Some even dropped the 81 mm mortar round as bombs (shades of World War I!). Our observers were constantly experimenting with weapons and the pilots left the choice of weapons up to the observer, within weight limits of course.

Observers and crewchiefs, who often flew as observers, were without equal in aggressiveness, ingenuity and just plain guts. None complained of the long missions on hard seats or the short missions heavy on enemy contact. Repeated runs through intense enemy fire didn't seem to faze them to any great extent. These young enlisted men constantly competed among themselves, and their own pilots were always the best in the world. They were an integral part of the team and were a definite asset to the troop's capabilities.

As far as individual weapons, when a spare M-60 machinegun was available it was hand held on the right side of the aircraft and was very effective. Observers would fold 8 or 10 unconnected 100-round belts over the console tunnel for use as required. With the M-60, targets could be tracked with up to 100 rounds as opposed to the maximum of 30 rounds for the M-16 (5.56 mm) rifle. When the M-60s were not available, the M-16 was used to good effect and we found this weapon to be best used if the majority of the rounds used were tracers.

Scouts used up many hundreds of thousands of tracer and ball 5.56 mm rounds. The weapon was fired from the hip and lefthanded at that. Aimed fire with the APH-5 helmet on was very difficult and the observer sat in the right seat of the aircraft. The best we ever had with the M-16 was a forward observer for 18th Artillery Battalion who was lefthanded and used a headset because no APH-5 would fit his head. He once shot a bird on the fly, hitting it with each of two rounds. He then fell about 10 feet out of the aircraft when we went in to recover the bird; he was eager too.

Toward the end of my tour we received some duplex 7.62 mm belted ammunition. The duplex or piggyback round had two projectiles in the same casing. These were well accepted by all of our troops and especially by the observers. These were belted four duplex to one normal tracer, and the near misses became confirmed kills many times with this round.



We carried M-79 grenade launchers for a while, then gave them up for fragmentation grenades. The M-79 was hard to shoot from the OH-13 with any degree of accuracy. We could drop grenades and only have to figure one lead. The M-79 took a very complicated set of leads and allowances and was fired from the hip.

Scouts threw many hundreds of white phosphorous hand grenades. "Whiskey Papa" was used to mark all enemy positions and often for reconnaissance by fire missions. Charlie shakes easily when a white phosphorous grenade goes off near him.

We threw many, many smoke grenades to mark friendly positions, landing zones, airstrike concentrations, or any other reason when we did not want to hurt the people we were marking. Weapons and ammunition always depended on what was available and needed for the mission at hand. At times, aircraft have returned from missions with every round of ammunition expended — even that for side arms.

Some personal armor was used by scout team members. Most had an old piece of UH-1 armor to sit on, for obvious reasons, and almost all wore either a flak jacket or a breastplate in addition. After a few missions I used to put my breastplate behind the seat back on the left side where it would not interfere with the collective. Most hits were taken from the rear of the aircraft and I didn't want to take any chances from that direction.

Employment of the scouts was predicated by a combination of mission and terrain. Most missions were flown at low level and at the optimum speed that could be induced from the overloaded aircraft (60-70 knots usually). Scouts bored in close and looked hard. Charlie has been discovered by such small things as a weapon stock that wasn't covered, a shadow among many shadows, and following footprints in small stream beds.

He was very easy to spot on occasion, but usually the hard close look was required. Some finds were comical in their simplicity. One large enemy unit was found in the jungle northeast of Plei Ku because several Viet Cong used banana leaves for cover, and there wasn't a banana tree for miles. They have been seen sitting on a paddy dike in the midst of miles of rice paddies with a banana or coconut leaf held between them and the scouts, not really effective camouflage.

In the teams there had to be a good working agreement between the lead and the wing aircraft to use the team as it needed to be used. Practice was what made the teams good. Knowing that the lead didn't mix up his turns too much helped wing keep clear of lead and lead's flight path. The aircraft crossed flight paths as little as possible on a mission. The wing's usual position was 300-500 meters right of lead and 100 or 50 meters behind. Charlie dented many of our OH-13s when they were flown in the same flight path.

Both aircraft freely exchanged positions during missions to keep everyone on their toes. If either aircraft needed a closer look at something, the remaining aircraft circled about 200 meters from the looking aircraft and 50 or so feet higher to keep a close cover. Where the terrain was very rough, the wing aircraft might be 1,500 feet higher than the lead. This

Artillerymen enjoyed working with the scouts

was also used where enemy fire was expected. The high aircraft could keep lead in sight and mark areas on the map as lead called them hot or cold.

One team worked a very good system of marking for supporting aircraft. The aircraft that found enough for a target would satisfy himself of the limits of the unit or area. This aircraft would then climb to a good altitude to direct fires. When the support arrived, he would direct the other aircraft on a marking run. This allowed immediate action from the supporting aircraft.

The teams were very effective in direction of tube artillery and mortars. This was done often and everyone got a lot of practice. Practical experience in the base camp area at An Khe helped scouts work out very useable methods with our supporting artillery. A comment on the artillery that supported 1st Cavalry Division seems appropriate. The artillery was one of our most effective support weapons in any area they could reach. Anyone could call for fires and as long as they knew who they were, generally where they were, and a frequency for any artillery unit, the artillery would work out the fire mission.

Our artillery was eager and more than cooperative. They enjoyed working with the scouts, mostly because we would effectively assess damage on their fire missions and give them valid reports. We worked together very closely and saw some excellent results of this relationship. Scouts flying in the tactical area of responsibility around the base camp would often call artillery control to see if any artillery concentrations had been fired and not assessed. If so, an assessment and report would be made.

Scouts were used for convoy control and cover, local reconnaissance for units as small as a platoon on patrol, road and area surveillance missions and contact missions for lost patrols or patrols without communications. We were used to control refugees in areas of contact with Charlie. If the Viet Cong could see the picture that they make in a column of refugees they would never leave their areas. Their seeming nonchalance leads them into serious trouble more often than not.

Screening refugees from the air may not appear to be a very effective method, but scout teams captured confirmed Viet Cong with amazing regularity in the areas where one aircraft could land and pick the suspect Vietnamese out of the column. Some darned good fire fights started in areas where scouts could not land. An OH-13 could make the Viet Cong very nervous by hovering along the trail at walking speed and only a few feet over the trees.

Scout aircraft have been taken under fire on all of these missions. The usual reaction to fire was to increase speed and continue in the direction you were flying when the fire started. If possible, the aircraft got lower or, like a grouse, put trees between themselves and the source of the fire. The Viet Cong had a lot of difficulty hitting the small area of the OH-13, but they often tried.

On the day that Bruce and I were out, they were certainly trying. By the time the aerial rocket artillery (ARA) had arrived, my observer and I had found a couple of small groups of Viet Cong who were not near immediate cover and had taken these troops under fire. My observer had knocked several down when we were called to mark for rockets. We marked both limits of the unit as we

had found them, and ARA gave us a good coverage with their two aircraft section and 96 rockets. When their runs were finished, there were two A-1s on station to continue the strike.

Our team turned the mission over to the forward air controller and returned to Plei Me for fuel. Another team replaced us on station to maintain contact with the enemy unit. About one hour after we got to Plei Me, the operations officer called us in and told us that the team replacing us was on the way back with one aircraft and one crewman hit by small arms fire. We returned to the area as soon as possible.

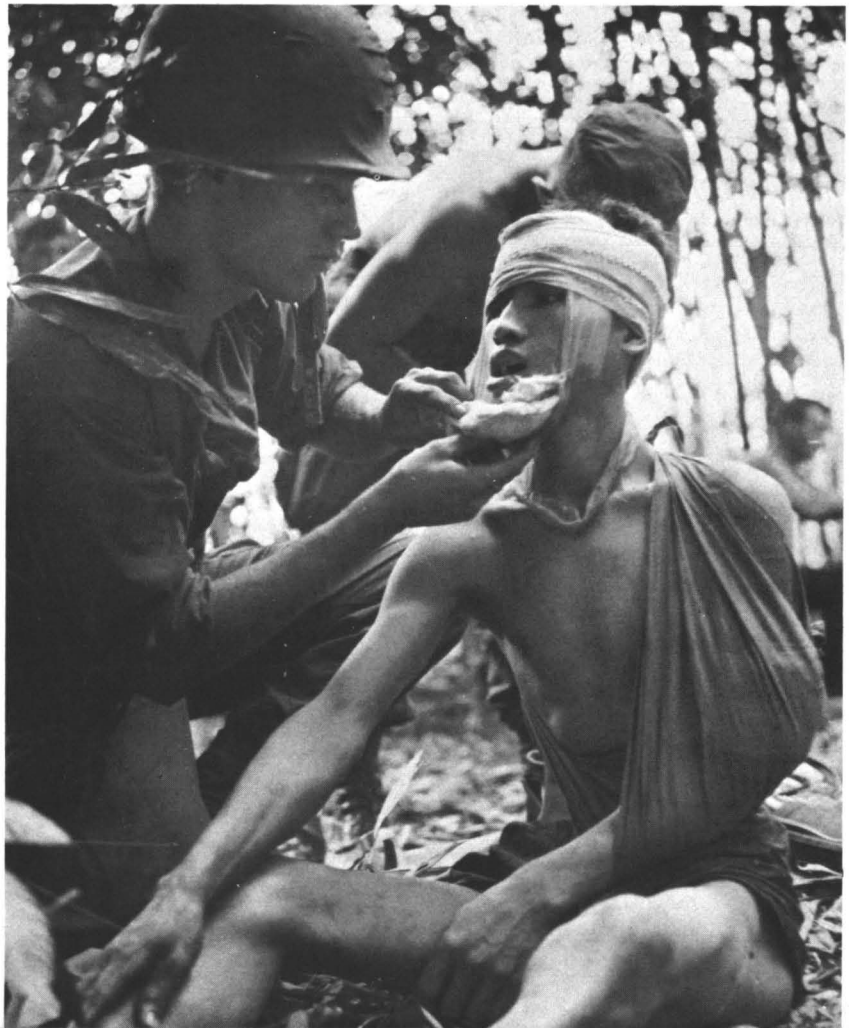
With the other team off station, the Viet Cong felt free to attempt to move out of the strike area, where large fires had been started by the air strikes. We caught the majority of the unit in the sparse woods with little cover and got the Air Force back. During the remainder of the day the Air Force expended 12 more A-1 loads of ordnance on the unit, striking them until the survivors had thrown away their weapons and were staggering around the woods in a dazed condition. They were perfect setups for the observers with their M-16 rifles. We only left because of darkness, certainly not for lack of targets.

When U. S. infantry troops moved through the area the following day, they found 86 bodies in the strike areas and evidence that many more had been policed up during the night. Several wounded Viet Cong were captured by these troops.

The effectiveness of two scout teams using supporting weapons had deprived the Viet Cong of a battalion size unit at the cost of one wounded and one aircraft damaged in only one day. A very bad break for Charlie.

. . . I still don't think they believed me.

In areas where the OH-13s were not available there were frequent firefights, much like the one above where a member of the 25th Infantry Division fires at the Viet Cong in the jungles north of Cu Chi. Frequently the pilots of the small helicopters detect large VC units and then help direct air attacks in support of assaulting ground troops. Below, a wounded Viet Cong is administered first aid after being captured in such action in Phuoc Long Province near the Cambodian border



HERE STANDS THE WARRANT★ ★ ★ ★

what would happen to your mission if you took all of your warrants out of the cockpit for one week?

Major Richard H. Marshall

GENTLEMEN, the next 7 days you will conduct combat operations . . ." The flight operations officer was presenting the pre-FEX briefing to a warrant officer candidate class that was approximately 2 weeks away from graduation and their Army aviator wings.

The flight commander, seated in the rear of the room, had heard this briefing nine times before, had watched nine classes graduate and, for the most part, fulfill their first aviation assignment in a combat role in Vietnam. He looked forward to this briefing, as the last 15 minutes belonged to him—one of the few times that he could talk to the entire class. In this period he could cover any important points that he felt had not been covered or needed to be reemphasized. He had made it a policy to vary this talk depending upon the classes' strong points or weak points, whichever might be the case.

These men had been through a great deal. The course had not been easy; it taxed each man to give his best at all times. There had been very little time for relaxation these past 8½ months. You cannot help but smile when you think about what a large part of the class visualized the game would be like. Many probably entered the program with a vision of white scarfs, jet boots, hours around the swimming pool making idle conversation about unbelievable aircraft maneuvers he had accomplished.

From the first day these visions

CWO Patrick H. Hayes (left) and CWO Ralph M. Fitch discuss flight plans prior to the start of a mission in Italy

had been replaced with tac officers who just did not understand, work schedules that seemed to be devised to break them mentally and physically, and instructor pilots who secretly wanted to see them divorced or murdered. The thought must have crossed their minds many times that "one should never volunteer in the Army." The important fact is that they did volunteer and they were sticking with the program to become Army aviators.

Once they realized the complex doctrine and techniques associated with any airmobile operation, they better understood why the initial part of the journey was made on such a rough road.

During the past months, the warrant officer candidate's world has evolved around hours on end in the classroom or on the flight line, thousands of preflights, doing flight maneuvers over and over again only to be told to do it one more time, and late nights reading military texts dealing with all subjects from navigation to survival. He has been required to eat, sleep, and live flying every second of his day and night.

You know that this man is well oriented in what is expected of him, but you wonder if other members of the service or community are fully aware of the importance of this young man. You think with pride of the young warrant officers whom you were associated with in Vietnam. These men, uncomplaining of the long hours of hazardous flying, were quick and capable of making immediate decisions which oftentimes favorably changed a battle or saved a life.

If one should ever doubt the contribution this man makes each day in Vietnam, he would merely have to visualize the impact on the war effort in Southeast Asia if all warrant officer aviators were pulled out of the cockpit for one week. You hope that both aviation and ground commanders have pondered this thought some time or other, and that it has motivated them to evaluate the rank structure, education and pay system, and the overall welfare of this critical soldier.

This man must be retained, and an occasional pat on the back is not the answer to the retention program. A chance to excel and recognition of excellence mean more to him than anything else. One approach may be to use each warrant officer in a key additional duty, such as a team leader or assistant operations officer, rate and evaluate him in this job position, and then based on performance, recommend and award him a direct commission. He could then attend the branch basic course, which would give him a good basic foundation in his branch.

This program would give the young warrant a high goal and recognition. It should be limited only to those who have excelled in a command or staff position in combat. It is true that this man could go through an officer candidate course, but then we would lose his services for 9 months compared to 2 months. This time loss would not be necessary because the man has already excelled in a realistic leadership training course—combat!

This WOC class had been a good average class, well motivated

Warrant officer candidates undergoing training at Ft Rucker

MAJ Marshall was Deputy Airfield Commander, Rotary Wing Branch, Employment Division, Dept of Tactics, Ft Rucker, Ala., when he wrote this article.

and eager to learn. The flight commander began to mentally review the material that he has planned to present. He would briefly review the training they had received in the 2-week pre-FEX period, discuss safety, and what was expected of them the next 7 training days. This material could be covered in about 6 minutes.

My opening statement, he thought, will be, "Gentlemen, for the past 2 weeks you have trained as combat replacements for an airmobile company committed to combat. You are now ready to perform that mission."

He glanced over the class and felt a surge of pride. These men are playing a leading part in one of the most critical roles in Vietnam today: the combat aviator. This young man is like the combat aviator of the past. His average age is 20 years, he is healthy, and loves a challenge almost more than life. He has a mind of his own, capable of hearing the call of his country even though the noise of protesters and the ignorant have deafened some of his contemporaries back home. His ability and worth have been proved by those who have gone on before him, many of whom are now instructing him for his very important contribution to his country.

He has volunteered to temporarily sacrifice further institutional education, the security of home, and the comforts that the average 20-year-old American daily takes for granted. While others assume that Vietnam is a war thousands of miles from home, he accepts the fact that his country is at war; therefore he is at war. He is of the breed who cannot watch a smaller man bullied, still thrills at hearing "The Battle Hymn of the Republic," and feels a personal loss at news of a fallen comrade.

Tomorrow he may be a senator, businessman, or sportsman, but today there is a world crisis that he can help to solve, so he dreams of tomorrow's goals but applies himself to the realistic mission of today. He is loaded with motivation and dedication, requiring only a little leadership and guidance to trigger him into action. He has some mixed emotions about maturity, applying himself long hours to learning a man's job, but not able to resist an occasional regression to the pranks of prep school days.

The flight commander ponders over what he should say to this dynamo of ideas for the remainder of the 15 minute talk. First it must be the truth, man to man; no war stories. Second, it must try to answer any questions that may remain in the mind of a man going into combat for the first time. You know that this man can be commended or criticized without danger of destroying his primary objective of becoming an Army aviator.

Let him know that he contributes each day to the fine tradition of aviation that has been established over the years by men like himself. This is particularly true in Army aviation, which has advanced from a few spotter planes to the greatest air/ground fighting teams in military history. Let him know that the force which drives men through intensive fire and tremendous odds to accomplish the mission is called esprit de corps, and is born through a common bondage of men who have shared good and bad.

Remind him that fear is fear no matter where you encounter it, in front of a ladies' garden club making a speech or on the battlefields of Vietnam. Let him know that mother nature prepares him physically with a shot of adrenalin, and confidence through the finest training in the world prepares him mentally. Fear serves a useful purpose, becoming shameful only when not controlled.

A good conclusion would be a few words on professionalism. The flight commander mentally composed his speech: "Being a professional is not always easy or natural behavior. It must be worked at constantly. You now have the basic tools to be a professional, a well grounded knowledge and the best equipment that money can buy. If you will add to these tools a pride in mission accomplishment regardless of obstacles, a can do-will do attitude, and an abundance of common sense, you cannot possibly go wrong.

"Earning your wings has not been easy. You have accomplished your first goal. In the next year or two you will have already contributed more than the average man your age contributes in a 10 year period, if ever. Walk with pride and let your actions be your mark."

The flight commander suddenly becomes aware of the operations officer saying, "Gentlemen, if there are no other questions, I present your flight commander!"

The flight commander mounted the instructor's platform and seated the students. As he visually scanned the class, he noted one thing that all of the candidates reflected: determination. He recalled an old Army term he once heard that went something like, "the best planned operation will fail unless vigorously executed." He thought to himself, just give these men the plan, and you can stand back and watch with pride the execution.

"Gentlemen, for the past 2 weeks you have trained as combat replacements. . . ."

TOGETHERNESS

Major Chapman C. Norton

THE FIXED-WINGED Army aircraft landed and taxied to the designated parking area. A VIP Code 4 was on board, so the pilot intended to make the shutdown procedure a rather quick one.

As he reached for the switches, the entire aircraft began to rock. The control yoke leaped under his hand, and the rudder pedals hammered from one extreme to the other. Forgetting the shutdown, the pilot concentrated on regaining control of his plane. Certain that he was in the center of a small hurricane, our hero glanced outside in an effort to determine what really had happened. It was as he should have expected—the pickup helicopter was moving in for his passenger.

Why helicopter pilots believe that fixed wing aircraft are the only manmade objects immune to helicopter rotor wash is as yet unknown. That they do apparently believe this is evidenced daily by the frequency with which they snuggle up to conventional aircraft. A proficient helicopter pilot is careful to keep a reasonable distance between his rotor and the tied down blades of a parked helicopter. That same pilot will, however, almost overlap the wing of a fixed wing plane. For this reason our hero found his controls going wild.

Time after time this little epic is repeated. Each time the pilot fights to control his plane while the VIP is fighting his way through a swirling dust storm (or driving rain).

The intentions of the helicopter pilot are undoubtedly noble: make it convenient for the passenger. His thoughts must be along this vein, because they certainly are not on safety or the mechanical well-being of the fixed wing aircraft.

Control surfaces of a fixed wing plane, as are the flight surfaces of a rotary wing aircraft, are specifically designed to react to flowing wind—and react they do. It makes no difference whether the wind be created through flight, high surface winds, or a helicopter-generated hurricane. The difference is in the wind itself.

In the case of helicopter-created wind, the wind is violent and seems to come from all directions at once. The control surfaces react by trying to go in all directions at once. This is hard on the surfaces themselves and on the associated hinges, control cables, and cranks. It can also be hard on the concerned pilot should he be caught unaware by suddenly activated flight controls.

No really good explanation appears as to why this situation is repeatedly created. Most passengers have little objection to walking as much as 100 feet or so to a pickup helicopter, even in the rain. No one can ever point out the individual who directed such a maneuver. It has been offered that maybe helicopter pilots are trying to prove something to somebody. In the light of their already displayed ability, by getting their beast started and moved into the general pickup area, this argument goes limp.

The only conceivable reason remaining appears to be that of thoughtlessness. Fixed wing aircraft don't have much of an effect on parked helicopters until they turn their tail towards them and add power. In effect, a hovering helicopter is "tail to, and at full power" all of the time.

Please, Mr. Chopper Driver, stay away from our frozen wings with your fling wings. The two may be made to operate in the same environment, but not at the same time.

MAJ Norton, a Senior Army Aviator, graduated from the Army Aviation Safety Course at the University of Southern California in 1965. He is currently serving in Vietnam.

Armed Helicopter Escort

Captain James E. Van Vleck

MUCH HAS BEEN said concerning the use of armed helicopters in the escort role. Many hours have been spent discussing and arguing the principles and procedures used by the armed-ship pilots. Despite all the discussion, I have yet to see any standardized procedure for performing this type of mission. It is not the intention of this article to state doctrine, but to discuss the various methods of escorting single ships into and out of landing zones and to let you evaluate each proposed method on its own merit.

No two escort missions are exactly the same. Each mission must be evaluated by the armed element commander before he issues instructions to the slick pilots. In this evaluation the first thing to be considered is exactly what must be done during the escort for the mission to be accomplished. Next, he should consider the location of friendly troops and the enemy situation. Third, the best possible route both into and out of the landing zone must be selected. When picking out this route one should be aware of such things as the direction and velocity of the wind and the position of the sun. The sun can become a big factor, especially on hazy days when visibility is seriously limited when flying toward the sun.

The route that offers the best possible protection from enemy ground fire should also be selected. Finally, the type of approach into the landing zone should be determined. Generally speaking we can divide the approach portion into three distinct

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types—the overhead spiraling approach, the normal approach or versions thereof, and a low-level approach.

During our evaluation of enemy disposition and activity we must determine the route and type of approach that will offer the best chance for the slick to land without undue hazard. Often the only secure landing area is that area held by friendly ground elements. In this situation perhaps the best approach would be an overhead spiraling approach, staying directly over the friendly elements. Although this approach is difficult for the armed ships to cover, it does have merit: the slick is over friendly territory at all time, and the landing area can be kept under observation during the approach.

With normal approach, it is relatively easy to provide good gunship coverage of the slick. This type of approach can be used when the ground troops indicate there is little or no enemy activity. The low-level approach in many cases will be not only the safest but the only method of getting into a landing area. An example of this would be when the friendly units are engaged in a fire fight with the enemy.

If at all possible try to pick a touchdown point for the slick behind the friendly troops. The low-level approach must be carefully planned to keep from becoming misoriented during the approach. Getting lost on final could result in a low slow pass directly over enemy positions, often with disastrous results.

We have discussed the more important items of the slick ships' portion of the mission. Let's now talk about the gunships' duties in the escort role. Our mission on a single ship escort is simply to provide any assistance needed to successfully accomplish the mission.

Getting lost on final could be disastrous

There are basically three different types of single ship escort missions—medical evacuation, resupply, and aircraft recovery. The biggest difference in these three types of missions is the length of time the slick ship is to spend on the ground.

In the case of an aircraft recovery mission, it may be necessary for the slick to hover over the downed aircraft for several minutes to allow the ground crew time to hook it up properly. Medevac helicopters sometimes must be on the ground for several minutes. Once they are on the ground often they must move to two or more different positions. Resupply aircraft will usually spend a minimum time on the ground. Often the supplies carried in can be in a slingload, which can be dropped as soon as the aircraft comes to a hover.

No matter what circumstances are encountered during the escort role, duties of the armed element leader will remain virtually unchanged. He must select the best route and type of approach into the landing area. Before the unarmed aircraft descends into the area, the armed element should make a thorough reconnaissance of the flight route to ascertain that the area is clear. When the armed element leader is reasonably sure that the slick can get into the area he should radio his instructions to the slick and maneuver into position to escort it into the area.

Once the unarmed aircraft starts it approach it becomes the duty of the armed helicopters to provide any fire support necessary to safely escort the slick into the landing area. While the slick is on the ground the armed elements must be prepared to lend fire support at a moment's notice. Once the slick's mission on the ground is completed the armed aircraft will escort it to an altitude out of reach of enemy small arms fire.

During the approach portion of a single ship escort, the armed helicopters must be in a position to provide fire support as necessary for the slick. There are several methods of accomplishing this phase of the escort. If there is little or no enemy activity in or

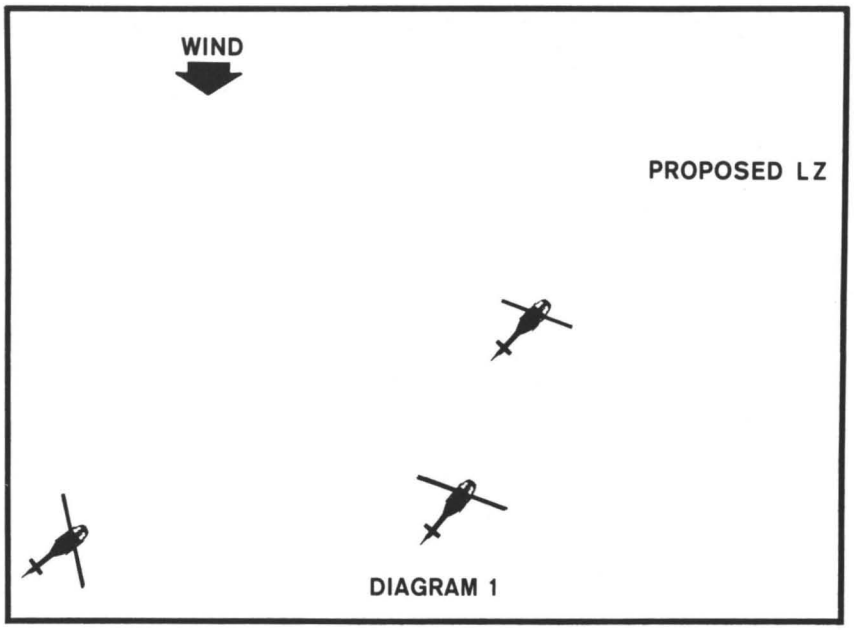
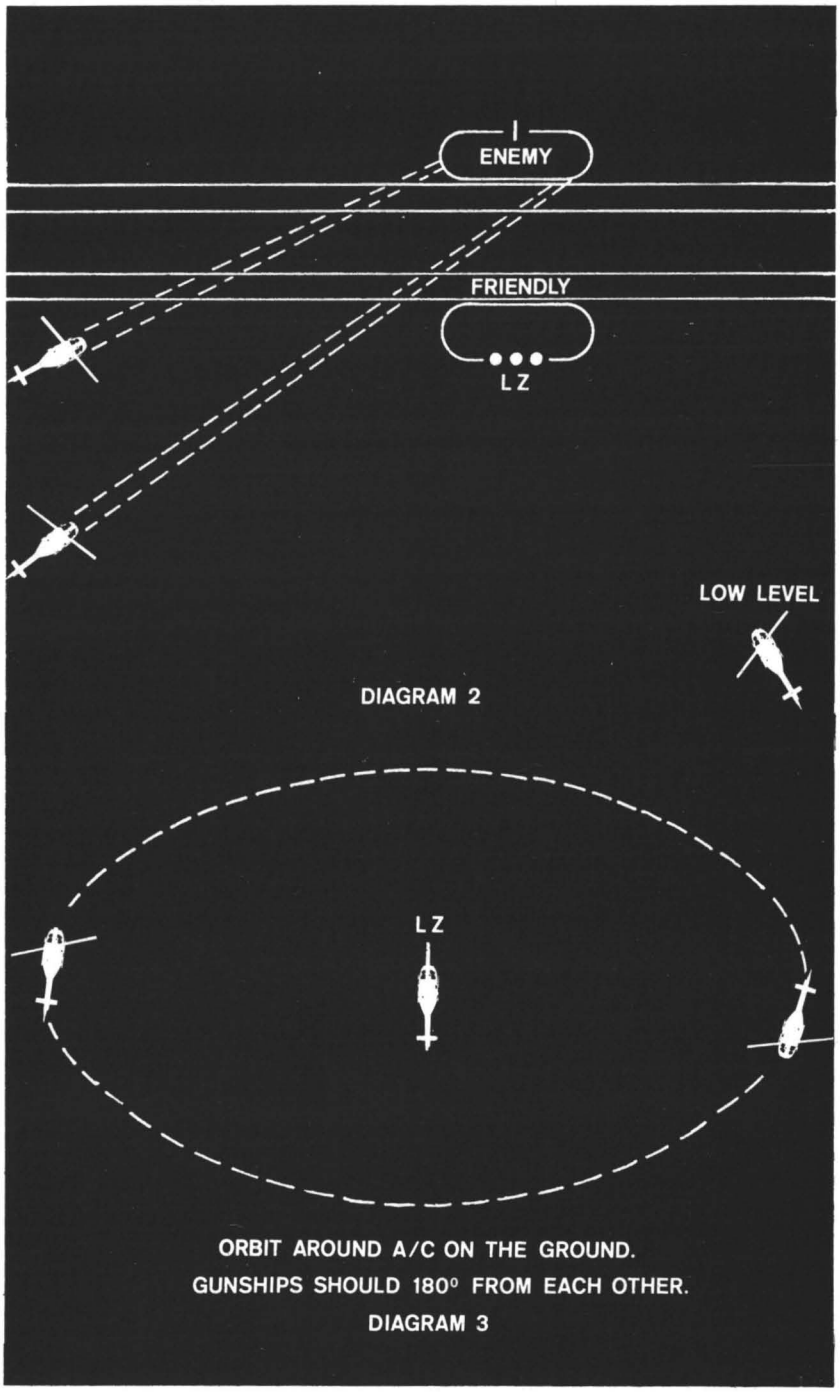


DIAGRAM 1

near the area, the armed ships can position themselves behind and on either side of the slick to be able to suppress any enemy ground fire. (See diagram 1.) This type of escort should be timed so that the lead armed helicopter passes the slick while the slick is on short final. Ideally, the wing ship would pass the slick just as the slick touches down. Once the slick is on the ground the gunships revert to a predetermined position to cover the slick on the ground.

When the friendly troops are engaged in a fire fight with the enemy and Dustoff helicopters must go into a hot landing zone, another procedure must be used. In this situation enemy units can often be accurately located. Once the enemy has been located, a route should be selected which offers the best protection in terms of cover and concealment and avoidance of enemy ground fire. The best approach under these circumstances will probably be a low-level approach, making maximum use of any cover and concealment on the approach route.



An attack of the enemy position will allow the slick aircraft to make his approach with comparative safety. (See diagram 2.) The attack must be timed to place heavy continuous fire on the enemy positions during the final portion of the slick's approach. Fire support must also be delivered while the slick is on the ground. If the slick is able to land in a well covered or concealed position, placing trees between himself and the enemy, it may be possible for the gunships to orbit until the slick is ready to depart the area.

These two methods are the most common and successful ways of escorting unarmed helicopters into landing zones. Whichever escort method is selected will depend on the enemy situation and the armed element leader's evaluation of the tactical situation.

We have discussed at length the actions of armed helicopters during the approach phase of the mission. Several choices are possible once the slick is on the ground. In all cases the armed helicopters must be able to immediately respond to any enemy small arms fire directed at the slick. Some units in Vietnam take up a 360° orbit around the slick on the ground. (See diagram 3.) This type of protection involves two disadvantages: it places the gunships in a position where they are

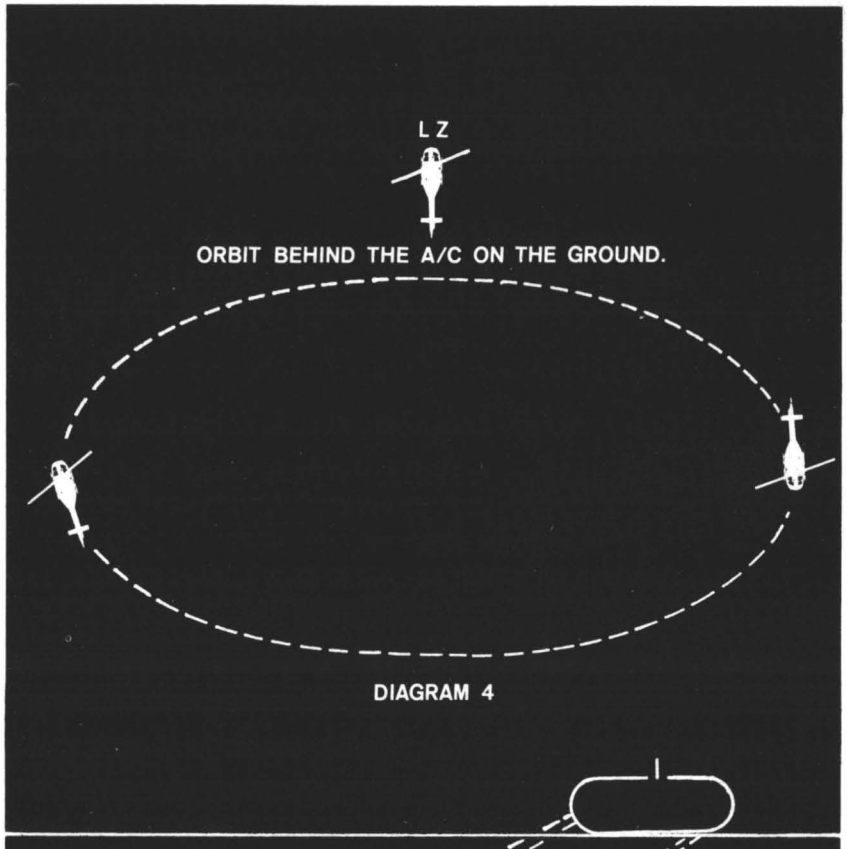
very vulnerable to enemy ground fire, and it gives away the slick's exact position to the enemy.

Another method of covering the ship on the ground is basically the same except that the 360° orbit is set up behind the unarmed aircraft. (See diagram 4.) In this orbit the armed aircraft should fly 180° from each other. This will place one of the gunships in position to place fire on any targets that arise almost immediately.

Another choice is for the armed aircraft to initiate and continue an attack on the enemy positions while the slick is on the ground. (See diagram 5.) If the attack is carefully planned and timed and skillfully executed to place the heaviest fire on the enemy during the time that the slick is vulnerable to enemy fire, the chances of success are greatly enhanced. One of the armed aircraft must also be in a position to observe the aircraft on the ground at all times. By being in position to observe the slick, the armed helicopters can react instantly to any unforeseen problems that might arise.

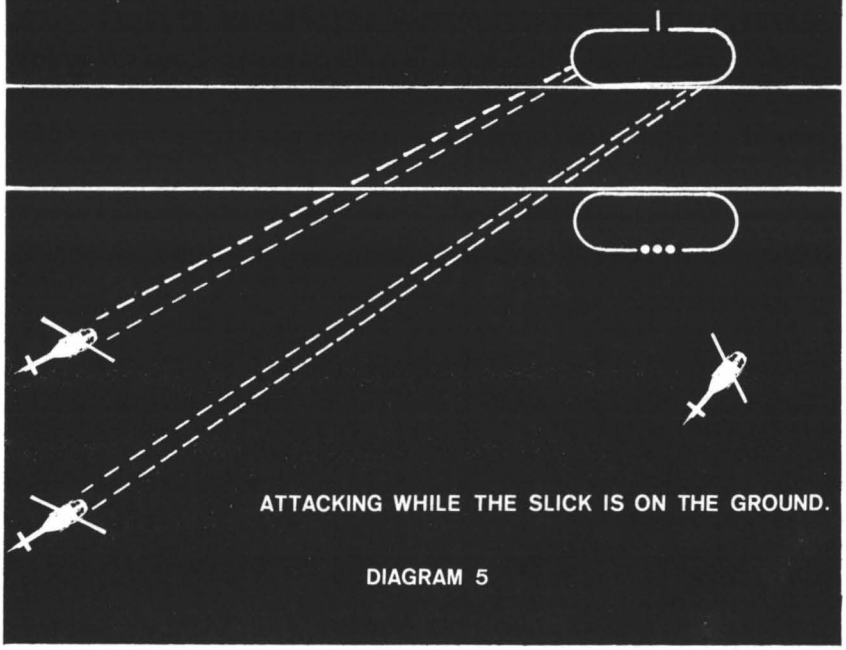
If the armed helicopters have made a thorough recon of the route and landing area, there should be little difficulty in escorting the slick from the area. One word of caution: don't get into the habit of escorting the unarmed aircraft out of the area the same direction that you took him in. By varying the direction the slick takes out of the area, you will avoid setting a pattern that the enemy can use to set up ambushes.

In your instructions to the slick, be sure to tell him to give you a few seconds notice when he intends to leave the area. This will allow the armed aircraft time to maneuver into proper position to give maximum protection during the escort out of the landing area. During departure from the area the armed helicopters must at all times be in position to place fire on enemy positions. Once the slick is at an altitude that is beyond the reach of enemy ground fire our portion of the escort mission is finished.



ORBIT BEHIND THE A/C ON THE GROUND.

DIAGRAM 4



ATTACKING WHILE THE SLICK IS ON THE GROUND.

DIAGRAM 5

These are examples of the various types of escort missions and some of the problems encountered with each type. It is now up to you to evaluate each escort mission and determine exactly how you would accomplish the mission based on your estimate of the situation.

A Matter Of Life Or Death

or

(Training On The MK-J5B Ejection Seat)

Captain Ronald E. Berner

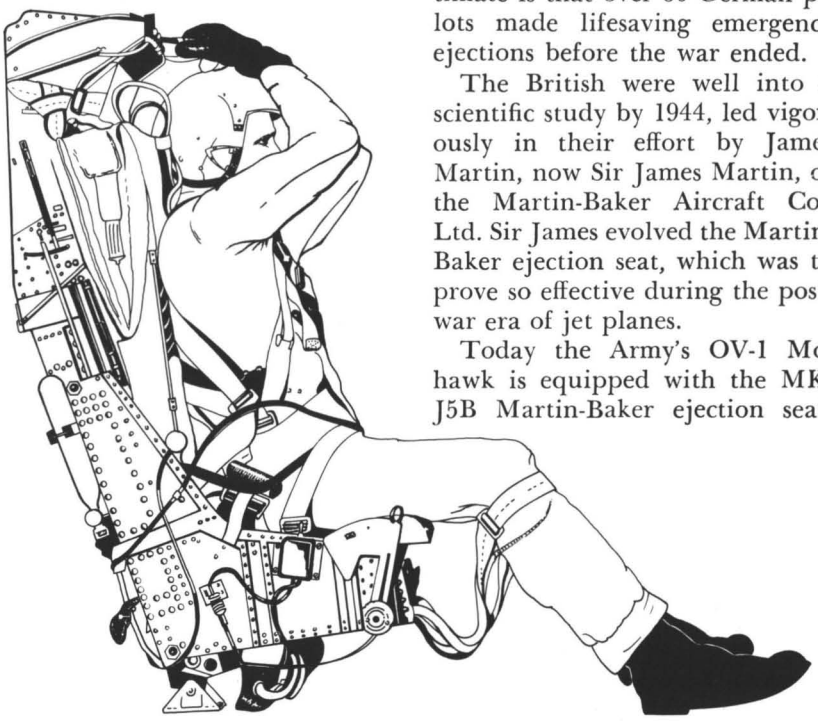
BAILING OUT of the low speed planes of the 20s and 30s was relatively simple: fall into the slipstream, count to 10, and pull the ripcord. However, such maneuvers didn't always work in faster planes of World War II. An increasing number of airmen were being injured by hitting part of the plane on bailout, or being pinned in the cockpit by outside forces during uncontrollable spins. Badly needed was a system for helping airmen to make a quick escape from crippled aircraft.

That someone had foreseen this problem and worked arduously on it became evident in the autumn of 1943. A veteran RAF pilot, who had just returned from a mission over the continent, told briefing officers he had seen a German pilot "pop out" of a doomed fighter plane, separate from his seat, and parachute to earth. "What you need is a week of rest and relaxation," the briefing officer said sympathetically. But as more and more reports of Luftwaffe pilots being "ejected" from their stricken planes trickled in, intelligence concluded that German pilots were using the first known ejection seats.

As a matter of fact, the far-sighted German Air Ministry had begun ejection seat experiments in 1938. By 1944 the Ministry ordered ejection seats for all front-line fighters. One authoritative estimate is that over 60 German pilots made lifesaving emergency ejections before the war ended.

The British were well into a scientific study by 1944, led vigorously in their effort by James Martin, now Sir James Martin, of the Martin-Baker Aircraft Co., Ltd. Sir James evolved the Martin-Baker ejection seat, which was to prove so effective during the post-war era of jet planes.

Today the Army's OV-1 Mohawk is equipped with the MK-J5B Martin-Baker ejection seat. The proximity of the aircraft's cockpit and propellers and the stabilizer configuration mounted high on the empennage precludes the possibility of a successful escape by bailing out through the side hatches or the canopy.



The Martin-Baker MK-J5B ejection seat provides for safe ejection at airspeeds of 100 knots and over, from straight and level flight at ground level to the maximum speed and altitude capability of the OV-1 airplane. After ejection of the seat and occupant from the airplane, the parachute is automatically deployed, and the occupant is automatically separated from the seat.

Ejection during takeoff or landing is both safe and practicable because of the ejection velocity of the long-stroke ejection gun and the rapid extraction and deployment of the personnel parachute. The telescopic ejection gun provides an ejection velocity of 83 fps to clear the airplane structure. If the occupant is in the optimum position, the rate of acceleration increase during the split-second of firing does not exceed the maximum acceptable human tolerance value of 30 g's per second. Thereafter, the load imposed on the occupant during ejection is rated at approximately 20 g's which is well within the acceptable range of human tolerance.

For high altitude ejection, a

CPT Berner's article is intended to familiarize all aviation personnel with the MK-J5B ejection seat. He is assigned to the Dept of Maintenance Training, Ft Rucker, Ala.

barostatic control delays opening of the parachute and separation of the occupant from the seat until the occupant has descended through the cold, rarefied atmosphere to an altitude between 15,000 to 10,000 feet above sea level. In high-speed ejections, further safety is provided by a g-controller which delays opening of the parachute until g-forces are reduced to safe limits (3½ to 4½ g's).

Your best assurance of a successful ejection lies in thorough knowledge and adequate training in the operation of the seat. AR 95-1 requires that personnel must have completed ejection seat training requirements before participating in aerial flight in the OV-1 (Mohawk). The training is prescribed by TC 1-26 and is mandatory for OV-1 aviators, observers, passengers, and medical and maintenance personnel.

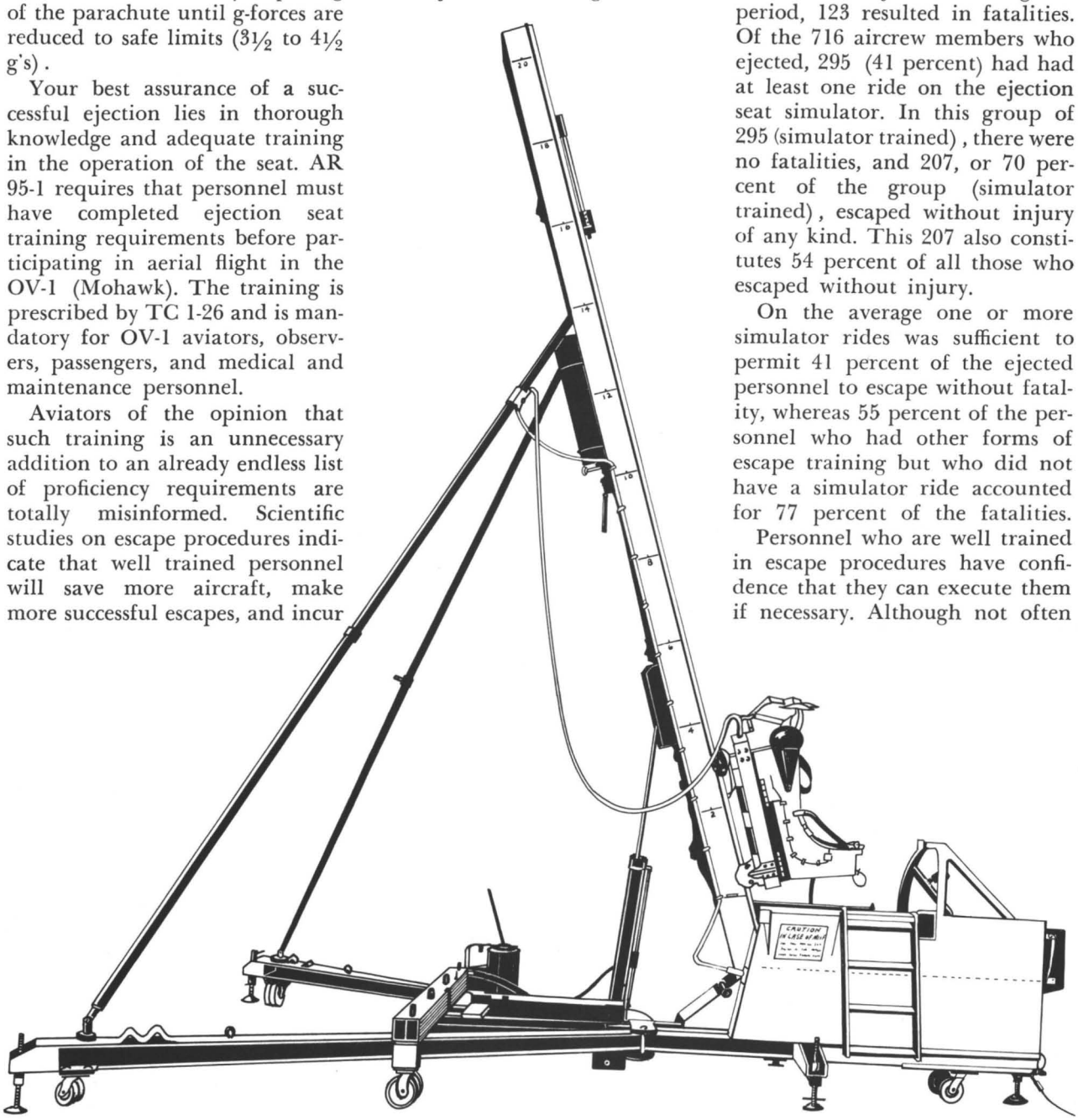
Aviators of the opinion that such training is an unnecessary addition to an already endless list of proficiency requirements are totally misinformed. Scientific studies on escape procedures indicate that well trained personnel will save more aircraft, make more successful escapes, and incur fewer injuries than those who have less training.

A study was conducted for ejection seat training in one armed service. The study was based primarily on analysis of questionnaire and interview data obtained from pilots and escape training instructors. The results showed that ejection training is inadequate both in its content and frequency. But the most dramatic finding is one regarding the relationship between occurrence of successful escape and prior training in "ejecting" with the ejection seat simulator, as revealed by escape statistics covering the period of 1 Jan 57 to 30 June 59.

Of the 716 ejections during this period, 123 resulted in fatalities. Of the 716 aircrew members who ejected, 295 (41 percent) had had at least one ride on the ejection seat simulator. In this group of 295 (simulator trained), there were no fatalities, and 207, or 70 percent of the group (simulator trained), escaped without injury of any kind. This 207 also constitutes 54 percent of all those who escaped without injury.

On the average one or more simulator rides was sufficient to permit 41 percent of the ejected personnel to escape without fatality, whereas 55 percent of the personnel who had other forms of escape training but who did not have a simulator ride accounted for 77 percent of the fatalities.

Personnel who are well trained in escape procedures have confidence that they can execute them if necessary. Although not often



required, there are emergency procedures pertinent to the ejection seat and these should be committed to memory. Periodic review and refresher training of these procedures will develop the desired automatic reactions and ensure a successful ejection once the decision to eject is made.

Training prescribed by TC 1-26 includes conference, demonstration and practical exercise instruction. The accompanying table, extracted from TC 1-26, shows initial and annual training requirements for aviators, crewchiefs, observers, passengers, medical and maintenance personnel.

For conducting the simulated ejection, major commands are provided with an ejection seat training device. When ejection seat simulators are not available to major Army commanders, advantage should be taken of ejection seat simulator training provided by the U. S. Air Force and U. S. Navy.

The ejection seat trainer consists of a simulated Martin-Baker MK-J5B ejection seat and a 24-foot tower for guiding the seat during ejection and controlling speed of descent. At the base of the tower, an open top mock cockpit surrounds the seat before ejection. The seat and student are ejected by a telescoping tube catapult which obtains thrust from the burning of powder contained in a cartridge. An instructor's panel provides procedure check lights, signals, and safety releases.

The ejection seat trainer simulates the conditions which occur during actual ejection of a pilot or crewmember in a Martin-Baker ejection seat. The ejection procedure is exactly the same as in actual flight, but the ejection sequence occurs with limited g force. The seat travels along guide rails and proceeds up the tower for a distance of between 8 and 15 feet. The seat and the student do not separate and the g force (approximately 9 g's) is less than one-half of the operational g force. After reaching the peak of ascent, the seat and student are returned to the preload or starting position. The descent is controlled by mechanical governors, and the seat and student are brought to a cushioned stop by a hydraulic-pneumatic seat catch system.

Applicable paragraph in section III	OV-1 aviators	OV-1 crewchiefs	Observers, passengers, and medical personnel flying in the OV-1 airplane	Other OV-1 maintenance personnel
9 Description and familiarization.	1½ hr----------	1½ hr----------	1½ hr----------	1½ hr
10 Normal (automatic) ejections.	½ hr----------	½ hr----------	½ hr----------	
10f Parachute technique.	½ hr----------	½ hr----------	½ hr----------	
11 Emergency operations.	½ hr----------	½ hr----------	½ hr----------	
12a Daily maintenance inspection.	----------	1 hr----------	----------	
12b Aviator's preflight check.	1 hr----------	----------	----------	
13a Safety precautions for crewchiefs and other maintenance personnel.	----------	½ hr----------	----------	½ hr
13b Safety precautions for aviators.	½ hr----------	----------	----------	
14b Proper harness adjustment and seating.	Demonstration.	Demonstration.	Demonstration.	
14c Ejection drill.	Practical exercises.	Practical exercises.	Practical exercises.	
14d Parachute landing techniques.	Practical exercises.	Practical exercises.	Practical exercises.	
14e Ejection in the ejection seat simulator.	One successful ejection.	One successful ejection.	One successful ejection.	

Upon successful completion of ejection seat training, records are completed for each individual. AR 95-1 states that personnel will be issued a Flight Equipment Training Record (DA Form 3015). Refresher training will then be recorded on the reverse side of this form. In addition an appropriate remark will be made in item 25 of DA Form 759 (Individual Flight Records).

You should now be completely sold on the ejection seat and the necessity for ejection seat training. Equally important to a successful ejection is the aviator's prompt decision to eject. Needless to say that delay in making this decision can prove fatal and the best ejection equipment and training is wasted. Some factors causing delay and requiring an aviator's conscious efforts to avoid are:

- Failure to recognize the existence of an emergency or faulty interpretation of the seriousness of the emergency.
- Aviator's overconfidence in being able to handle the emergency and thus ignoring the necessity to eject.
- Overconcentration on the details of the activity in progress, such as an emergency airstart or some detail of the mission.
- Confusion which comes from a situation suddenly being changed.

This information is intended to familiarize aviation personnel with the ejection seat and associated training requirements. If you should have the opportunity to become acquainted with the OV-1 (Mohawk) as an aviator, passenger, or mechanic, I strongly urge you to zealously participate in the ejection seat training as though your life depends on it. It does.

ON THE MOVE

MOVING a division tactical operations center (DTOC) is never an easy task, but the 478th Aviation Company makes the job a lot easier for the 1st Air Cavalry Division.

The CH-54 Flying Cranes of the 478th can lift up to 18,000 pounds and have the capability of carrying specially designed pods. These pods are used to haul personnel or cargo, and can be specially equipped as an airmobile DTOC and a medical operating room.

The 1st Cav has one pod equipped as an operating room and two equipped as DTOCs. The medical pod gives the Cav the unique capability to provide front line medical care to wounded troops who would normally have to be evacuated to rear areas. The time saved may even mean the life of the critically wounded soldier.

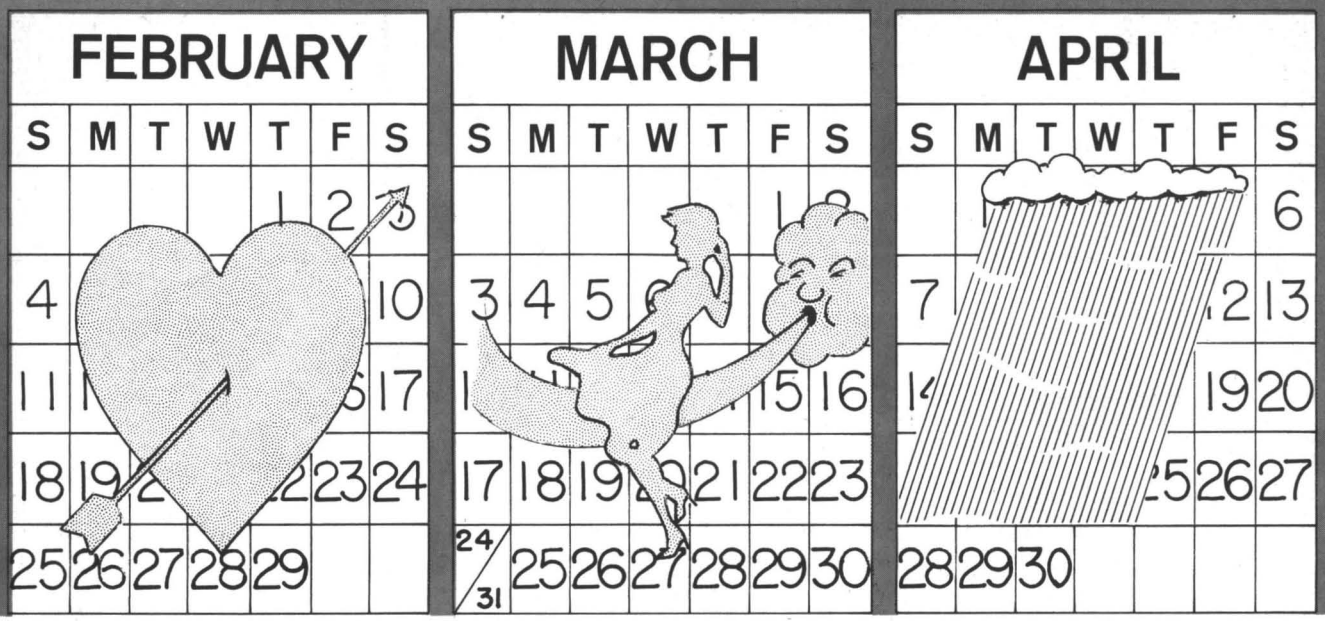
When the division decides to move its forward command post, a call is put in to the 478th to lift the DTOC to the new location.

The airmobile DTOC enables the 1st Cav to move quickly and have an operational command post after touching down. All that remains is to install the generator, start it, turn on the lights, and the 1st Cav has a functional tactical operations center.

The heavy lift capabilities of the Flying Crane enable the Cav to perform many missions impossible by other means. A 155 mm artillery fire base on a mountaintop surrounded by dense triple canopy jungle is now a reality. The Cranes are capable of moving rotor and fixed wing aircraft as well as a variety of heavy construction equipment.

A specially constructed pod is slowly placed into position for hookup to the CH-54 for transporting to the 1st Cavalry Division's base camp for maintenance

The CH-54 takes off for the maintenance area with the pod which is used by the 1st Cav as a mobile tactical operations center



Six Months Is A Long Time

Major Phillip D. Semmens

CAPTAIN SMITH stood outside the commanding officer's door making last minute adjustments on his uniform. Having assured himself that everything was in order, he knocked and entered.

"Captain Smith reporting for duty, sir," he said in his best military manner.

"Good morning, Captain," the CO said as he shook his hand. "Have a chair and bring me up to date on what is happening in Vietnam."

After some small talk about the war and mutual friends, the CO asked Captain Smith about his instrument ticket.

"I had a standard fixed wing ticket which expired while I was in Vietnam," the captain replied. "Not much chance to get it renewed while over there since I was in a chopper unit. I haven't flown a fixed wing aircraft for over a year, but I'd like to get my ticket renewed as soon as possible."

The CO said, "Unfortunately, we can't establish an instrument training program here, so the requirement for instrument ticket renewal falls directly on the shoulders of the individual aviator. In your case this means you will have to develop your proficiency to a satisfactory level on your own.

"Don't look so sad, Smitty; it isn't as bad as it seems. We have had quite a few aviators in your situation joining the unit over the past few months. Some were having problems getting back into the swing of things, so I asked the operations officer to come up with some specific recommendations. Before we get into that, take a look at this message from DA."

Captain Smith read the following message: TWX DA 765017, Subject, Army Aviator Instrument Qualification. Aviators returning from SEA (Laos, Vietnam, Thailand) will have 6 months to reestablish instrument qualifications rather than 90 days as stated in para 2c, AR 95-63.

"Six months," the CO continued, "is a long time to have to renew your ticket, but you'd be surprised at the number of aviators who find themselves with no ticket and time running out. One reason for this is that the majority of aviators returning from Vietnam are in a similar situation to yours. They have been assigned to a rotary wing slot and haven't flown a fixed wing or practiced instruments for over a year. Naturally they are a little rusty when they get back, and it's hard for them to get started again."

The CO opened a drawer in his desk and pulled out a mimeographed paper which he handed to Captain Smith. "Take a look at this while I get this letter answered," said the CO. "It should give you some ideas on how to go about preparing for your ticket renewal." As the CO began his answer

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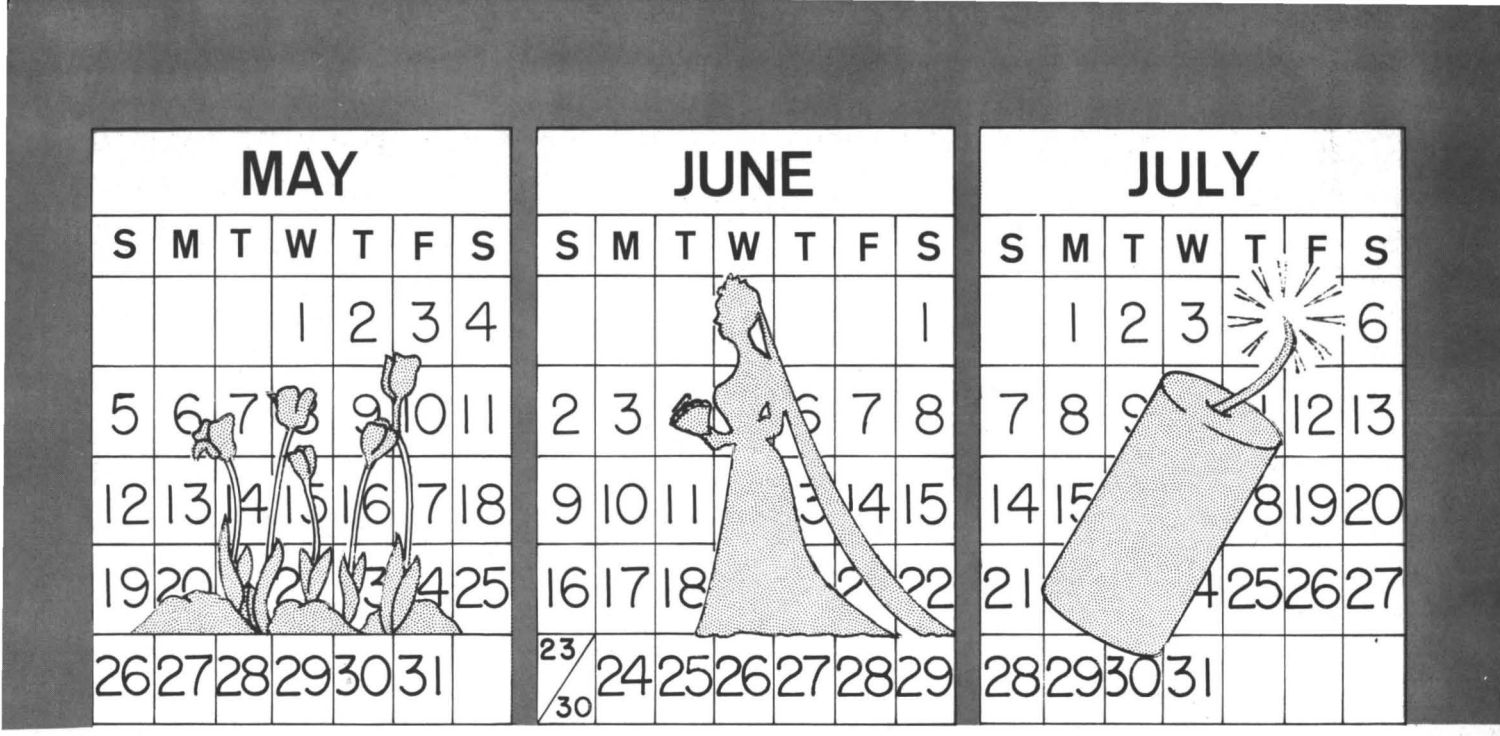


when it concerns your instrument ticket

to the letter, Captain Smith read the following recommendations:

START TO WORK IMMEDIATELY

This is perhaps the most important item and the easiest to overlook. The general feeling is that 6 months is a long time and there is no reason to rush things. If this is your policy, beware, you will find yourself with time running out. Begin work on your instrument ticket as soon as possible; this will make the task a lot easier. Don't delay.

ESTABLISH A POSITIVE PROGRAM

First you need to determine your own capabilities and limitations. How long has it been since you have flown the particular type aircraft that you will be using for your checkride? These and other items will be considerations in establishing a program that will bring you to the required level of proficiency. A typical program might be:

Flying Hours	Purpose
2	Familiarization with aircraft
2	Basic instruments (turns, climbs, descents, etc.)
4	Approaches, holding, missed approach, and partial panel
2	En route work and position reports
–	Work on weak points

Nonflying hours

6	Procedural trainers
4	Reading (regulations and other publications)
–	Discussions (coffee breaks, slack periods)

Individual requirements will vary; however, some type plan should be developed as a starting point. The plan should be flexible enough that changes can be made and time is not wasted on areas where proficiency is at a satisfactory level.

You may have initially thought that 6 hours of en route work would be required. After 2 hours you discover that your proficiency is satisfactory and that additional time in this area is not required. Conversely, you may find that 4 hours of approaches is not enough and that additional time is needed. The big thing is to have some idea of what you are going to do.

USE AVAILABLE ASSETS

At times perhaps you will be able to get away for some instrument training but the aircraft won't be available. Or perhaps weather or an aircraft discrepancy may force you to cancel a training flight. Another factor that could ruin your plans is the nonavailability of an instructor pilot. Don't throw up your hands and quit when one of these unforeseen events arises. Take advantage of other assets available.

This would be a good time to see if you could get in some "link" time. This may not be as thrilling as actual flying, but it is a mighty good place to practice those procedures that you haven't thought about for a year. If the IP can't make it, why not see if someone else would ride along with you? Any instrument rated aviator can give you some help and watch out for other aircraft.

One excellent method of instrument training is to combine hood flight with other missions. This can't always be done but with a little extra effort, chances are that many times it can. Few passengers mind a few minutes delay after you explain your plan to combine some training with their mission. In fact, a detailed explanation of what you are doing just may gain another convert to Army aviation. It's surprising how little the average person knows about instrument flying. Show him some of your charts and approach plates and see how interested he becomes.

All else failing — no aircraft, no instrument pilot, link down for repair, and no mission that you can combine with training — you still don't have to waste the entire morning. Why not sit down with the FLIP chart case and do some reading? There are probably many changes since you last flew instruments. Some things you will have questions about. Make a note of these and ask the examiner about them the next time you see him.

If you are interested enough, there are many other ways that you can make use of available assets. Don't quit before you get started.

MAKE TIME AVAILABLE

This is one of the most frequent excuses heard from aviators: there just isn't enough time. This usually means that there isn't enough time during duty hours. What about weekends, holidays, and nights? Strangely enough, you can fly instruments on Sunday afternoon or Friday night just as well as on Wednesday morning. Aircraft are also normally more available during these times. You might run into trouble getting someone to go with you during these nonduty hours, but if you are really sincere about increasing your proficiency there will always be someone to go along.

Captain Smith finished reading the recommendations and remained silent until the CO slid the correspondence into his out basket.

"Well, what do you think?" said the CO. "Will this help you in getting your ticket back?"

Captain Smith answered thoughtfully, "Sir, you have covered just about every excuse I could possibly find for not getting with the program. If I follow these four steps I should have my ticket back in no time at all. I wish I'd had some guide like this when I was getting ready for my annual checkride before going to Vietnam. It certainly would have made things easier."

"You are absolutely right there, Captain," said the CO. "This is not only a guide for those returning from Vietnam, it also can and should be used by anyone who gets behind in his instrument proficiency. It's amazing how many problems people have getting ready for checkrides. It's really a very simple situation when you do some planning. Now how about some coffee? And let's swap some war stories."

"Sorry, sir," Captain Smith replied, "but I want to get over to operations and check the latest regulations on instrument procedures and find out when I can get an aircraft for some proficiency. Like your recommendations said, 'start to work immediately.' "

"Good idea, Smitty," said the CO with a smile. "Let me know how things work out."

Captain Smith renewed his instrument ticket 45 days after reporting for duty with his new unit. How long did it take you?

Guatemalan Armed Forces

Continued from page 5

the J-6 office of the Southern Command Headquarters. No portable VHF AM equipment was found which could provide an infantry patrol with the ability to talk on the aircraft frequencies. In fact, the U. S. Air Force was using a commercial set to accomplish that end. Before referring to the civilian market for a non-MILSPEC item, the problem was re-evaluated in all its aspects. The conclusion was that so many uses existed for a portable VHF AM radio within the Guatemalan Army that the search was justified, even if it meant adopting a nonstandard item.

Correspondence was initiated to locate radios in the civilian market which would meet specifications. None was found, but the SKY-515 came close to meeting all requirements. The manufacturer had made the lightweight aircraft radio into a manpack version with an eye toward commercial cropdusting and small airport markets. The requirements were explained to him, and he was asked to send a couple of sets on loan for testing. He was sufficiently impressed with the potential market to send his marketing vice president with two radios for two weeks of extensive operational testing, and for discussions with both USA and Guatemalan military personnel of all three services.

The radios were put through their paces in jungle, mountains, and desert, on foot, in vehicles and in boats. They performed well in all environments encountered in Guatemala. Modifications were recommended to make the product more attractive to the military market. Some of these recommendations were: waterproofing, use of the H-33 handset, inclusion of a cutoff switch for the internal speaker, construction of a more rugged case, inclusion of an internal battery charger which could use commercial power or vehicular power, and a shape which could use the PRC-10 harness. With the manufacturer's agreement to make the modifications at a modest increase in price and with approval of the test report by the Guatemalan Minister of Defense, the first order in quantity was placed. As promised by the manufacturer, the finished products arrived in February 1967.

The radio makes an easily transportable manpack. It weighs less than 15 pounds complete with all accessories for field use. The antenna is only 22 inches long and the case measures 4½ by 10 by 15½ inches.

It uses amplitude modulation in the frequency range 117 through 135.95 mHz, with crystal-controlled channels every .05 mHz. To get all 380 channels, it is necessary to have 39 crystals installed, but it is possible to use as small a number of crystals as needed, down to a minimum of two. This flexibility enables the purchaser to keep the price down, but provides the ability to expand channel capacity simply by buying more crystals.

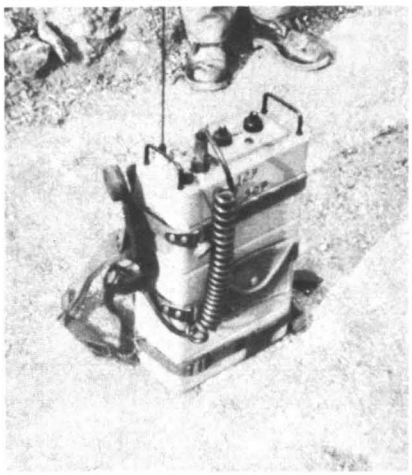
Power output is 5 watts, which is sufficient for line-of-sight communications in excess of 70 kilometers. The NICAD battery is rechargeable, using a built-in charger. Battery life depends upon use. It has 7 amp hours; the radio draws 1.25 amps on transmit and .08 amps on standby. In the field, a battery should last about a week without recharging. The radio can also use the standard PRC-25 dry battery.

Maintenance of the radio is straightforward, and the manufacturer guarantees parts to be available for at least 10 years. To date, 10 radio repairmen in Guatemala have received maintenance training.

Primary use for the radio is forward air controlling of tactical air support, but it has many other uses. Paratroops use it as a pathfinder radio to communicate with transport aircraft. The Air Force uses it for a ground radio in their gunnery training and as a control tower radio in advance air bases. It is used for joint air/ground reconnaissance missions. The marines use it for ship-to-shore and ground-to-air communications and for linkup communications for landing parties. For emergency rescue work, it can be dropped into inaccessible areas to allow pilots to communicate directly with people on the ground who need help.

The SKY-515 provides one of two major communications links between ground troops and Air Forces. Long range ground-to-ground communications are handled by a 20-watt portable single-sideband radio. Strike requests are made through the single-sideband set to the Air Force Operations Center (with veto ability by the intervening headquarters). The field commander is notified of aircraft takeoff time through the single sideband net. When tactical aircraft arrive in the target area, final coordination and target description are made via the SKY-515. Whenever possible, there is an airborne FAC as well as a ground FAC. The value of the airborne FAC in target identification has been firmly established in Guatemala.

The SKY-515 radio



ACCIDENT REPORT NARRATIVE: "The pilot woke up at 0530. After dressing, he left at 0600 without eating breakfast and drove to the airport, arriving there at 0700. After preflighting the O-1A, he made a takeoff at 0730. His mission was to fly convoy control for an engineer battalion during their deployment.

"A fuel stop was accomplished at 1030. . . . After refueling, the aircraft was flown to and landed at a point where the convoy vehicles were being refueled. An uneventful takeoff was made at 1100.

"Upon arriving at his destination, the pilot decided to land in a short field behind a restaurant to eat lunch. An airport was available approximately 5 miles from the chosen field. The pilot stated that he did not know about the airport and did not see it. It was a new airport and was not listed on the latest chart revision available through his flight operations. . . .

Aircraft accidents can be prevented when their causes are known. Causes can be determined only through thorough and accurate investigation which provides the necessary information on which to base corrective action.

"At approximately 1130, a landing was attempted after two passes, one of which was a low reconnaissance. According to the pilot's statement, he selected a flap setting between 35° and 45°. He had previously selected his touchdown and go-around points during his low reconnaissance.

"Apparently, a normal approach to the north was made and initial touchdown was 357 feet from the 40-foot high barriers on the approach end of the field. Wheel marks indicated the main gear touched the ground first, followed 24 feet later by the tail wheel. The disturbed ground indicated the tail wheel contacted the ground rather sharply. This, coupled with slight terrain roughness, and hard braking, caused the tail wheel to leave the ground after rolling 21 feet. The tracks indicated the aircraft was landed in a slight crab to the right. The tail wheel track was 3 inches left of the centerline of the main gear tracks.

"After the tail wheel left the ground, braking was reduced. . . . Directional control difficulty evidently began just prior to, or at the time the tail wheel was brought back on the ground. As indicated by the track made by the tail wheel, the tail of the aircraft started moving to the left and crossed outside the left main gear track 170 feet prior to the end of the groundroll. The left wing and horizontal stabilizer struck the ground at the termination of the groundloop. . . . Extensive damage to the wing indicated the aircraft was still traveling at a high rate of speed when the wing hit the ground.

"An accident investigation team departed the home station immediately after notification in accordance with the unit's accident investigation plan. A maintenance specialist accompanied the team.

WHEN IS A DUCK?

Pierce L. Wiggin

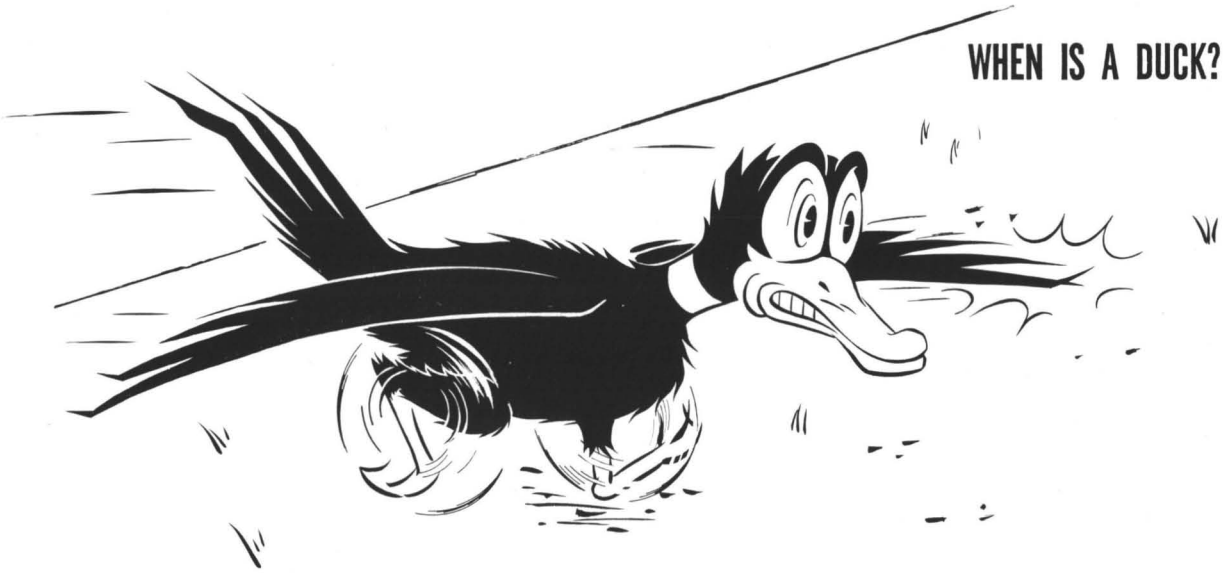
crash sense

the following 28 pages prepared by the U. S. Army Board for Aviation Accident Research

Because no injuries were incurred, the aviation medical officer did not accompany the investigation team to the scene of the accident. . . . Before discussions took place, both the pilot and passenger were asked to give written statements. A thorough search of the field was made to determine the point of touchdown, ground tracks, and the sequence of events. Dimensions of the field were taken and the slope was determined. The field was 918 feet long and 275 feet wide at its widest point. It sloped upward in the direction of the landing, 6 feet in the first 700 feet. The last 200 feet are approximately flat.

"The aircraft was inspected to determine damages and any possible malfunction which might have contributed to the accident. The flaps had been retracted and it was not possible to accurately determine the flap setting used for the landing. Fuel and oil samples were taken in the event questions were raised later, although these systems were not suspected. The engine was started and it ran with no abnormal characteristics. Flight and ground steering controls appeared to be normal. . . .

"The gross weight of the aircraft was computed to be 2,258 pounds, with the pilot, passenger, baggage, and approximately 33 gallons of fuel on board. At this gross weight, a temperature of 86° F, a field elevation of approximately 500 feet, and zero



wind, the aircraft could land over a 50-foot obstacle in 650 feet, using maximum performance techniques. Normal landing procedures would require 1,070 feet for landing over a 50-foot obstacle. These calculations are based on performance predictions in the –10.

". . . No weather reporting station was located in the vicinity. Based on the pilot's statement and observation by the investigation team, the wind was light and variable and visibility was good. Weather was not considered a factor. . . .

"The primary cause factor for the accident was pilot error. According to the pilot's statement, a flap setting of 35° to 45° was used for landing. This flap setting was insufficient for the length of the field. The –10 requires a flap setting of 60° for a maximum performance landing. This insufficient flap setting resulted in excessive speed and necessitated very hard braking in an attempt to stop the groundroll. The slope at the point of touchdown and the failure of the pilot to compensate for it also contributed to the accident. A combination of the tail wheel striking the ground hard, excessive roughness, and hard braking caused the tail wheel to leave the ground and increase directional control difficulties. *It is suspected that pilot proficiency was marginal for this type of operation, requiring near maximum performance of the aircraft, since pilots of this unit did not regularly practice maximum performance barrier approaches and takeoffs.*

"The final result of these cause factors was a classic groundloop."

Established cause factors were listed as: "Pilot error, insufficient amount of flaps, and failure to maintain directional control after touchdown." The Board listed probable or suspected cause factors as: "Excessive airspeed on approach; lack of pilot proficiency in short field techniques."

From the above, it is obvious that the investigation board was satisfied with its finding of pilot error. But when it came to recommendations, the board refuted its finding by recommending: *"All pilots of this unit should be given additional training in the selection and evaluation of landing strips from the air."* This was the board's only recommendation and the reviewing official and approval authority concurred.

No mention of unit policy concerning the selection and use of landing areas other than established airfields was made in the report. Nor was any mention made of a mission briefing, and the pilot's flight plan, if filed, was not included.

Unit training and standardization programs were disposed of with this statement: *"It is suspected that pilot proficiency was marginal for this type of operation requiring near maximum performance of the aircraft, since pilots of this unit do not regularly practice maximum performance barrier approaches and takeoffs."*

The board diagnosed pilot error, but prescribed treatment for a training and supervisory duck. This report is typical of investigations and reports which demonstrate a lack of understanding and appreciation of the purpose and benefits of thorough and accurate aircraft accident investigations. This is further evidenced by the board's statement: *"Because no injuries were incurred, the aviation medical officer did not accompany the investigation team to the scene of the accident."* Injuries are by no means the sole reason for flight surgeons or aviation medical officers to fully participate in accident investigations. Chapter 12, AR 95-5, outlines the role of flight surgeons during investigations.

A DUCK IDENTIFIED

COMPARE THE previous investigation and finding to the following accident report narrative: ". . . after discussing their mission, the O-1D pilot and observer departed at 0915. The weather consisted of high, thin, scattered cloud conditions; visibility of 15 miles; light wind from the east northeast; and no reported turbulence. Their mission was to perform a visual reconnaissance. Two other O-1D aircraft were flying missions in the same general area and the three pilots were flight following for each other. . . .

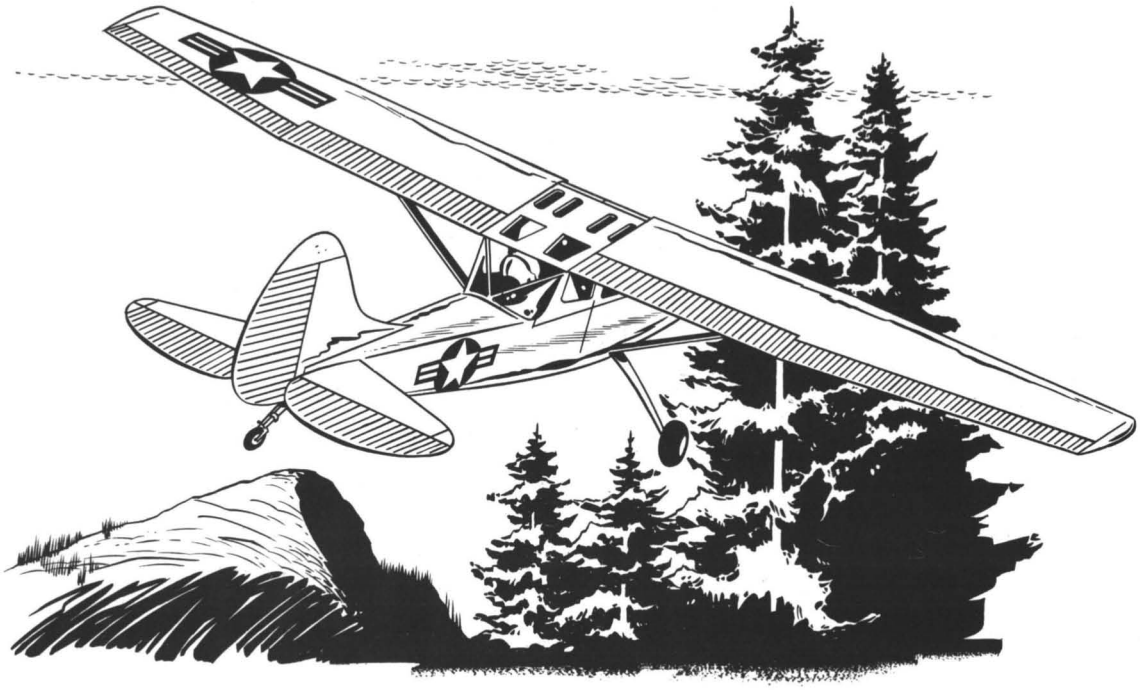
"After observing the assigned area, the pilot proceeded north and began a wide right turn. While in the turn, both the pilot and observer identified foxhole positions along a narrow stream. The pilot then completed a 360° right turn to pass over the area again and to make positive identification of what they had seen. After passing over the foxholes again, he decided that he would make another pass and mark the position with a smoke grenade. After completing another 360° turn, he leveled the wings and made a slight throttle reduction. The aircraft was heading approximately 100°.

"The pilot then removed the pin from the smoke grenade. . . . As they approached the foxholes, he threw the grenade out of the right front window. The altitude of the aircraft at this point was approximately 50-100 feet above the foxhole positions. Upon throwing the grenade, the pilot told the observer, 'That should wake them up! Ah—, I missed!' The aircraft then began striking trees.

"At the point of initial impact, the trees were approximately 100 feet higher than those at the foxhole positions. The two points were 500 meters apart.

"The observer stated that he experienced a split second realization that the crash was imminent as he glanced from the foxholes toward the front of the aircraft. At this moment, he made a quick self-bracing movement and the pilot also made a sudden movement. The aircraft appeared to the observer to be slightly right wing low as they hit the trees. It continued down through the trees and came to rest 150 meters from the point of initial impact.

"The tail section was separated and came to rest 100 meters to the rear. The right wing was separated and rested 25 meters to the right rear. The left



wing remained attached to the fuselage, but was bent back at an angle of approximately 45°. The engine was immediately to the right of the cockpit and the observer crawled over it while exiting the wreckage. The aircraft caught fire at final impact and, as the observer escaped, the wreckage was engulfed in flames. Despite his own injuries and the intense blaze, the observer attempted to remove the pilot from the cockpit, but could not free him. The pilot was killed.

"During the initial phase of the investigation, the board attempted to obtain the best possible photographs of the crash site. A camera equipped with a telephoto lens was used and the pictures were taken from a helicopter hovering over the crash site. Statements were gathered from the observer and other pilots flying in the area. These statements established a sequence of events which served as a guideline for the remainder of the investigation.

"The board made a thorough study of the pilot's flight and medical records, and the unit's standard operating procedures and training program. The board met daily to review the information gathered by each member. Diagrams were made to establish the flight path, crash pattern, and wreckage distribution. Maintenance forms and records were carefully studied and maintenance personnel were interviewed and consulted. Statements were recorded from those individuals who were in direct contact with the aircraft prior to the accident.

"Cause factors:

"Design— There were no characteristics inherent in the aircraft which were related to the accident.

"Maintenance— The aircraft had been worked on the morning of its last flight, when two spark plugs were replaced after the engine ran rough during a flight the night before. After questioning the platoon leader, two crewchiefs, and the linechief, the board concluded that the work had been performed in accordance with directives. However, an error was made on the 2408-13. A red X condition had not been properly signed off. This administrative error was unrelated to the accident.

"Inspection— All inspections were performed in accordance with directives and were not considered cause factors.

"Materiel—The observer stated that the engine

was running normally at the time of the accident. The pilot had signed off the first flight (en route to pick up his observer) as 'OK.' In exiting the wreckage, the observer stated that he climbed over the engine. When questioned about the condition of the propeller, he said that both blades had been sheared from the prop hub and only the hub remained attached to the front of the engine. He further stated that he did not see the blades at all during his exit from the wreckage and departure from the crash site. The board concluded that the engine was developing sufficient rpm to maintain flight and that the propeller blades were sheared in the trees and vines as the aircraft passed through them. Materiel failure was not a cause factor in this accident.

"*Operation*— Pilot error was a major cause factor. The pilot diverted his attention from the control of the aircraft to throwing and watching the trajectory of a smoke grenade. This was extremely poor judgment, particularly in view of the fact that the aircraft was at low altitude over hazardous terrain. The board concluded that the pilot held the control stick in his left hand while throwing and watching the grenade. From his position over the foxholes, the pilot would have had to increase his altitude to clear the trees at the point of impact. When he allowed himself to be distracted, he failed to realize that the altitude adjustment was necessary.

"*Training*— The fact that the pilot was insufficiently trained for the mission he was engaged in was a cause factor. He had been given a standard checkout in the O-1D by the unit's standardization instructor pilot. This checkout does not include the teaching of visual reconnaissance techniques. The unit's program of instruction for newly assigned aviators states that the company checkout does not attempt to ensure that each aviator is proficient in normal operations and this training is the responsibility of the platoon to which he is attached. The platoon leader stated that the pilot was not given the training prescribed in the POI. He began flying solo operational missions the day after he had been released by the unit's standardization instructor pilot. The board reviewed all of the 2408-12 forms for flights subsequent to the pilot's assignment to the company and determined that he had not flown with an instructor pilot since his initial checkout. The company standardization instructor pilot stated that the pilot's flying apparently was below average, and that he was not quick to grasp new concepts or flight maneuvers. He further stated, however, that the pilot was very methodical and, in time, would have developed a mechanical proficiency in each flight requirement. The pilot was left to develop his own methods and techniques for the mission he was required to perform. This situation resulted in the development of bad habits which went unnoticed by his supervisors.

"*Supervision*— The definite lack of supervision at both the platoon and company levels was a contributing cause factor. The platoon leader failed to ensure that the pilot was given the proper training and was unaware of his manner of performance. The platoon leader stated that he thought he was a very good pilot. He added, however, that he had never flown with him. The company commander failed to monitor the platoon training program to ensure that his directives were being carried out. A breakdown in the unit's supervision system occurred when the standardization instructor pilot's evaluation of the pilot's weak performance was not passed along to the platoon leader.

"*Administration*— Proposed directives and SOP's within the unit were adequate and did not constitute a contributing cause factor.

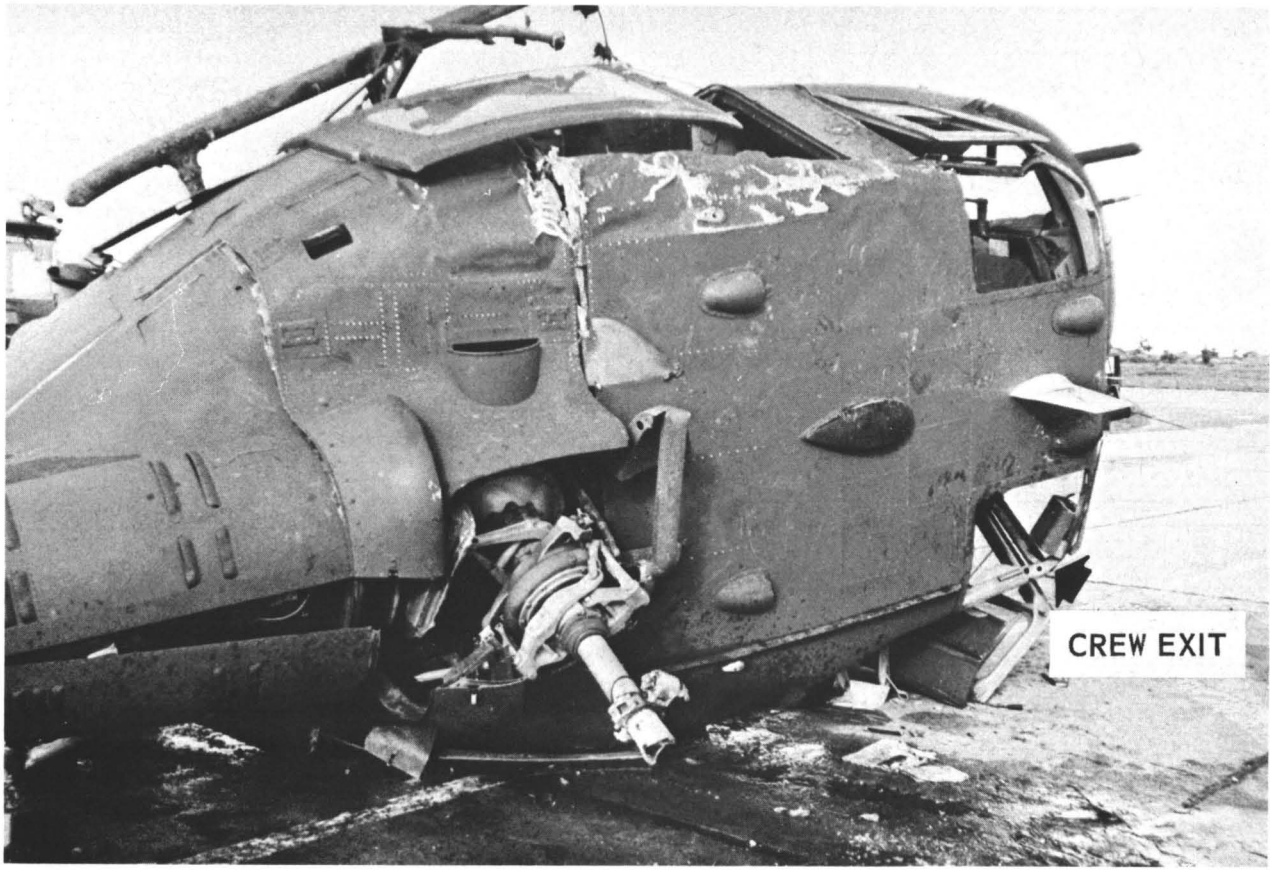
"*Unrelated cause factors*— The board concluded that maintenance procedures, both functional and administrative, in this unit constituted a potential accident cause factor. The crewchief that replaced the spark plugs on the aircraft stated that he was aware of the fact that he was not authorized to change the red X status in the log book. He stated that, in the absence of a qualified individual, he took it upon himself to commit this error. Both crewchiefs were weak in technical knowledge and their supervisor, the line chief, was supervising a sandbag detail when the error was made. The careless manner in which the forms were maintained coupled with absence of a qualified supervisor from the flight line when maintenance was being performed are conditions which could substantially contribute to future accidents."

Though operating under far more difficult circumstances, this board was not satisfied with a finding of pilot error. It investigated each facet of the pilot's training and experience to determine the all-important WHY? Because of this, it was able to recommend effective action to correct the deficiencies that led to pilot error. Its report was complete in every detail and its findngs were well substantiated with evidence. Here is what the Army commander had to say about this investigation:

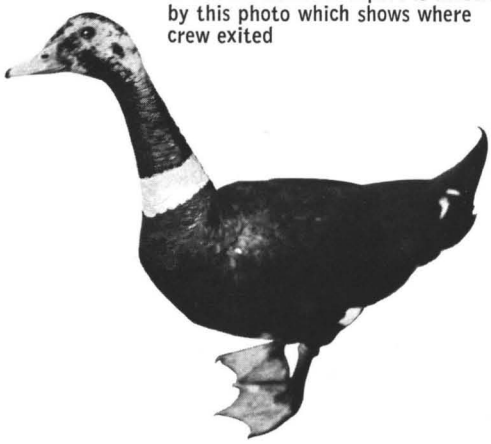
"Concur with board findings and recommendations. . . .

"The board of investigators are commended for their thorough and excellent written report."

CHECKOUT DUCK



Excellent photographic evidence contained in UH-1B accident report is illustrated by this photo which shows where crew exited



REPORT NARRATIVE: "The aircraft (UH-1B) was being used for a checkride for an aviator who had recently been assigned to the unit. After preflight and runup procedure check, the aircraft was cleared to the north portion of the airfield. The initial portion of the checkride was to be conducted in this designated training area.

"After pointing out the training area limits to the pilot, the instructor pilot proceeded with the checkout in accordance with procedures outlined in the battalion standardization guide. Several simulated inflight emergencies and straight-in autorotations were accomplished. These were completed

without incident. According to crew and witness statements, all systems were operating normally.

"The instructor pilot then stated that he would demonstrate a low level autorotation and told the pilot to follow through lightly on the controls. The wind was reported from the northwest, light and variable. The instructor pilot entered a downwind leg from south to north, with a right turn on base. After turning final, with 80-90 knots airspeed, at approximately 100 feet, he rolled off the throttle to the flight idle detent and, holding his pitch static, began a gentle movement to the rear with the cyclic to a flare attitude to gain rpm. The expected results did not materialize and rotor rpm continued to decrease. At this time, the instructor pilot bottomed pitch and increased the flare. This maneuver was also unsuccessful and ground impact was imminent.

"The instructor pilot leveled the aircraft and attempted to make a power recovery, rolling the throttle on one turn. The aircraft struck the ground several hundred feet short of the intended touchdown spot in a nose high attitude, with a very high sink rate, with an estimated 50-knot airspeed. Initial impact spread the cross tubes to a degree that the box antenna was sheared off. It appeared, from the skid marks, that the helicopter bounced and became airborne again for approximately 30 feet before hitting the second time in level attitude. It continued a ground slide for approximately 214 feet before hitting an 18-inch dirt mound with the right skid. This caused it to start a slow turn to the right. The toe of the left skid hit a hole adjacent to the taxiway, causing the aircraft to roll on its left side. During this roll, the main rotor mast was severed below the mast collar, and the main rotor came to rest on the south side of the taxiway. The helicopter continued to roll to the left, coming to rest on its left side.

"It is the opinion of the board that the tail rotor pylon was partially severed at initial impact and thrown clear during the ground slide."

Conclusions:

"This checkride was conducted in accordance with accepted standard operating procedures.

"Weather (wind) was a contributing factor.

"There was no indication, either by statements or inspections, that materiel failure or component performance was a contributing factor.

"All helicopters assigned are required to be mission ready, leaving no aircraft available for transition training. Consequently, all training flights are conducted in aircraft with load configurations not conducive to safe initial transition or training flights."

Cause factors:

"The instructor pilot held collective pitch during the flare portion of the maneuver, causing a loss of rotor rpm.

"Failure of the instructor pilot to recognize the loss of rpm in time to take corrective action.

"Failure, in the power recovery attempt, to roll the throttle to the full on position.

"Misjudgment on the part of the instructor pilot in the entry to the maneuver caused the aircraft to touch down several hundred feet short of his designated touchdown point.

"The maneuver was conducted with a quartering, gusty tailwind."

Recommendations:

"That only the more experienced unit instructor pilots perform checkouts for newly arrived personnel.

"That low level autorotations not be practiced or demonstrated unless the pilot being checked has never successfully completed this maneuver in the type aircraft for which he is being checked.

"That straight-in autorotations not being practiced or demonstrated unless the pilot being checked has not successfully completed this maneuver during the previous 90 days."

Statement of reviewing official:

"Concur with the findings and recommendations of the board.

"A policy of submitting only instructor pilots assigned to this battalion and supervised by the battalion standardization board to conduct training and checkrides has been established.

"Current policy prohibits practice autorotations, except for transition training and instructor pilot proficiency.

"Special purpose aircraft was not normally used for training. In this case, an aircraft with a command radio console installed was the only aircraft available. The additional weight of this equipment is not considered to have been a cause factor. . . .

"A summary of this accident and its cause factors has been brought to the attention of the battalion standardization board."

First indorsement to letter of transmittal:

". . . Concur with the findings of the board, after amendment of cause to read: Instructor pilot technique, in that he failed to reduce collective pitch, while executing a flare with the throttle in the flight idle position.

"Concur with recommendations of the board and the statement and actions of the reviewing official."

Other Mishap Ducks

SO FAR, we have been discussing the *hows* and *whys* of unidentified and identified accident ducks. A much greater opportunity to learn and profit from experience is to be found with incidents, forced landings, and precautionary landings. The only thing that keeps an incident from becoming an accident is the degree of damage to major components and manhours required for replacement and repair. In most cases, this is totally unrelated to cause factors and preventive action. The chance to gain prevention information is much greater from forced landings and precautionary landings because the aviators involved in these were able to successfully cope with inflight emergencies and land without damage. If we could learn the full circumstances that brought about these emergencies and the techniques used to cope with them, we would be in a far better position to prevent accidents resulting from similar cause factors.

Unfortunately, these mishaps rarely generate the investigation interest given to accidents involving major or minor damage. This is apparent in the TWX messages used to report them. Item 7 of this message is supposed to contain a description of how the mishap occurred. Item 7 of a recent precautionary landing message stated, "Fuel leak." From this message, we could only learn that a UH-1B had a fuel leak and the left fuel manifold assembly was replaced. We don't know how the pilot identified the problem, we don't know the phase of flight, nor do we know what action the pilot took to successfully complete a precautionary landing.

Item 7 of a recent forced landing message stated, "Engine failed." Here again, the message contained no information about the phase of flight or the action taken by the pilot. We can only assume that the helicopter was autorotated, but we know nothing about the circumstances, such as the altitude and attitude at the time of the emergency, the type of terrain, and the procedures used to complete a successful forced landing. To date, no supplementary message has been received to explain why the engine failed.

Item 7 of a recent incident message stated, "Hard landing." Apparently, the sender of this message believes that all hard landings are exactly alike and that details of the circumstances which brought about the hard landing are unnecessary.

Mishap messages of this type have very little prevention value and the lessons that could be learned and shared are wasted. Following are examples from recent mishap messages with lessons that were learned and shared:

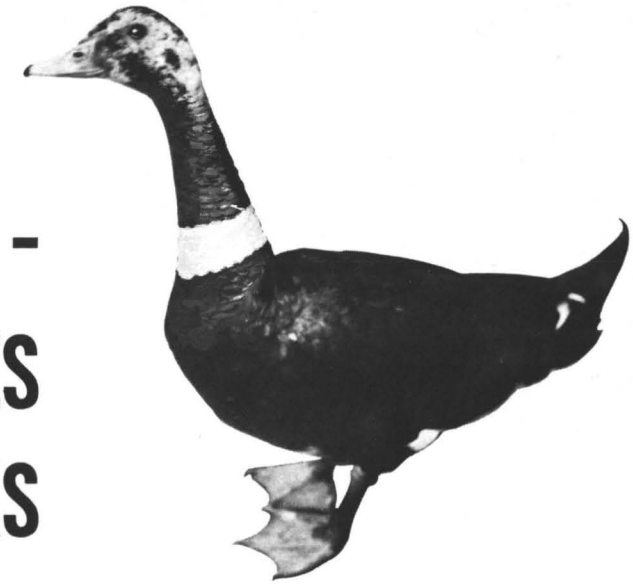
"During a straight-in practice autorotation to an authorized touchdown area, the pilot failed to level aircraft and was late with initial pitch application. Aircraft contacted ground in tail low attitude and sustained incident damage to tail rotor blades, tail boom, and 1″ drive shaft. Aircraft remained upright and there was no fire."

"Aircraft was on reconnaissance mission at 1,000 feet when engine started running rough. Altitude could not be maintained and landing with partial power was made to an open area, with no damage. Engine ran extremely rough on ground." Item 9 of this message stated, "Suspect engine failure," and item 16 stated, "Supplement will follow."

"Engine ran rough and misfired after takeoff for test flight. Pilot cut throttle and started autorotation. Engine stopped during autorotation. Pilot continued autorotation to open field and landed with no damage. Exhaust valve rocker shaft came off in no. 6 cylinder. Suspect maintenance failed to secure cover."

Messages of this type meet the requirements of paragraph 23, AR 385-40. More important, they supply prevention information that can be effectively used in the accident prevention program of the unit involved. Because they were fully and accurately described in TWX mishap messages, they can be shared with all Army aviation units through the USABAAR WEEKLY SUMMARY.

After - The - Facts Ducks



THE COST OF accident and incident experience is very high. FY 1967 accident experience cost the Army more than 99 million dollars in aircraft damages. The additional cost of personnel losses and injuries cannot be determined by monetary value because of variances in training costs and experience levels. The combat readiness lost during the time required to repair or replace damaged aircraft and train replacement crewmembers for those lost in accidents cannot be purchased at any price. This expensive experience should be milked for every ounce of prevention information through thorough and complete investigation and accurate reporting. AR 95-5, AIRCRAFT ACCIDENT PREVENTION, INVESTIGATION, AND REPORTING, explains how to use and share your experience.

Before - The - Facts Ducks

CIRCUMSTANCES that result in accidents and other type mishaps are the same, whether they are allowed to develop into accidents and mishaps, or whether they are discovered and corrected beforehand. Major General Joseph D. "Smokey" Caldara, USAF (Ret), President, Flight Safety Foundation, said, when he was USAF Deputy Inspector General for Safety:

". . . At any level, the commander sets the pace for aircraft accident prevention. Not that he is the safety officer—Heaven forbid! When I bump into a chap who says to me, 'Smokey, I'm the number one fly safe officer in my organization,' I get my prayer wheel and start to spin it, because no commander has the time to perform that job.

"Our accidents rarely result from some great, dramatic catastrophe, but from a series of piddling coincidences that snowball to disastrous proportions. It's a case of getting nibbled to death by ducks. You're not being bitten in half by an alligator and you've got to think in those terms. Take the time to kick the ducks away. That's what flying safety officers should be used for. I recommend it strongly."

Before-the-fact circumstances and conditions which cause accidents and mishaps can be found and corrected. This requires the concerted efforts of all who command, operate, and maintain aviation equipment and facilities. Appendix VI, AVIATION SAFETY PLANNING GUIDE, AR 95-5, is recommended reading for all who would like to kick their before-the-fact ducks away.

..."THERE'S A HELICOPTER IN OUR REAR VIEW MIRROR!"

... the pilot had a history of low flying and buzzing, showing a tendency toward "risk-taking" ...

WITNESS: "We were driving north at 4:10 PM. My daughter saw a helicopter in the rear view mirror. It came close with a roar and went over our car and started to land on the highway in front of us. It took off upward, curved left, headed south, hit a wire, and nose dived. Some of it was falling apart as it came up from the highway. One man walked beside the highway and another man walked and fell down right away. Two men were caught in the helicopter . . . We tried to keep the men lying down."

Witness: ". . . I noticed a helicopter flying from the south on the west side of the highway, heading north at a very low height. Approximately 3-4 minutes later, a branch of a tree shook. I looked up and noticed a powerline pole shaking and looked to the north and noticed some debris of a helicopter or some kind of aircraft flying in the air. . . ."

While in straight and level flight at approximately 15 feet, the UH-1D struck and broke two 3/8 inch powerlines strung across the highway. One of the powerlines struck the UHF antenna, removing it from the cabin roof, and then struck and sawed through the right cyclic servo push-pull tube. The second wire broke on the swashplate. The severed push-pull tube would account for the apparent out-of-control condition after the wire strike.

The gunner was not strapped in his seat and was thrown out of the helicopter at impact. He died 5 days later. The pilot, copilot, and crewchief sustained serious injuries.

The accident investigation board listed the following cause factors:

"The cause of the wire strike was unauthorized contour flying in an area not designated as a contour flying area.

"The pilot has a recent history of low flying and buzzing to include one instance of low flying at night. No disciplinary action, other than a verbal admonishment, was taken against this aviator, in spite of several violations of flying regulations, all of which involved unauthorized low flying.

"Failure to provide psychiatric supervision. In spite of a history of low flying and buzzing, showing a great tendency toward 'risk-taking,' the pilot was not referred to the flight surgeon or psychiatrist for evaluation. In the case of this pilot, a psychiatric evaluation subsequent to the first one or two reported instances of low flying might have pointed out a personality factor which would have necessitated removal from flying status. . . .

"This accident occurred in a unit which had experienced several incidents involving low flying in unauthorized areas. There has been a failure at unit level to observe, detect, and correct unsafe flying practices."

Lieutenant Colonel Clement A. Wyllie

OIL ANALYSIS PROGRAM

As a means to enhance the combat effectiveness of Army aviation, this is one of the best accident prevention tools yet encountered . . .

THE PUBLICATION OF AR 750-13 in December 1966 represented the U. S. Army's transition from an austere, volunteer oil analysis program to an expanded, formal, worldwide program. The publication of this regulation also represented the culmination of considerable effort on the part of USABAAR to promote operational safety through an oil analysis program.

Early in 1962, USABAAR became interested in oil analysis as a means to enhance the combat effectiveness of Army aviation by reducing aircraft losses occurring from engine, transmission, or gear box failures. This interest was stimulated by an oil analysis test program, then being conducted by the Transportation Aircraft Test and Support Activity (TATSA), located at Fort Rucker. The results of this program were most gratifying and convinced USABAAR that this was one of the best accident prevention tools yet encountered. A total of 651 aircraft were monitored under this program. During one 9-month reporting period, 59 of the components (engines and/or transmissions) evaluated were found to contain safety-of-flight defects requiring corrective maintenance. The accuracy of the operation was 72.8 percent. At the close of the

Oil samples and forms received by Fort Rucker laboratory are sorted by Maureen Cox and Janice Trant

reporting period, many other components were carried forward as suspected items, pending further evaluation results.

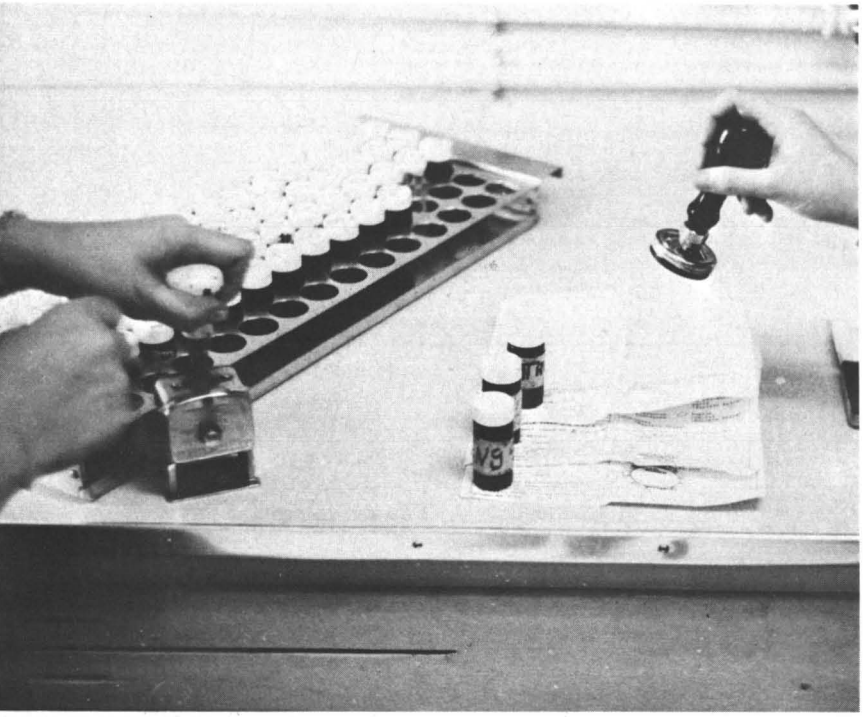
Several administrative problems existed, reducing the laboratory's ability to detect discrepancies in the early stages of development so that corrective action could be performed and the aircraft kept in service.

First, and most important, the units participating in the program did not have the authority to have disassembly inspections performed after the first oil analysis detection of abnormal wear concentrations. Secondly, maintenance procedures did not provide for feedback information on component removal. This data is essential for the evaluation and correlation of the spectrographic analysis. Some feedback information was obtained via telephone, but this procedure was unsatisfactory, particularly as the program expanded. In addition to the Army aircraft being monitored under the TATSA program, approximately 100 C-119 aircraft were provided with oil analysis at the request of Robins Air Force Base, Ga.

As a result of the TATSA test, USABAAR proposed to the commanding general, United States Army Materiel Command, on 29 August 1962, the adoption of an Army-wide oil analysis program.

Response was slow initially and indicated the need for further "selling" before any formal program would be adopted. A big step in this direction was to expand voluntary participation in the existing program. USABAAR literally advertised and solicited individual unit participation.

The TATSA laboratory was subsequently absorbed as a function of the Army Aviation Test Board with an expanded capability. A new laboratory was also opened at the United States Army Aeronautical Depot Maintenance Center (ARADMAC), Corpus Christi, Texas. By July 1965, over 70 percent of the aircraft in the Army inventory were being covered on a voluntary basis. The Fort Rucker laboratory alone was handling in excess of 2,000 aircraft, covering 3,000 components. Their record continued to substantiate the value of an oil analysis program as a tool for predicting incipient failures. The laboratory had obtained 131 confirmed safety-of-flight deficiencies. The value of the components involved exceeded 1.7 million dollars. The reliability of total predictions was 68 percent.



Each sample and form are dated and assigned identification numbers

Files are checked for information about each aircraft from which samples are drawn

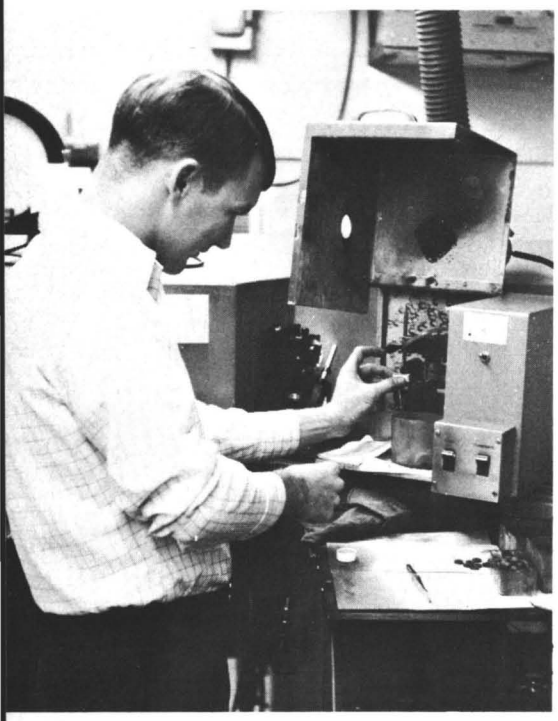
A USABAAR review of 2,942 Army aircraft mishaps reported during the period 1 July 1961 through 30 September 1963 showed that 671 were caused by engine failure. Based on the high degree of reliability of the oil analysis program in predicting impending failures, USABAAR reasoned that if only 1 percent of the total component failures were prevented, the program would pay for itself.

Followup action was initiated by USABAAR in January and October 1965, strongly recommending the publication of an Army regulation establishing oil analysis as an official Army-wide program. Another delay was encountered to determine the feasibility of a tri-service program between the Army, Navy, and Air Force. An agreement between these three services would assure a coordinated program within the various departments and ensure maximum materiel readiness and optimum cost effectiveness. An agreement was completed and published as AR 700-61, NAVAIRINST 4730.1, and AFR 66-39, dated 6 March 1967. The objectives of this agreement encompass the following areas:

1. Standardization of techniques, terminology, procedures, and policies.
2. Standardization of equipment.
3. Standardization of calibration samples.
4. Interservice use of oil analysis laboratories.
5. Most favorable laboratory locations for user access.

The urgency for implementing the Army-wide program was evidenced in January 1966 by the crash of a CH-47 which killed six crewmembers and destroyed the aircraft. The cause of the accident was failure of the forward transmission. This failure had been predicted by the oil analysis laboratory at Fort Rucker and a message dispatched to the unit concerned. Unfortunately, the TWX was received in such a garbled state that a retransmission was requested. The retransmitted message was received 1 day after the crash. This taught that a vital segment of any oil analysis program must be a fast and efficient communications system between the laboratory and using units.

The case for oil analysis as a safety tool continued to be written in the records of the laboratories. During 1966, the laboratory at Fort Rucker covered 2,600 aircraft, processed over 87,000 samples, and predicted 226 confirmed safety-of-flight deficiencies. These components constituted a total value in excess of $4 million. Had these components failed



Operator Mike Payne inserts measured quantity of sample to be burned by electric arc for analysis

After verifying previously recorded data about aircraft component from which sample was taken, and rechecking serial numbers of aircraft and component, Andy Speigner types any additional information needed, then waits for oil analysis computer to automatically type the results of the test on the component record card

and caused accidents, the cost in lives and equipment would have been immeasurable.

Engine and gear box deficiencies continue to be predicted, which heretofore would have gone undetected until failure. As a result of the oil analysis program, it is now a commonplace occurrence to replace such items as defective bearings, valves, valve guides, cylinders, contaminated oil, rods, and seals, which, if allowed to progress to the failure point, could result in aircraft accidents.

Following is the current status of U. S. Army oil analysis laboratories:

1. U. S. Army Aviation Test Board, Fort Rucker, Ala. — Operational. Provides service for units in Third U. S. Army area, including the U. S. Army Aviation School.

2. ARADMAC, Corpus Christi, Texas — Operational. Provides service for units in the Fourth U. S. Army area.

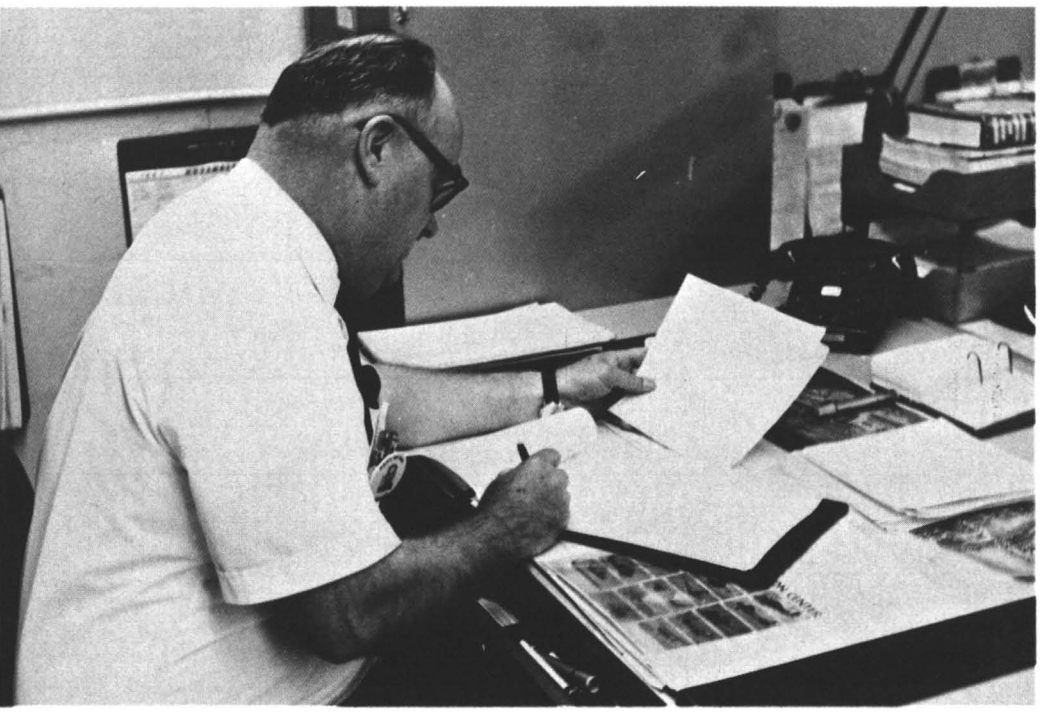
3. Sharpe General Depot, Lathrop, Calif. — Operational. Provides service for units in the Fifth and Sixth U. S. Army areas, Alaska, and Southern Command.

4. Cam Ranh Bay, Vietnam — Operational. Provides service for all units in Vietnam. (Note: Units in Japan, Okinawa, and Korea are now being serviced by U. S. Air Force laboratories in accordance with the tri-service agreement.)

5. USAAMAC, Sandhofen, Germany — Will be operational on or about 1 February 1968 and provide service for units in Europe and Middle East areas.

6. New Cumberland General Depot, Penn. — Will be operational on or about 1 February 1968. Geographical responsibility has not been completed. However, it will probably be for units east of the Mississippi River.

USABAAR considers the adoption of a formal oil analysis program to be one of the most important weapons added to the cause of accident prevention in recent years. There are many approaches to accident prevention, but we like to separate them into two broad categories. The first concerns preventing an accident before it happens. The second, the practice of preventing future accidents similar to the ones that have already happened. Obviously, a properly conducted and rigidly supervised oil analysis program can produce immeasurable dividends in both categories. Our goal is not safety for safety's sake—but the inevitable by-product of safety, which is increased combat effectiveness.



Chemist Harry Smith, chief, Fort Rucker oil analysis laboratory, reviews and analyzes test findings. Units submitting samples are promptly notified when aircraft oil-wetted components show abnormal wear patterns which indicate pending failure

pearls

Personal Equipment and Rescue / Survival Lowdown

If you have a question about personal equipment or rescue and survival gear, write Pearl, U. S. Army Board for Aviation Accident Research, Fort Rucker, Alabama 36360

THIS MONTH'S LESSON comes from 1LT Vincent R. Guerrieri, information officer, 34th General Support Group. Here is what Lieutenant Guerrieri wrote—

What do you do when you're flying in a helicopter offshore in Vietnam, the engine sputters, and the pilot autorotates and ditches . . . in the water?

Most men would put on their life jacket and wait for rescue, but not LTC William Brooks, the aviation safety officer of the 34th General Support Group (AM&S), Vietnam. At least it would seem that way from a recent experiment he conducted!

Reports of water ditchings come into the 34th General Support Group with regularity via crash facts messages. These reports are reviewed and analyzed to find lessons to be learned and suggested improvements for safety of flight.

One of the lessons discovered was in the area of ditchings where most fatalities were due not to the ditching but to the water. Further research conducted in this area indicated a possible solution to the problem. In one message on ditchings, a survivor who could not swim reported that the flak jacket he was wearing acted like a life preserver and aided in keeping him afloat. (The primary purpose of the flak jacket is for individual body protection from flying shrapnel. It is used by infantrymen as well as pilots and crewmembers.)

This seemed like it could be one answer to the question, "What do you do when your aircraft goes down?" So the aviation safety officer of the 34th Group undertook a test project. The purpose was to learn just how effective the flak jacket was as a life preserver. To test it, he set up an experiment, with himself as the subject, to gain firsthand information about the buoyancy of the flak jacket.

For the first test, he donned his normal military uniform, which consisted of jungle fatigues and

Wearing full gear, including armor crest plate and flak jacket, LTC Brooks leaps into swimming pool

Buoyancy of flak jacket is demonstrated as he floats erect with head out of water

boots, then added his new ballistic flight helmet, aviator's gloves, shoulder holster and pistol, with two magazines of .45 calibre ammunition, and an individual armor plate chest protector worn beneath a flak vest. With all of this equipment, LTC Brooks, who normally weighs 158 pounds, tipped the scales at an even 200 pounds. Then, weighed down as he was, he took a dip in 9 feet of water at a local swimming pool. After a few minutes of enjoyment in the water, he climbed out of the pool and related his experience.

He noted that the air absorbed in his clothing slowly escaped as it was replaced by the water, further increasing his weight. However, the performance of the flak jacket was encouraging, performing 50-75 percent as effectively as a life preserver. As an unexpected added advantage, he found that the new ballistic helmet acted as a buoy when he was floating in the water on his back, helping to hold his head above water.

For the second part of the test, he took another dip, this time without the armor plate chest protector. When he hit the water the second time, his gross weight was 187 pounds. After more frolic in Neptune's kingdom, he emerged to report that the flak jacket was 75-100 percent as effective as a life preserver, especially when floating on his back and making use of the buoyancy of the ballistic flight helmet. He re-emphasized the effect of the water adding weight to his clothing, indicating that it may add 40-50 pounds of additional weight.

What was learned by the experiment? LTC Brooks said that no hard and fast information is prsently available on water survival techniques and procedures. In Vietnam, water has taken its toll of crews and passengers in water crashes and ditchings. "Life preservers are mandatory on overwater flights, but sometimes they are not immediately available and the mission must go on. Often the mission is not planned as an overwater flight, but emergency circumstances may require flying over water. If the pilot is forced to ditch, the flak jacket will be an aid to flotation, even though movement will be severely restricted. The flotation capability of the flak jacket will be even more effective in sea water," said LTC Brooks, "as this experiment was performed in fresh water."

LTC Brooks reported added buoyancy for head was supplied by ballistic helmet

From Headquarters, 1st Aviation Brigade *Accident Prevention Bulletin,* dated 15 October 1967:

AIRCRAFT REFUELING PROCEDURES

A UH-1 recently caught fire and burned while refueling at a miniport. However, due to precautions while refueling, the crewchief was the only person to receive any injuries and these were minor. This individual's burns were minimized because he had his visor down, sleeves down, cuffs buttoned, and gloves on.

If unit SOPs do not already reflect the following procedures, it is recommended that they be established.

• When the aircraft lands, the crewchief and gunner will exit the aircraft. If there are passengers inside, one door will remain wide open. The gunner and crewchief will open the pilot and copilot doors and slide back the armor plates on pilot and copilot seats. If there is only a crewchief, he will ensure that both doors are open and both armor panels are in their most rearward position before refueling.

• The crewchief will ask the pilot how much fuel is desired. The aircraft will be grounded before refueling and before opening the filler caps. Just prior to refueling the fuel hose will be checked for pressure, water, and appropriate fuel. The crewchief or gunner, as appropriate, will refuel the aircraft and secure the fuel cap.

• The gunner/crewchief will stand to the side and rear of the crewchief/gunner and watch for a hand signal from the pilot when there is enough fuel. The gunner/crewchief is responsible for notifying the crewchief/gunner when to stop refueling. The crewchief/gunner will watch the exhaust and if there is any indication of flame coming out of the exhaust, he will stop refueling immediately.

• When there is not a gunner present, the crewchief will have to watch for the pilot's signal. Under no circumstances will the pilot indicate enough fuel by increasing rpm.

• After refueling, the armor plates on pilot and copilot seats will be placed in the most forward position. Crewchief and gunner will have visor down, sleeves down, cuffs buttoned, and gloves on during all refueling operations.

FIVE FORT RUCKER aviators have become the first to receive the gold Broken Wing, a new award which has been established for Army Aviation Center and School pilots who demonstrate exceptional professional skill in recovering from inflight emergencies.

MG Delk M. Oden presented the small gold lapel pins and certificates to LTC Atsuki A. Miyamoto of the Department of Tactics; 2LT Jay E. Gillman, and Chief Warrant Officers Ralph A. Valentine, Maurice N. Bradford, and Richard J. Whatley, all of the Department of Rotary Wing Training.

Also earning the commandant's Gold Broken Wing were CWO George B. Lesnick, who is now serving in Vietnam, and CWO Freddie L. Waters, now in Korea.

The men were cited for outstanding ability in successfully landing disabled aircraft, preventing injury and damage.

Nominations for the commandant's award are submitted to the safety award committee by department directors and section chiefs. Comprising the committee are the Center safety director, directors of the Departments of Rotary Wing and Advanced Fixed Wing Training, and the chief of the Maintenance Division, Office of the Deputy Chief of Staff for Logistics.

MG Delk M. Oden (third from right) presents certificates and pins to (from left) CWO Maurice N. Bradford, 2LT Jay E. Gillman, LTC Atsuki A. Miyamoto, CWO Richard J. Whatley and CWO Ralph A. Valentine

from ROTOR BREEZE,
Bell Helicopter Company

How To Check And Service Roller And Ball Bearings

BEARINGS, ROLLER or ball, are generally the most critical components in any rotating equipment.

Although the demand for higher precision and greater reliability has continuously increased, little, if any, progress has been made to enable the "field inspector" to be absolutely certain the bearing he is inspecting is meeting all of the hypercritical requirements which have been set forth.

Generally speaking, manufacturers using bearings have entrusted the responsibility of determining the quality of a bearing to an employee with a trained thumb and ear — hoping his sensitive thumb and ear will be adequately and accurately simulated for reliable evaluation.

The following field inspection criteria provides a methodical investigation approach to be used during bearing evaluation.

Cleanliness in bearing maintenance cannot be overstressed. Rooms in which work is being performed on bearings must be well illuminated and as free as possible from dust, dirt, moisture, corrosive fumes and other agents detrimental to bearings.

Dirt is the most common cause of bearing failure and the principle cause of wear. When dirt enters the bearing, it mixes with the grease or oil and forms a "lapping or grinding compound" that quickly wears the balls or rollers. The word "dirt" is used in a broad sense and includes all foreign matter which may enter and cause damage to the bearing.

Deleterious substances most likely to enter bearings may be divided into three groups:

1. Abrasive materials that are of sufficient hardness to cut or scratch, such as emery dust, particles from grinding wheels, or sand and grit contained in contaminated lubricants.

2. Obstructive materials such as metal particles, small chips, or improper lubricants that are not hard enough to cut, but are of sufficient strength to interfere seriously with the rotation of the bearings.

3. Clogging substances which may gradually accumulate in the bearing and will prevent proper lubrication, reduce the clearance between parts, and interfere with smooth bearing operation.

METHODS OF CLEANING OPEN BEARINGS

a. *General.* Dirty bearings must be thoroughly cleaned by one of the methods listed in *b* through *e* below. It is essential that whichever cleaning method is used, no residues are left which may react unfavorably with the lubricant or may be unstable and decompose to form corrosive deposits. For this reason, a final thorough cleaning with dry-cleaning solvent or mineral spirits paint thinner is required.

b. *Initial Cleaning by Hand.*

(1) When cleaning bearings by hand, the initial cleaning is generally accomplished by complete immersion in dry-cleaning solvent or mineral spirits paint thinner accompanied by such wiping, scrubbing, and agitation as may be necessary to accomplish thorough cleaning.

Caution: Do not spin dirty bearings, as dirt may cause serious scratching. Rotate them slowly while cleaning.

(2) If the lubricant on the bearing is gummed or caked, it may be necessary to soak the bearing for a few hours or overnight suspended in a wire basket or from a piece of wire in one of the above cleaning agents. In stubborn cases, where the lubricant is badly gummed or caked, it may be necessary to soak the bearing light engine oil (SAE 10) heated to 180°F. After soaking, thoroughly flush the bearing by slushing slowly through the hot oil. In extreme cases, use hot 100 percent paraffin base oil or a mixture of 5 percent denatured alcohol and 95 percent kerosene, or a mixture of 5 percent denatured alcohol and 95 percent dry-cleaning solvent.

Caution: In such extreme cases, be sure that there is no open flame in the vicinity.

(3) Following any of the extreme procedures in (2) above, wash bearings in dry-cleaning solvent or mineral spirits paint thinner. The bearings are then drained. This preliminary cleaning and draining is then followed by further cleaning and rinsing by complete immersion in a clean supply of dry-cleaning solvent or mineral spirits paint thinner, thus completing the initial cleaning procedure. The initial cleaning is then followed by fingerprint removal as prescribed in *f* below.

Caution: During the subsequent and final cleaning, use extreme care to prevent the handling of bearings in any manner which may result in contamination of the surfaces with foreign matter, particularly fingerprints. Wear cotton or synthetic gloves, or use a clean cloth when handling or processing bearings. If this handling procedure is violated, the entire cleaning process must be repeated.

c. *Initial Oil Spray Cleaning.* An oil spray cleaner equipped with a filter in the air line may be used for cleaning bearings. After cleaning with the oil spray, rinse the bearings in a clean container using clean dry-cleaning solvent or mineral spirits paint thinner. The initial oil spray cleaning is then followed by fingerprint removal as prescribed in *f* below.

d. *Initial Cleaning by Power Flushing.* In cleaning bearings by power flushing, use warm dry-cleaning solvent. Rotate the bearings slowly and spray with dry-cleaning solvent, using an air-operated spray gun. The air pressure should be kept at 10 pounds pressure or lower if satisfactory results are to be obtained. The initial power flushing is then followed by fingerprint removal as prescribed in *f* below.

Warning: Keep dry-cleaning solvent and mineral spirits paint thinner away from open flame.

e. *Initial Cleaning by Vapor Degreasing.* This is a hot-vapor cleaning process involving the use of trichloroethylene or tetrachloroethylene. The bearings to be cleaned are placed in a wire basket and suspended in the vapor of the cleaning agent until no further condensation occurs on the bearing. The initial vapor degreasing is then followed by fingerprint removal as prescribed in *f* below.

f. *Fingerprint Removal.* Following any of the initial cleaning methods outlined in *b* through *e* above, removal or neutralization of perspiration or fingerprints or similar residues is accomplished by immersing and agitating the bearings for a minimum period of 2 minutes in fingerprint remover corrosion preventive or methanol. The bearings are then given a final rinsing in clean, dry-cleaning solvent or mineral spirits paint thinner.

Caution: Methanol should not be used if other satisfactory cleaners are available. Methanol (wood alcohol) is a poison and a dangerous fire hazard.

CLEANING BEARINGS HAVING SEALS OR SHIELDS

a. *Bearings with Shield or Seal on One Side.* Bearings having a shield or seal on one side may be cleaned by any one of the initial cleaning methods outlined in the section above on methods of cleaning open bearings.

b. *Bearings with Removable Seals.* Remove the seals. The bearings may then be cleaned by any one of the initial cleaning methods outlined in the section above on methods of cleaning open bearings.

c. *Bearings with Shields or Seals on Both Sides.* Exterior surfaces or bearings having shields or seals on both sides should be wiped completely dry, using a clean cloth that has been saturated in dry-cleaning solvent and wrung dry. These bearings must not be subjected to vapor degreasing or immersed in liquid dry-cleaning solvent, since solvent is not satisfactorily removed from the inclosed portions of these bearings.

CLEANING INSTALLED BEARINGS

a. Bearings can be cleaned much easier and more thoroughly when they have been removed from their housings and shafts. When removal is not possible, a light engine oil (SAE 10) should be heated to 180° to 200°F, and flushed through the housing while the shaft or spindle is slowly rotated.

b. When grease or oil is badly oxidized and cannot be removed as prescribed in *a* above, a petroleum solvent such as dry-cleaning solvent or mineral spirits paint thinner may prove effective.

c. In extreme cases, use hot 100 percent paraffin base oil or a mixture of 5 percent denatured alcohol and 95 percent kerosene, or a mixture of 5 percent denatured alcohol and 95 percent dry-cleaning solvent to remove the great part of the sludge and scale.

Caution: In such extreme cases, be sure there is no open flame in the vicinity.

When petroleum solvents, by themselves or when mixed with alcohol, are used, they should be followed by a flushing with light engine oil and drained before the lubricant is added to the housing. This will remove any of the solvents which would otherwise dilute the lubricant.

d. If the bearing is to be relubricated with grease, some of the fresh grease may be forced through the bearing to purge any remaining contaminants. This method cannot be used unless there are drain plugs which can be removed so that the old grease may be forced out. Also, operate bearings for at least 20 minutes before drain plugs are replaced, as excess lubricant will cause serious overheating of the bearing. This method of cleaning is not satisfactory for sealed or shielded bearings.

DRYING BEARINGS

a. Immediately after cleaning, dry all bearings by either prepared compressed air (filtered), temperature controlled oven, or infrared lamps.

Note: Drying by wiping (method D-4) or draining (method D-5) is not authorized.

b. The use of unfiltered compressed air is not authorized in bearing cleaning operations, due to the possibility of moisture and foreign matter entering the bearing. Compressed air lines must be equipped with moisture filter traps. When using filtered (prepared) compressed air for drying bearings, care must be taken to prevent spinning any of the components by force of air, since any dry particles of dirt remaining in the bearing may scratch the critical surfaces, or the spinning action may score the balls or rollers and raceways while the bearing is in an unlubricated condition.

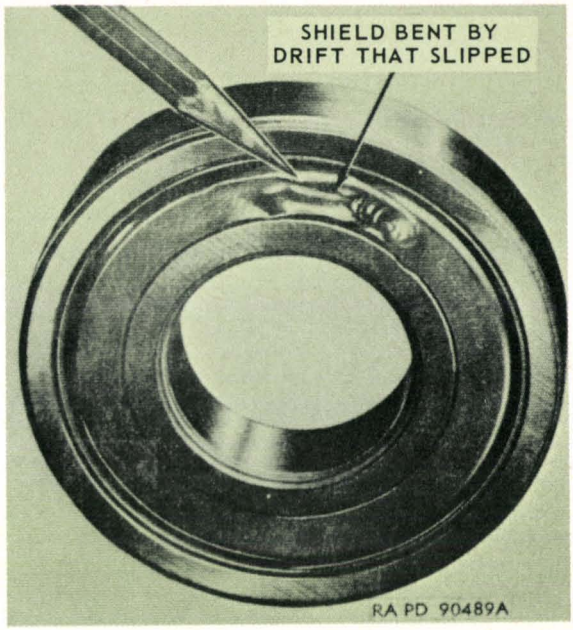


Figure 1. Dented shield

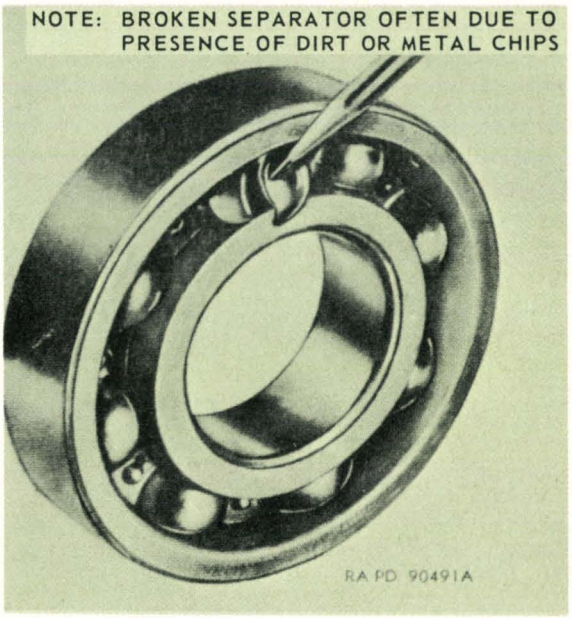


Figure 2 Broken separator

HOW TO CHECK AND SERVICE ROLLER AND BALL BEARINGS

GENERAL

a. Extreme care should be exercised in visually inspecting dirty bearings. As cleaning procedures progress, continue to inspect the bearings, particularly for spalls on balls, rollers, and racers. Discard unserviceable bearings.

b. Bearings without defects sufficient to cause them to be classified as "unserviceable" will be classified "serviceable" and will be made available for immediate use at the installation. Unserviceable bearings are to be disposed of as scrap. Any one of the following defects is sufficient cause for classifying the bearing "unserviceable":

(1) Broken, cracked or split rings.
(2) Dented seals or shields.
(3) Cracked or broken separators.
(4) Broken or cracked balls or rollers.
(5) Flaked areas on balls, rollers, or raceways.
(6) Spalled balls, rollers, or races.
(7) Bearings that have been overheated.
(8) Brinelled raceways.
(9) Scored or etched balls, rollers, or raceways.
(10) Pitting of balls, rollers, or races.
(11) Wear bands on critical surfaces.
(12) Rust or corrosion on critical surfaces.
(13) Excessive looseness of bearings due to wear.

Note: Discretion should be used when inspecting for looseness as various ball and roller bearings are normally loose when unmounted.

(14) Loose bearings having wear bands.
(15) Any large or deep scratches or other appreciable defects on the rolling surfaces.

COMMON FORMS OF BEARING DAMAGE

a. *General.* The most common forms of damage that occur in operation of bearings are described in *b* through *p* below. The occurrence of any forms of damage described is sufficient cause for rejecting and scrapping the bearing.

b. *Broken, Cracked, or Split Rings.* This is often due to the wrong fit of bearings on shafts having diameters larger than specified or cocking the ring while installing or removing it.

c. *Dented Shields or Seals.* Dented shields (fig. 1) or seals are caused by improper use of drift while disassembling.

d. *Cracked or Broken Separators.* Cracked or broken separators (fig. 2) are caused by the presence of dirt or metal chips.

e. *Broken or Cracked Ball or Rollers.* Cracked or broken balls or rollers are caused by the presence of dirt, metal chips, or overloading.

f. *Flaked Areas on Balls, Rollers, and Raceways.* Flaked or spalled areas on balls, rollers, or raceways (fig. 3) are primarily caused by excessive overloads.

g. *Spalled Balls, Rollers, or Raceways.* Spalled balls, rollers, or raceways (fig. 3) are caused by excessive overloads.

h. *Bearings That Have Been Overheated.* Overheated bearings (fig. 4) are generally darkened to a brownish-blue or blue-black color. Overheating can be caused by either excessive speed, excessive loads, improper lubrication, or installation.

i. *Brinelled Raceways.* Brinelling (fig. 5) is caused by impressing balls or rollers into the races and appears as a series of nicks or indentations under each ball or roller. It often results when the driving force travels through the rollers instead of being applied directly to the press-fitted race. Hammer blows or sudden or excessive loads may also cause brinelling. Roughness due to brinelling may be detected by slowly rotating the bearing when the inner and outer races are tightly gripped with the forefinger and thumb. False brinelling resembles true brinelling very closely in appearance but comes from entirely different causes. Bearings which are subject to vibration, or which oscillate through a small arc instead of revolving, will show false brinelling. It is very difficult to eliminate this condition, but the removal of vibration or the use of a lubricant of low viscosity may prove effective.

j. *Scored or Etched Balls, Rollers, or Raceways.* Scoring or etching (figs. 6 and 7) may occur on rollers or races and is caused by dragging the roller assembly across the surface of the races in a cocked position or with a heavy load on the bearing. Although scoring may look harmless, it will cause noisy bearing operation and will eventually lead to pitting.

k. *Pitting of Balls, Rollers, or Races.* Pitting (fig. 8) is a form of damage which cannot always be avoided, as it will eventually occur in any bearing which has operated beyond its expected life. However, there are many factors which tend to hasten pitting, such as nicking, scoring, brinelling, indenting, or the operation of bearings with excessive loads or speeds.

l. *Wear Bands on Critical Surfaces.* Wear bands on critical surfaces indicate excessive wear or improper rotation of the bearing.

Figure 3. Flaked or spalled bearings

m. *Rust or Corrosion on Critical Surfaces.* Rust and corrosion may be caused by handling the bearings with hands that are moist or perspiring. The fingerprint patterns are found rusted into the bearing surfaces under the lubricant. Rust on the operating surfaces of bearings will rub off or flake during operations and pitting will result, thus causing early bearing failure.

n. *Excessive Looseness of Bearing Due to Wear.* Excessive looseness is due to excessive wear. A worn appearance of the balls, rollers, or raceways is nearly always indicative of excessive looseness due to wear.

Note: Care should be exercised when inspecting bearings for this defect, since various balls and roller bearings are normally quite loose when unmounted.

o. *Loose Bearings Having Wear Bands.* Loose-

ness of bearings having wear bands is caused by dirt or foreign matter that has entered the lubricant or excessive wear.

p. *Larger or Deep Scatches or Other Appreciable Defects on the Rolling Surfaces.* Any large or deep scratches or other appreciable defects on the rolling surfaces could be caused by improper bearing removal, improper mounting, dirt or metal chips, or contaminants in the lubricant.

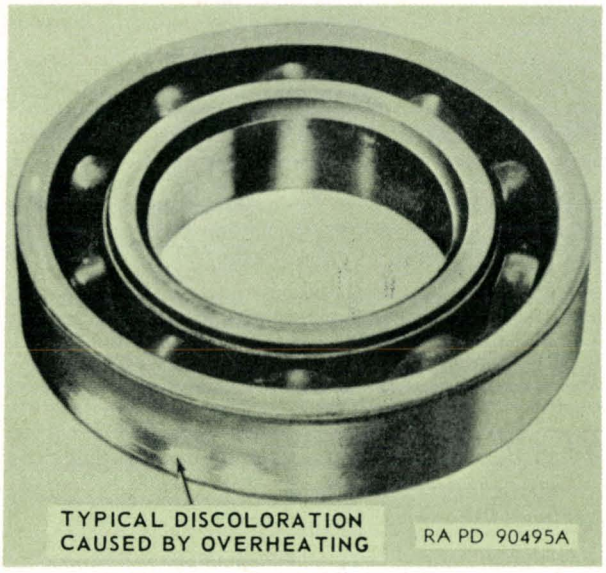


Figure 4. Overheated bearing

FINAL INSPECTION

a. Immediately after cleaning operations, the bearings will be visually inspected to determine their serviceability.

Note: Bearings having light gray lubrication stains are acceptable, providing the surface has not been physically affected.

b. Where equipment covered in the section below on four-power floodlight magnifier is not available, inspect cleaned nonseparable bearings by holding the inner race stationary and rotating the outer race. Listen carefully for excessive noise while the bearing is being rotated. Feel the surfaces for excessive roughness. Watch the bearing and listen for signs of grit or roughness while it coasts to a stop. Bearings suitable for reuse will coast smoothly and freely to a stop and will not emit excessive noise. Bearings that are defective will emit excessive noise while rotating. They will transmit easily felt vibrations to the hand while being held and rotated, and will not coast to a stop but will stop abruptly. If grit or roughness is noted during rotation of the bearing, reclean, dry, and recheck.

c. When inspecting a ball thrust bearing for roughness, do not spin the bearing as described in *b* above, but place it flat, face down on a clean table. Rotate the bearing slowly by exerting an even pressure and, at the same time, turning with

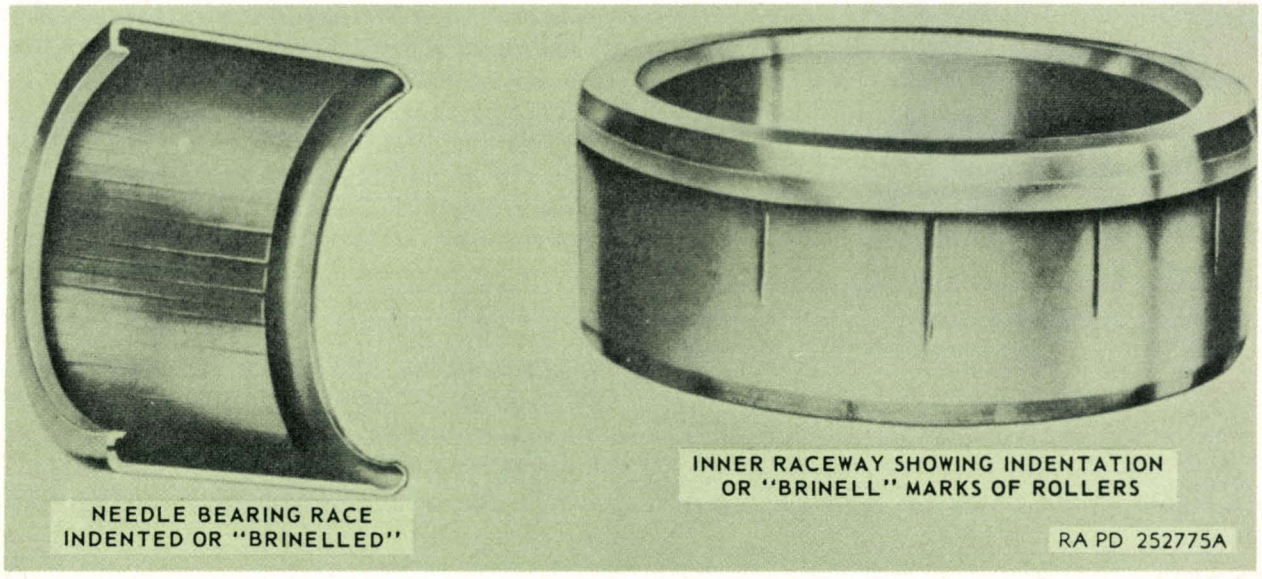


Figure 5. Brinelling

the palm and heel of the hand. Since the bearing is without lubrication, continued rotation will score the races. Defective bearings will emit excessive noise while rotating. They will transmit easily felt vibrations to the hand while being held and rotated. As in the case of nonseparable bearings (*b* above), if grit or roughness is noted during rotation, reclean, dry, and recheck.

FOUR-POWER FLOODLIGHT MAGNIFIER

If a four-power floodlight magnifier is available, the final inspection will be made to determine the extent of any imperfection.

CHECK BEARING FIT-UP AFTER ASSEMBLY

This is very important. Make sure that the outer race is still perfectly free on the inner race (except for bearings with an original tight fit-up). If the press fit on the shaft were too tight or if the inner race were badly cocked, the bearing will bind, and that would mean an early failure. This is the time to discover it and remove the bearing and correct the condition.

a. The ideal bearing should still have a very slight looseness (except where a tight-fit bearing is required). Please note that it is possible to detect an extremely small looseness if you know how to check for it.

b. How to test for shake is illustrated below. It is possible to detect as little as .0001″ total radial play by holding the outer race tightly between the thumb and forefinger and by rocking it back and forth. This is quite sensitive because a radial play of .0001″ will usually give as much as .006″ or .007″ axial tilt at this point.

c. Check to make sure that the bearing is still clean. If there is a lock nut and washer be sure to wipe them off before putting them in place, especially the thread of the lock nut.

d. Pull the nut down as tight as possible. The nut is practically useless unless it is exerting a continuous and permanent axial squeeze against the inner race. Be sure that when the nut is pulled down and the lock washer is bent over, that chips are not put into bearing.

e. Also make sure that you do not strike the ball cage or the shield of the bearing. Sometimes the inside surface of the nut does not correctly bottom on the bearing. It may be tapered or conical, in which case it might foul the shield or the retainer and cause trouble. These should be checked.

f. Some designs specify a hole in the lock nut to be drilled after the unit is put together. This is quite dangerous and requires extreme care to avoid these chips entering the bearing.

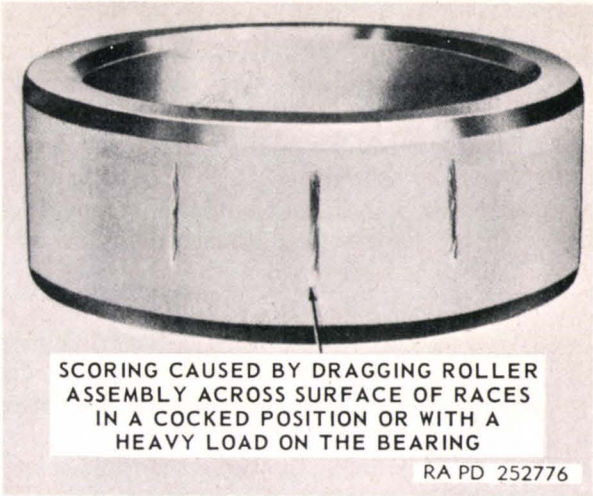


Figure 6. Scoring

Figure 7. Etching

Figure 8. Pitting

VFR

continued from page 1

Sir:

This letter confirms our telecon of 7 December 1967. I hate to be classified as a "nit-picker," but feel that I must take issue with LT Mirabella's letter appearing on page 64 of the December issue.

The UH-1D, S/N 62-2106, is still in the Army inventory and has the honor of being the number one production line D model. The aircraft is bailed to AVCO-Lycoming as a flying testbed for T53 engines. Currently installed is the T53-L-13 engine along with approximately 800 lbs. of test instrumentation consisting of:

1. Photo panel for recording engine instruments
2. Brown automatic temperature recorder
3. Oscillograph recorder

As for TLC (tender loving care), you can rest assured that 2106 gets her share from the mechanics of our Flight Test Department. The "old girl" makes frequent flights from her home base at Bridgeport, Connecticut, Airport.

The enclosed photos should prove that 2106 is still around and enjoying good health, for years to come, we hope.

LTC RUSSELL W. JOHNSON, JR.
USAR (RET)
AVCO-Lycoming Flight Test
Stratford, Conn. 06497

Sir:

After 1,300 plus hours of armed helicopter and aeroscout flying here in Vietnam, I have come to several conclusions. Some are insignificant, but some, I think, deserve some consideration by Army aviation "planners." So these are some of my thoughts—thoughts that I consider to be proved and valid concerning one phase of combat aviation.

Our aeroscout platoon in the air cavalry troop to which I was assigned was without a leader, so I volunteered. After my first tour, I stared with disbelief as the 1st Cavalry Division loaded out their OH-13s for combat in Vietnam. You'd never get me in one of those things, said I.

Now after a few hundred hours of OH-13 scout flying I am here to tell you that for finding, fixing, and killing the enemy in Vietnam, there is no finer, more effective, more economical aircraft than the OH-13S. One pilot, one enlisted observer, and a hand-held M-60 machinegun with plenty of ammo is all that's required. Of course, we fly in teams of two.

But all is not as rosy as it could be. Aeroscouts are here to stay, but we could use a new vehicle: one that will be a decided advantage over the OH-13. In this light, I bring to the reader several requirements which must be met to fill the bill for an aeroscout vehicle.

• The machine must be maneuverable. It must be quick, powerful, and agile to perform like a hummingbird—hovering, darting, dodging, hooking and jabbing. A turbine engine would be most desirable.

• The machine must provide good visibility for the crew. There is only one way to go in this respect—tandem seating. With the observer up front and pilot in the rear, visibility is excellent to both sides.

• The weapons system must be flexible, easy to shoot and capable of firing to either side as well as up or down, without hitting the rotor blade, of course. In my thinking, a chin turret mounted weapon such as the TAT 101 by Emerson with two M-60C machineguns is ideal. The weapon is fired by the observer, using a flexible sight. It should be capable of stowed fire by the pilot as a secondary mode.

• The machine must be fast; 120 knots dash speed is more than adequate for scouting. We're not going to escort; we're going to scout. Most of our work will be done in the 0 to 60 knots range anyway.

• Endurance must be adequate. Three hours fuel is all that would ever be required of a scout bird. Scouts should live near the front, not at a base area hours and kilometers away.

• The machine must be easy and comfortable to fly. Pilot comfort is a necessity. Only one pilot flying 7 or 8 hours a day without relief can be fatiguing and very dangerous. Adjustable seats and controls are a must.

• Communications capability must be adequate. In my way of thinking, two FM radios are required. One is needed for the command frequency of the ground unit you're supporting and one for artillery direction or advisory. Scouts must be able to shoot artillery, and they must be kept aware of the artillery situation so they don't get shot down by the good guys. One UHF multi-channel radio is also desired for air-to-air communications between scouts and for talking to tac air. Scouts direct air strikes daily. On a channelized UHF such as the OH-13S has, you can very seldom talk to the fighters.

Anybody ever seen or heard of a Sioux Scout? Take a look at what I consider to be a good place for our designers to start. It already possesses some of the features mentioned above. When I flew the Sioux Scout I wasn't impressed, but that was before I flew the OH-13S in Vietnam. Let's start with this prototype and work forward.

A good scout vehicle will be just that. Command and liaison flights and limited resupply will be out. Let the UH-1s and LOHs do that. If a specialized vehicle were ever needed to enhance the capabilities of Army aviation it is a good scout helicopter. If you don't believe me, ask an ex-scout, preferably one who has flown with an air cavalry troop. He'll tell you.

CPT DAVID H. PRICE
Trp A, 1st Sqdn, 9th U. S. Cav
1st Cavalry Division (AM)
APO San Francisco 96490

The OH-13 plays a key role in Vietnam.
See articles beginning on pages 6 & 14

There's more to see,
There's more to say.
Open to page fifty-three,
This Valentine Day.
pearl
STEP