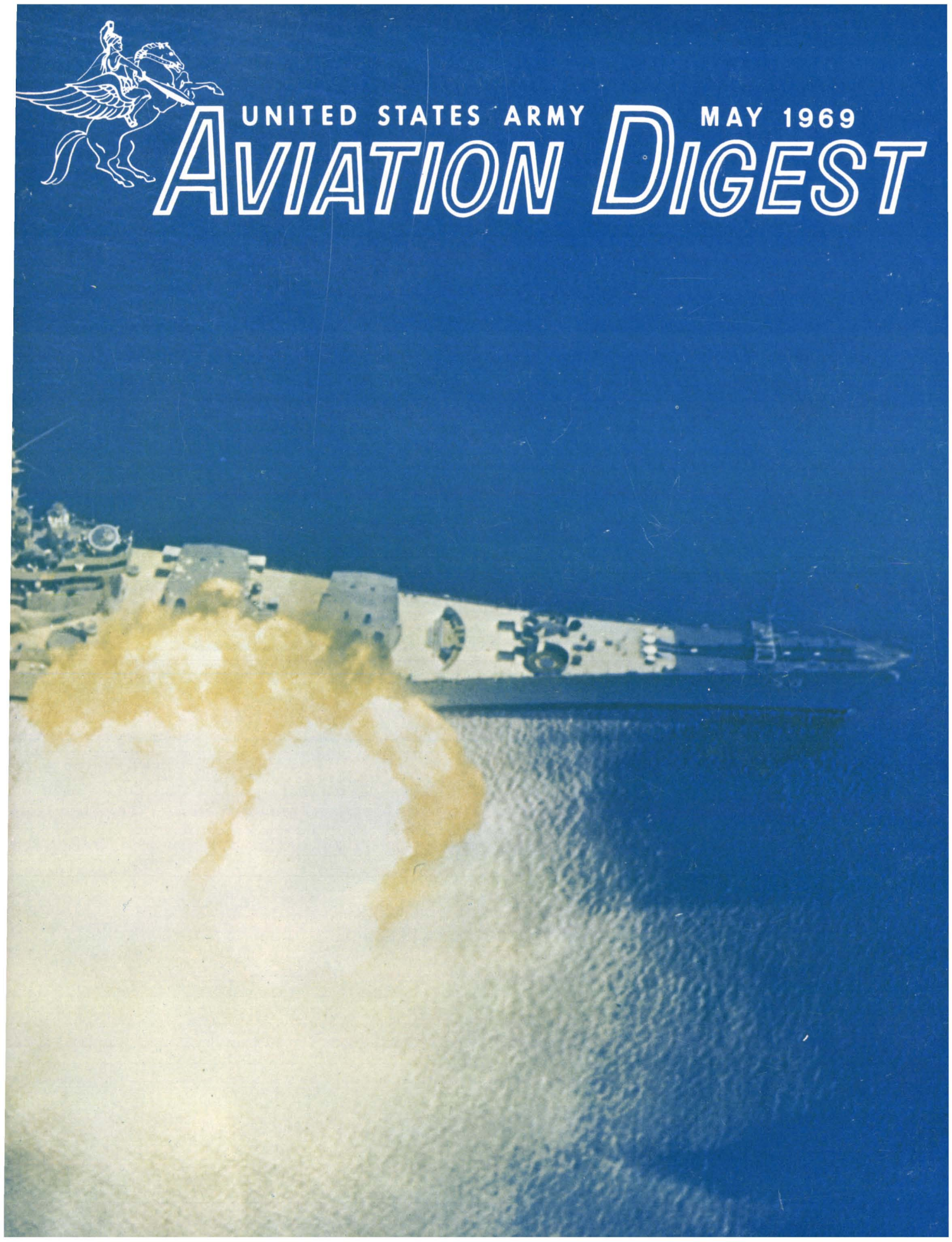
UNITED STATES ARMY

MAY 1969

AVIATION DIGEST



UNITED STATES ARMY AVIATION DIGEST

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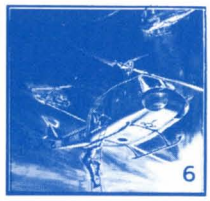

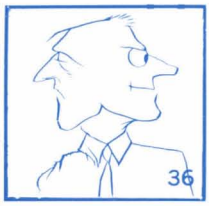

MAY 1969 VOLUME 15 NUMBER 5

VIEWS FROM READERS 1

CATKILLERS, LTJG Craig R. Whitney 2

SEAWOLF TRAINING AT RUCKER, CPT Frederick I. Steiner 5

RECONNAISSANCE PATROL, CPT R. J. Ronchetti 6

SHOTGUN FOR HIRE, CPT William N. Bryant 8

SOME THOUGHTS ON AUTOROTATIONAL LANDINGS John J. Shapley Jr. 10

NIGHT HUNTER OPERATIONS, CPT Richard C. Keehn 16

SIXTY-NINE DASH TEN, MAJ William H. Gardner 21

HOW LOW CAN YOU GO? George Zuments 26

REFORGER I, WO1 Jack D. Jory 32

CRASH SENSE—HUMAN SENSE, MAJ Chester Goolrick 36

AIRFRAME FOD, LTC Lester R. Kerfoot Jr. 54

REVETMENTS AND COMMAND INFLUENCE LTC Lester R. Kerfoot Jr. 58

MORE ON REVETMENTS, P. R. Thompson 59

PEARL'S 62

USAASO SEZ 64

ABOUT THE COVER

The USS New Jersey fires its 16 inch guns. Army aviators have been directing fires of the New Jersey in Vietnam (see page 2). Our thanks to the U. S. Navy for the cover photo and those appearing on pages 3 and 4.

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.

The DIGEST is an official Department of the Army periodical published monthly under the supervision of the Commandant, U. S. Army Aviation School. Views expressed herein are not necessarily those of Department of the Army or the U. S. Army Aviation School. Photos are U. S. Army unless otherwise specified. Material may be reprinted provided credit is given to the DIGEST and to the author, unless otherwise indicated.

Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, Ala. 36360.

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VIEWS FROM READERS

From the Department of the Army:

A decision has been made to permanently retain Hunter Army Airfield, formerly Hunter Air Force Base, Savannah, Ga., as a subpost of Ft. Stewart, Ga.

It had been announced in November 1964 that Hunter AFB would be closed by July 1967, but this action was temporarily deferred to permit the Army to conduct increased rotary wing pilot training there. The field was transferred from the Air Force to the Army in April 1967 to provide required facilities for the expansion of Army flight training.

With the increase in Army helicopters to the present level of more than 11,000, there has been a corresponding increase in the requirement for training facilities for helicopter pilots.

Hunter Army Airfield has been selected for permanent retention as an Army training facility because of its excellent aviation facilities and the excellent aerial gunnery range at nearby Ft. Stewart. Training there includes initial entry helicopter and fixed wing training and Cobra transition and gunnery training.

* * *

From the Army Logistics Management Center:

The U. S. Army Logistics Management Center is scheduled to begin publication this summer of the ARMY LOGISTICIAN, an official Department of the Army bimonthly periodical under the sponsorship of the Deputy Chief of Staff for Logistics, Department of the Army and the Commanding General, U. S. Army Materiel Command.

The new magazine provides timely and authoritative information on Army logistics concepts, plans, policies, procedures, operations and developments to officers, noncommissioned officers and civilian employees of the Army engaged in logistics activities.

Articles, photographs, illustrations and items of interest on any function or aspect of Army logistics are invited. Direct communication is authorized to: Editor, ARMY LOGISTICIAN MAGAZINE, U. S. Army Logistics Management Center, Ft. Lee, Va. 23801.

Activities and organizations desiring to receive copies of the ARMY LOGISTICIAN should complete DA Form 12-4 in accordance with the guidelines outlined in Department of the Army Circular 310-72.

* * *

Sir:

The December issue of AVIATION DIGEST printed a letter from Major Gary Dennison concerning safety meetings and the undesirable manner in which they are normally held. Boy, I couldn't agree more!

This hated, mandatory, unrewarding tool is most often the result of an unenlightened or non-aviation-oriented commander or senior staff officer. Their thoughts must run along the lines of: "Now those aviators must have safety meetings! They always have everywhere else I've been. Somebody may ask us if we have them. As I recall we make them keep 'minutes' and monthly forward a copy to us. That should cover us there. No, wait a minute! A standard Army class is always 50 minutes long. We'll require that also."

You might draw the conclusion that I'm against safety meetings. Well, you're dead wrong! The safety meeting, supervised by a competent safety officer as part of an integral safety program, is one of the major tools a commander possesses for use in maintaining maximum unit effectiveness.

You say I double talk? Well, here's the answer! A safety meeting has no defined limits as to length, context, attendance or frequency. A safety meeting should not carry a classroom atmosphere. Here is what AR 95-5 has to say about safety meetings:

> Unit safety meetings offer one of the most productive areas in safety training providing they are timely, interesting, and properly conducted. Such meetings should be held at a time and place convenient to aviation personnel and conducted with an air of informality which promotes audience participation. Careful planning is required for appropriate topics and for methods of presentation which will insure stimulating variety.

MAJ Dennison says that at Hunter AAF one safety tip a day is presented to each student class. Excellent! But, for a unit with a mission, a daily tip conspicuously displayed so that each aviator will see it, can serve a similar purpose.

When meetings are to be held, there are several things that can be done to make them more palatable.

- Hold them at a convenient time. Anytime everyone is gathered together serves the purpose. A safety officer should always be making notes in a pocket notebook just in case everyone gets together.
- Try to keep from holding meetings strictly for safety. Attempt to arrange them in conjunction with other gatherings. This will help eliminate the "mandatory" nemesis most pilots mentally associate with safety meetings.
- Try to have the CO or XO lead off with a cogent comment. Staid, stale comments like, "Men, pay attention to this safety meeting. We must become safer!" are better left unsaid.
- Anytime an accident or unsafe incident takes place have the man or men most knowledgeable of the circumstances stand up and discuss the incident. Group participation is highly desirable.
- Pick out an aviator and ask him to prepare a talk to give to the other pilots about his "hairiest," unsafe aviation experience. If the CO is the first one to make one of these talks, then the other pilots will be more apt to have the nerve to tell about their unsafe blunders. Make sure they end the stories with a moral or teaching point. Having a can of beer while these tales are being told never hurt to "uninhibit" the tongue.
- Have the meeting last one minute or one hour; but not one minute longer than is needed to cover the subject.

This list can go on ad infinitum. The only limit is the imagination of the safety officer.

If the safety officer will daily view about 10 takeoffs and landings, watch some preflights and shutdowns, monitor some climbouts and approaches and talk to a mechanic he'll fill up a notebook a month on topics for meetings.

A safety meeting can be painless and meaningful. Keep it that way and we'll all benefit and look forward to them.

CPT James R. McCormack
HQ, USARV Avn Sec
APO San Francisco 96375

. . . and it might help if the CO or Safety Officer bought the refreshments. —The Editors

CATKILLERS

Members of the Army's 220th Reconnaissance Airplane Company like to "shoot" the USS New Jersey which made a habit of bottling up the NVA troops

LTJG Craig R. Whitney
United States Navy

IT WAS ONLY a few hours until the New Year's Eve celebration at the Army's 220th Reconnaissance Aircraft Company officers' club in Phu Bai. But Captain Charles S. Finch Jr. had a mission in his O-1 Bird Dog and on this crisp, clear afternoon, he found himself flying a Marine Corps aerial observer in tight little circles over the southern part of the demilitarized zone.

Skirting the southern shore of the Ben Hai River, he could see hundreds of bomb and shell craters from years of bombardment. The low, scrub-covered sand dunes were torn and blasted so much that it scarcely seemed possible for any enemy soldiers to exist down there.

Still, it was Finch's job to keep a watch over the area, which straddles a known infiltration route from North Vietnam into enemy base areas further south.

Suddenly his observer spotted a bunker in the sand which looked as if it had recently been used. Finch quickly put the single-engine plane into a steep bank, circling around the bunker complex for a closer look.

Two North Vietnamese Army soldiers jumped out and began firing at the aircraft with AK-47 rifles. Finch wrenched his plane around dead-on to the enemy riflemen and launched a 2.75-inch rocket at them. Roaring back up to his spotting position he yelled over his radio, "They really hosed me good!"

In radio contact with the Third Marine Division fire support coordinating center a few miles away at Dong Ha, he relayed target coordinates and a request for fire. Shortly afterward, 300 rounds of high-explosive five-inch projectiles from a Navy 7th Fleet destroyer, the USS Arnold J. Isbell, sailed into the firing position in the DMZ and destroyed 13 bunkers in the complex.

Finch then returned to Dong Ha airfield to drop off his observer and check his aircraft for bullet holes. This time he didn't find any.

This mission is representative of those flown by the 32 "Catkillers" of the 220th, who make up part of the remarkable interservice team that keeps the enemy off balance in the northern provinces of the Republic of Vietnam.

The pilots of the 220th's first platoon fly reconnaissance and fire support missions over the DMZ and north of Phu Bai in the coastal strip. Marine Corps observers and Army spotters from the 108th Artillery Battalion, based in Dong Ha, depend on the 220th's OD green birds for their surveillance and spotting missions. And many of the Catkillers are experienced spotters themselves—men who can call in artillery, naval gunfire or air strikes from the Marine Crops, Navy and Air Force.

In addition to this formidable arsenal, the planes have their own 2.75-inch smoke rockets and the pilots and observers carry pistols and M-16 rifles on every mission.

"The NVA troops in the area certainly don't like to come out when the battleship New Jersey is firing," Finch says. "After she gets on station and starts shooting, she holds ground fire to a minimum. This is one of our biggest assets."

The Catkillers like to "shoot" the New Jersey on such area-type targets as bunker complexes, trench work and tunnels because of her wide dispersion coverage and shrapnel effect. When a spotter or a pilot gives the New Jersey a mission and guides her projectiles onto the target, he is the man in charge during the mission—requesting the type of shell to be used, designating the target to be hit and telling the ship how many rounds he wants to put on it.

Working with the Army pilots is Marine Corps Major Thomas F. Meehan. "These people bend over backwards to get airplanes to shoot the New Jersey," he says. "It's especially effective against .50-caliber positions; one or two rounds will silence them and the area that is covered is tremendous."

An Army aviator and a Marine observer spot enemy targets in Vietnam from an O-1 (above) and then direct fires of the USS New Jersey's 16-inch guns

CATKILLERS

The 220th also provides aircraft for all combat units north of Da Nang, not only for naval gunfire but also for artillery and bombing missions, reconnaissance and surveillance missions. The Army's pilots perform all of them with courage and skill. Army aviation can be proud of them.

good shooting, New Jersey!

Seawolf Training At Rucker

It's 'lookout Charlie' when these warriors prowl the Mekong

Captain Frederick I. Steiner

A GROUP OF Navy Pilots called the "Seawolves" now show their "fangs" after completion of the UH-1 transition and gunnery course at Ft. Rucker, Ala. The group, part of the Navy Helicopter Attack (Light) Squadron Three, is used as a supporting unit in a task force which has the mission of controlling the river and swamp areas in the Mekong Delta and in the Rung Sat Special Zone. The Seawolves, as the squadron is known, number some 400 personnel employing 22 UH-1B gunships throughout the Delta in seven detachments. The first group of Seawolves arrived at Ft. Rucker on 5 Sep 68.

After completing two weeks and two days of intensive work transitioning into the UH-1B helicopter with the Department of Rotary Wing Training, the group begins to "cut its teeth" in tactics by firing 2.75 inch rockets and employing the M-16 and M-21 weapons systems with the Department of Tactics on the aerial ranges at the Aviation School. This latter portion of their training lasts for 1 week and 3 days.

In addition to gunnery training, the Seawolves receive academic instruction on the M-16 and M-21 weapon subsystems, principles of attack helicopter employment, characteristics and capabilities of the 2.75 inch rocket, ballistics and cardinal rules for the employment of armed helicopters. After gunnery training, the Seawolves move to the "boondocks" where they are exposed in a tactical environment to the type missions they will be performing in the Republic of Vietnam. This phase of their training includes river convoy escort, direct fire support, low level navigation, river reconnaissance, support of Seal operations and use of the Firefly heliborne searchlight system for detection of river traffic at night.

After completion of the Seawolf program the class is usually divided and sent to Little Creek, Va., and Coronado, Calif., where they receive 3 weeks of intensive training in counterinsurgency and survival and weapons qualification before they depart for Southeast Asia.

Attending the Aviation School with the Seawolf aviators are a contingent of Navy enlisted volunteers, destined to become Seawolf door gunners. These enlisted sailors are trained by the Door Gunner Training Branch, Aviation Armament Division of the Department of Tactics at Ft. Rucker. Upon completion of training they earn the coveted Army aircraft crewmember badge. While at the Aviation School, the enlisted sailors receive UH-1 maintenance training and academic instruction on the armament subsystems presently used on Seawolf aircraft. These sailors also receive instruction on the duties and responsibilities of a door gunner to include: map reading, air-to-ground machinegun fire, first aid, visual search and target detection. The Seawolf door gunners spend their final week on the aerial ranges where they practice the techniques and principles of aerial gunnery learned in the classroom. After graduation the Seawolf door gunners are slated for immediate deployment to Vietnam where they will be assigned to the Seawolf Squadron.

The Aviation School is presently training one class of 12 Naval aviators per month with classes scheduled through May 1969. One thing is certain—when these Seawolves strap on their "Hueys" and begin to prowl the Mekong—look out Charlie!

Reconnaissance Patrol

Captain R. J. Ronchetti

IT STARTED OUT like any one of a number of missions before it: put in a six man reconnaissance patrol just prior to last light in the middle of a major Viet Cong infiltration route, the A Shau Valley. Before the night was over, however, this would turn out to be no ordinary mission.

An area of operation was selected the night prior to the mission and at noon the next day a

reconnaissance was made of the area. The purpose of this reconnaissance was to select a landing zone (LZ) in which to insert the reconnaissance patrol as well as to familiarize the patrol leader with the area. It was determined that a landing to the ground was not possible in the selected LZ. Stumps and six foot elephant grass covered the LZ and it had an 8- to 10-degree slope from east to west. The patrol would have to use ladders to get into the area.

The rest of the afternoon was spent getting the aircraft ready for the insertion that evening. Because of the large enemy troop concentrations in the area it was decided that a heavy gun team, three armed helicopters, would escort the flight. The flight would consist of a command and control ship (C & C), the insertion ship and two recovery aircraft. Both of the recovery aircraft were equipped with ladders and one also had a rescue hoist.

Takeoff time was 1830. Planning on a 20 minute flight to the LZ would enable the infiltration aircraft to take full advantage of the late evening shadows to approach the LZ low level and depart undetected taking advantage of the last light.

The mission started off according to plan. The infiltration aircraft began its approach into the LZ at 1850. Overhead the remainder of the flight orbited, nervously awaiting word from the infiltration aircraft that the patrol was on the ground and had safely departed the LZ. Each minute seemed like an hour. Then the long awaited call from the infiltration aircraft broke the silence. "BINGO!" The team was in and the infiltration aircraft was clear of the LZ.

Our relief was shortlived. A radio call from the reconnaissance patrol revealed that one member of the patrol was impaled on a punji stick when he exited the aircraft and they were requesting immediate evacuation.

It was decided that the entire patrol would be pulled out because their position would be compromised when the injured man was evacuated.

The C & C aircraft and the heavy fire team had a full load of fuel but the remaining aircraft had only enough fuel for a round trip and another 10 minutes on station. Due to the high altitude in this area the ships would not be able to exfiltrate the patrol with a full fuel load. They just did not have the power!

The team had to be pulled out at once because the recovery ships were getting low on fuel, darkness was enveloping the area and the weather began to deteriorate between the LZ and our base camp to the east.

The last man climbs safely aboard while covering fire is provided by doorgunners and gunships overhead

The gunships set up an orbit and directed the first recovery ship into the now dark LZ. As the recovery ship was on short final it began to receive automatic weapons fire. The gunships began placing suppressive fire into the enemy positions. The first recovery ship was able to pick up the injured man and two additional patrol members before it began to lose rpm. Under the protection of the gunships it safely departed the LZ. Three men remained to be picked up but would have to wait until the recovery ships returned. The C & C ship and the gunships remained overhead. The gunships continued to suppress enemy fire which was increasing in volume. A request for a flare ship was sent to base camp. When the recovery ships returned they were accompanied by a Marine CH-46 which would drop flares if needed. The recovery ship which was to make the extraction of the remaining three patrol members elected to try to make the recovery without the use of flares. The gunships, which were orbiting the LZ, vectored the aircraft into the vicinity of the now totally dark LZ. Once established on final approach the patrol members on the ground flashed small pencil flashlights and it was to these three small pin points of light that the recovery ship made its approach. As the last patrol member climbed safely aboard the enemy began to overrun the area. With covering fires from its own door guns and the gunships overhead, the recovery ship safely departed the area.

Just as the recovery ship departed the LZ the 20-minute fuel warning light came on in two of the gunships. Weather had closed off the route home so it now became necessary to climb on top and head for the coast. The Marine CH-46 pilot radioed that he would vector the gunships back to Hue Phu Bai. With the outstanding navigation equipment on board such as TACAN and DME he was able to give distance, time and heading to Phu Bai. It was just like having your own personal GCA up there. Once over Phu Bai we were able to find a hole almost directly over the field.

The fuel held out and the gunships landed safely at Phu Bai along with the remainder of the flight. Two of the gunships had 30 pounds of usable fuel remaining while the third had 70 pounds. This was one night mission we were glad was over!

shotgun for hire

Captain William N. Bryant

THE NEED FOR in-country training of aviation doorgunners in the Republic of Vietnam has been greatly reduced with the implementation of a new MOS qualifying course at Ft. Rucker, Ala.

The purpose of the new three-week gunnery course is to eliminate the lengthy and somewhat hazardous time period previously required to train helicopter doorgunners "on-the-job" in Vietnam.

Enlisted students are selected for the specialized training following a five-week basic aircraft maintenance course. Their doorgunner training begins with one week of UH-1 Huey helicopter maintenance familiarization, conducted by the Department of Maintenance Training. Students become familiar with the flight characteristics, major components and general tech-

niques of inspecting the Huey. Classes are conducted on such subjects as air frames, power plants, power trains, rotor systems and flight controls.

After successful completion of this phase of their instruction, the students are assigned to the Aviation Armament Division of the Department of Tactics for their final two weeks of training.

The first week with the Armament Division is devoted to studying the wide range of skills necessary to be a doorgunner. Academic subjects including *Duties of a Doorgunner, Visual Search and Target Detection, Crewmember Emergency Procedures, Map Reading, Aircraft Flares* and *Principles of Air-to-Ground Machinegun Fire* are covered. Classes also are conducted on each of the UH-1 weapon systems currently being used in Vietnam. Primary emphasis is placed on the M-23 (door gun) Armament Subsystem.

During practical exercises the students practice arming each of the systems, including the handling of rockets. They also practice assembly and disassembly of the M-60 machinegun which will be their primary weapon in Vietnam.

During this first week students spend one day with the Special Subject Division Survival Committee. They undergo training on techniques of survival including shelter construction, signaling and land navigation, camouflage, emergency food procurement and principles of escape and evasion. One of the highlights of the survival training is the Vietnam village orientation. Students are taken to a simulated Viet Cong village where they can observe enemy village defense networks first hand.

At the end of this first week of classroom studies the students undergo their first M-60 machinegun familiarization firing. The exercise is designed to acclimate the student in firing the machinegun and in correcting stoppages and malfunctions with the weapon. To simulate firing from the aircraft as nearly as possible, students fire from 20-foot towers. The instructor in each tower aids the student and evaluates his progress with the assistance of an electronic scoring device which automatically registers the number of hits in the target area.

The final week of the course is spent on a newly constructed aerial live fire range. The range was specifically designed for the course. It has four target areas that realistically represent enemy fortifications likely to be encountered in Vietnam. The four areas include recoilless rifle positions, mortar positions, machinegun emplacements and Vietnamese-type hooches. Cardboard silhouettes of the enemy are emplaced in positions to add further realism.

Doorgunner training at the U. S. Army Aviation School now is underway and has relieved the pressure of "on-the-job" training in the Republic of Vietnam

The student spends a total of four days and one night flying in the doorgunner's seat of the UH-1 helicopter. He fires a total of 1,400 rounds in various firing tables conducted under simulated combat situations. The instructor flying with each student provides training in the proper adjustment of aerial fire utilizing the ring sight, tracer ammunition and the burst-on-target method of engaging both point and area type targets.

The students progress rapidly during the following two days and one night of aerial firing and, almost before they know it, are ready for the final qualification exercise. This exercise is designed to test each student on how well he can apply everything he has learned and practiced in the classroom and on the range. The aircraft makes five passes over the target area with each student.

The first three passes are made at the relatively high altitude of 500 feet. As the aircraft comes in to position to fire, the instructor specifies the targets. The student must react quickly in recognizing and bringing effective fire upon that target. The fourth pass over the target area is made at an altitude of 100 feet with the instructor again pointing out specific targets. At low level, reaction time is at a premium due to the speed of the aircraft (about 80 knots) and the proximity of the target.

The fifth and final pass is a simulated assault into a "hot" landing zone. Near the completion of a normal approach to the ground the instructor points out enemy gun emplacements in the target area and the student begins firing on the selected targets.

Throughout the qualification exercise the instructors evaluate each student's ability to recognize the targets quickly and place effective machinegun fire upon them. In addition, the student is expected to take corrective action on stoppages which might occur while firing. The effectiveness of the students' fire is also recorded in the control tower by means of an electronic scoring device which records the number of hits in the target area. A combination of the electronically recorded score and the instructor's evaluation determines each student's qualification.

Upon graduation, a helicopter doorgunner MOS and crewmember wings are presented to each student qualifying.

Some Thoughts On

Autorotational Landings

John J. Shapley Jr.

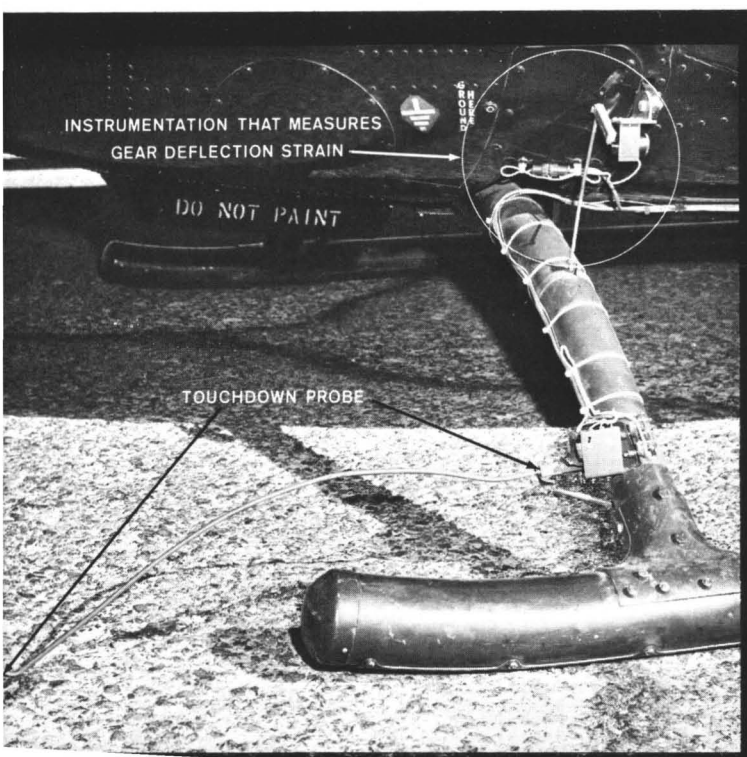
Mr. Shapley is an engineering test pilot with the U. S. Army Aviation Systems Test Activity, Edwards Air Force Base, Calif. Prior to joining the USAAVNSTA, he was an experimental and production test pilot with the Boeing Company, Vertol Division. A part of his experience with the Aviation Test Activity includes opportunities to discuss with many test pilots and engineers in government and industry the aspects of autorotational performance. In this article he passes along some of his thoughts on the subject, especially as they affect the Army aviator. He does not intend to devalue the technical data found in operators manuals. His purpose is to inform the aviator that some inaccuracies do exist and are being corrected as the problems are identified

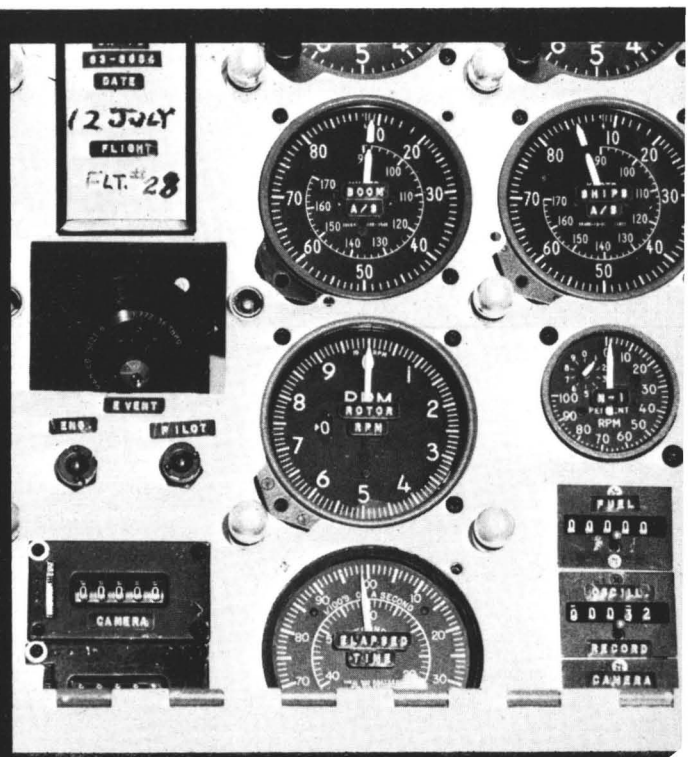
IT IS GENERALLY understood that a helicopter is capable of landing after experiencing a loss of power. This is derived from the ability to extract energy from the rotor in its autorotative state and develop lift. However, as most pilots know, this is not a simple operation.

In the operators manual the autorotating landing information is expressed in terms of altitude and airspeed, commonly referred to as the height-velocity (H-V) diagram, or "Deadman Curve."

The information presented in this curve is usually gathered by a highly skilled flight test team under "controlled" conditions. The controlled conditions are:

- Calm wind (less than 3 kts).





The UH-1 above is the one used in the tests conducted by the U. S. Army Aviation Systems Test Activity. At far left is a closeup of landing gear instrumentation. At the immediate left is the photo panel located on a tube behind the copilot's seat and at right is the cockpit test instrumentation

• A highly qualified pilot who has the experience of several hundred landings in the aircraft type.

• The pilot is allowed a warm-up period to increase proficiency and progress to the required demonstration points.

• The landings are performed over a smooth surface that has been inspected for any discontinuities (usually a runway).

• A fully instrumented aircraft that usually has landing gear instrumentation to record gear deflection at touchdown.

• Usually the tests are careful, logical "build-ups" from low gross weight/density altitude conditions, progressing to more difficult conditions.

• Entry characteristics have previously been conducted at altitude to determine the aircraft response, rotor decay, control requirements, flare airspeeds, etc. (The Mil Spec 8501A requires a two second delay on *collective only*. FAA requires a one second delay on *collective only*.)

• A fire truck and medic are on site.

• No restruction is placed on touchdown airspeed or touchdown distance.

• A surveyed course with photographic equipment to quantitatively record aircraft and/or pilot performance on each test point.

• Internal and external photographic coverage.

Unfortunately the last two items are often used to help document any crash and can be of great assistance to anyone who may care to second guess the test team with such sage observations as, "They should have quit on the previous one."

The final result is usually expressed as Figure 1 indicates.

Now that the ground rules have been spelled out it might be well for each aviator to assess his capabilities, knowledge and experience; speculating on the results should he lose an engine while operating on the curve presented in the book.

For some time there has been diligent investigation at the Army Aviation Systems Test Activity to improve test methods and better the presentation of the information to the Army aviator.

The first step was to modify the OH-6A handbook autorotational procedures. The initial information as presented in the handbook is shown in Figure 2.

A recommendation by the USAAVNTA resulted in the change of paragraph 7-19 of the handbook, TM 55-1520-214-10, "Minimum Height for Safe Land-

Figure 1
ALTITUDE RECOMMENDED FOR SAFE AUTOROTATIONAL LANDING AT MINIMUM TOUCHDOWN SPEED

AIRCRAFT	= YUB-1B USA S/N 58-2078
ROTOR RPM	= 323 (at throttle chop)
DENSITY ALT	= 200 FT
GROSS WEIGHT	= 5700 LB
C.G. STATION	= 132 IN. (mid)
WIND	= CALM

1. FOLLOWING THROTTLE CHOP IN LEVEL FLIGHT-COLLECTIVE HELD FIXED FOR 2 SECONDS; THEN LOWERED TO FULL DOWN POSITION DURING NEXT SECOND.
2. FOLLOWING THROTTLE CHOP IN CLIMB, COLLECTIVE LOWERED TO FULL DOWN POSITION WITHIN 2 SECONDS.
3. TOUCHDOWN TRUE AIRSPEEDS NOTED BESIDE EACH POINT ~ KNOTS.
4. SOLID SYMBOLS DENOTE CRITICAL LANDINGS.

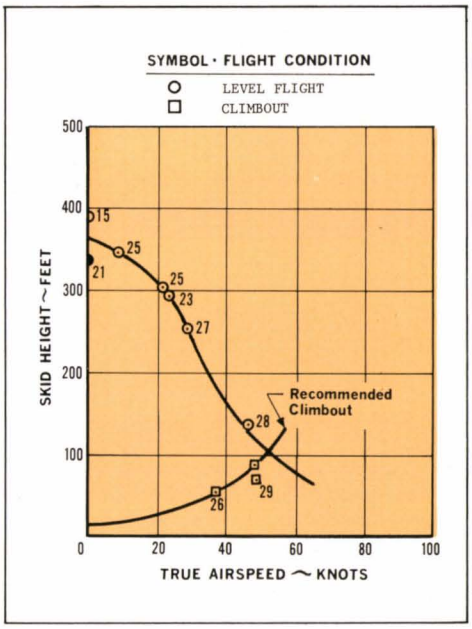
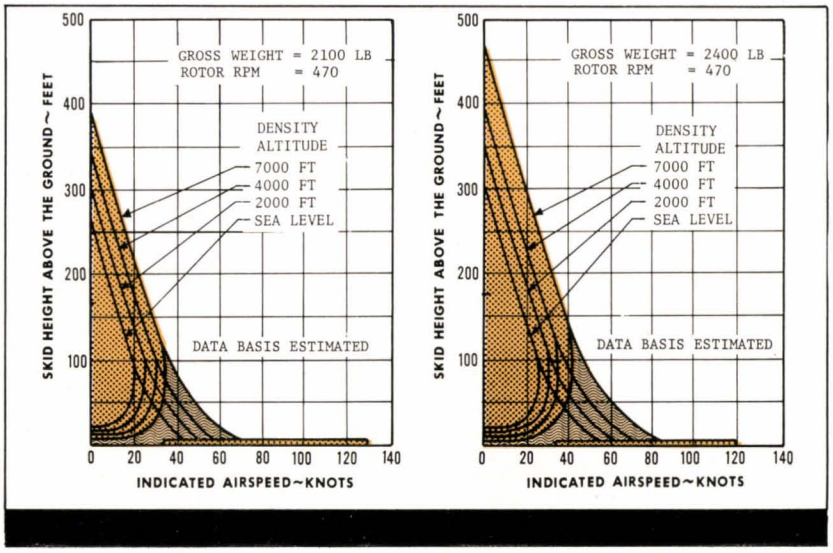


Figure 2
MINIMUM HEIGHT FOR SAFE LANDING AFTER ENGINE FAILURE

OPERATE (1 Sec Pilot Reaction)
CAUTION (No Delay)
AVOID CONTINUOUS OPERATION

AIRCRAFT	= OH-6A
ENGINE	= T63-A-5A
FUEL GRADE	= JP-4
FUEL DENSITY	= 6.5 LB/GAL.



ing After Engine Failure." Airspeed-altitude combinations to be avoided in the event of an engine failure are shown in the height-velocity chart, Figure 3.

The height-velocity chart for this aircraft was obtained from Army engineering flight test data in accordance with Army approved procedures. This chart should always be used in conjunction with the landing site density altitude versus gross weight chart.

The degree of hazard involved when flying aircraft will depend upon the area of operation shown in the height-velocity curve. The unshaded area of the chart represents the region in which safe autorotational landings can be performed with average pilot skill and reaction time. The shaded area of the height-velocity curve is not a prohibited area but continuous operation in this area should be avoided as safe autorotational landings are difficult to perform when operating in these areas.

The proper technique must be used when making a landing from a condition near the shaded area of the height-velocity chart (Figure 3). Both pilot actions and timing are critical factors. The technique varies with flight condition as follows:

Autorotational Landing from a High Altitude-Low Speed Condition: This flight condition is defined as area along the curve from Point A to Point B. The data is based on a level flight or climb condition and does not consider rate of descent.

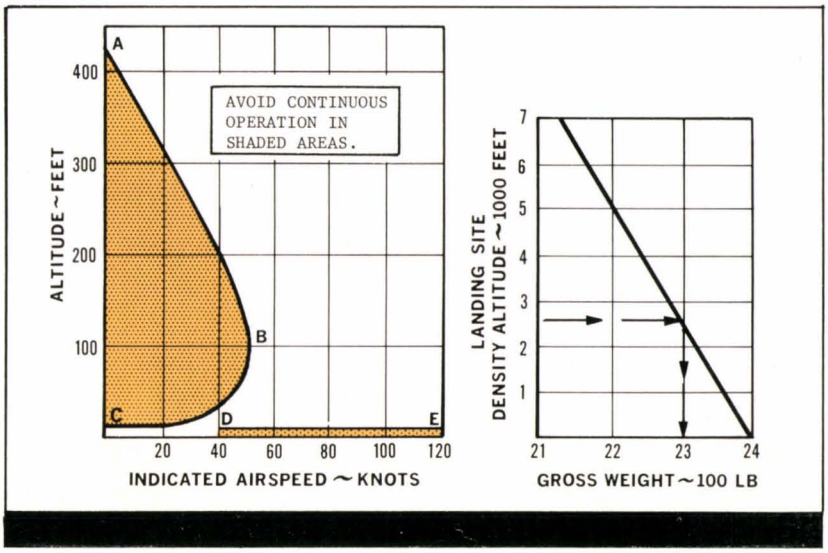
The first recognition of power failure will probably be a change in transmission noise and left yawing of the helicopter. The rapidity of the yawing increases with power loss. During descent neither yawing nor transmission noise change may be apparent. In this case the engine-out warning system may be the only indication of failure. Right pedal should be applied to correct for the yaw, immediately followed by lowering the collective stick and moving the cyclic stick forward to gain airspeed. The helicopter should be accelerated to a minimum airspeed of 45 knots, prior to accomplishing the cyclic flare. Aft longitudinal control is applied to flare at a skid height of approximately 50 feet. The flare should be sufficiently nose-high to increase rotor speed to near 500 rpm (at light gross weights the maximum attainable) and held to reduce the forward speed. At higher gross weights and/or altitudes, it may be necessary to increase collective slightly to prevent rotor overspeed. The helicopter will descend during this maneuver and when the tail skid nears the ground (3 to 5 feet), forward longitudinal control is applied to obtain a level attitude. During the leveling maneuver and prior to ground contact, increased collective is used to stop the rate of descent. The rate of collective increase and the amount used is that required to prevent excessive rate of sink at ground contact. After ground contact, care should be exercised to avoid rapid lowering of collective and aft cyclic input.

Autorotational Landing from a Low Altitude-Low Speed Condition: This flight condition is defined as the portion of the curve from Point B to Point C and above the line from Point D to Point E. The assumption in this flight regime is that since a takeoff of landing is being conducted, pilot alertness is high and that there will be no delay other than pilot reaction time. Loss of power will be characterized by a left yaw, a rapid rotor speed decay, noise change and decrease in load factor. For speeds below 30 knots, right pedal should be used to correct the yawing motion. Longitudinal stick should be used to attain a level attitude or slightly nose high attitude. The collective should be smoothly applied to produce

Figure 3
MINIMUM HEIGHT FOR SAFE LANDING AFTER ENGINE FAILURE

AIRCRAFT	= OH-6A
ROTOR RPM	= 484 (Entry)(103%N_2)
WIND	= CALM
SURFACE	= HARD, SMOOTH
ENGINE	= T63-A-5A
FUEL DENSITY	= 6.5 LB GAL.
FUEL GRADE	= JP-4

WEIGHT VS ALTITUDE AS INDICATED



Cabin space aboard the test aircraft is used for instrumentation

a minimum vertical touchdown speed. For airspeeds above 30 knots, it may be possible to execute a slight flare. Following this maneuver the technique is similar to that at the lower airspeed. Following ground contact, rapid collective decrease and abrupt aft cyclic inputs should be avoided.

Autorotational Landing from a Low Altitude-High Speed Condition: This flight condition is defined as the area above the curve from Point D to Point E. When operating at high speeds close to the ground pilot alertness should be high and the recognition time should be a minimum. At the low speed portion, a power loss will be identified by a noise change and left yaw. As airspeed is increased yaw change becomes less predominant and a left roll tendency becomes apparent. At maximum airspeed, there is no immediate pedal correction required. There is instead a necessity for a rapid right lateral stick input which will, if not corrected, eventually introduce a nose-down pitching. Following these entry corrections, aft longitudinal cyclic and slightly increased collective are used to decrease airspeed and avoid ground contact. When airspeed has been lowered to 45 knots, a flare and landing is accomplished as previously discussed. Cyclic should be placed in neutral position prior to lowering collective. Avoid rapid lowering of collective.

An example:

Problem. For a site density altitude of 2,650 feet, what is the maximum weight for which the height-velocity curve applies?

Solution. Refer to the landing site density altitude versus gross weight chart (Figure 3).

- Enter the pointer on the landing site density altitude scale at 2,650 feet.
- Move pointer horizontally to the right to intersect the diagonal line.
- At this point, move the pointer vertically downward to the gross weight scale to read 2,300 pounds.
- For the conditions of this example, the maximum gross weight for which the height-velocity curve applies at a landing site with a density altitude of 2,650 feet is 2,300 pounds.

This rewrite was based upon engineering flight test experience. Using the data from Figure 2, the test aircraft was damaged on landing. The experience, however, opened the door to some serious reflections relative to the basic problems. Some of these include: What can be expected of aviators? What can be expected of helicopters? What can be considered as reasonable terrain conditions? Good questions all, and few satisfactory answers available.

Even under the controlled testing conditions previously mentioned, this area of flight is highly critical and there is a potential to incur structural damage. This leads one to the conclusion that the tests must be too critical. Again, if they are too critical for the test groups, why are the results being presented to the Army aviator who is usually not blessed with all the previously mentioned ground rules? This is especially important when considering our newer Army pilots. The "old hands" may have learned from their experience and intuitive judgment what a helicopter will do, especially after they have accumu-

***See "Checklists and Operator's Manuals," March 1969 AVIATION DIGEST; "The New CL," April 1969 AVIATION DIGEST, and "Sixty-Nine Dash Ten," this issue**

lated many hours in a particular type.

The U. S. Army Aviation School at Ft. Rucker, Ala., has shared our views that there is a need for better information and a more effective presentation in the operator's manual.* U. S. Army Aviation Systems Command (USAAVSCOM) is in the process of improving the autorotational demonstration requirements in an updated version of Mil Spec 8501A. Subsequent to our initial interests in the autorotation presentation in the handbook, USAAVSCOM has initiated a program to evaluate all charts in Chapter 14 of TM-55-1520-214-10.

As a result of these problem areas, USAAVSCOM issued a test directive to the U. S. Army Aviation Systems Test Activity to conduct an autorotational study in an attempt to resolve some of these recurring questions. The USAAVNTA Project (68-25) is currently utilizing a fully instrumented UH-1C helicopter for the initial portion of this project. Dedepending upon the results of this program it is anticipated that follow-up programs will utilize other helicopters to further evaluate pertinent parameters or phenomenon. Some of the specific objectives of the program are:

• To calibrate normal pilot reaction time to engine failure in the absence of an engine failure warning system.

• Evaluate the effect of pilot reaction time, aircraft response and displacement of critical controls following a simulated engine failure on the altitude loss and time required to achieve steady state autorotative flight.

• Determine adequate autorotation entry test criteria for future tests on single engine helicopters.

• Determine the effect of airspeed and rotorspeed on rate of descent and glide distance, as well as evaluate the effects of maneuvering flight (values of turns and turn rate) on descent performance in autorotative flight.

• Determine the airspeed and rotor rpm necessary to arrest autorotational descent to "tolerable" limits, i.e., the vertical touchdown speed at an airspeed suitable for touchdown without the application of collective to cushion and landing (this value will be determined from the low airspeed landing tests).

• Establish test criteria for determining effective flare airspeed requirements for future tests.

• Determine the time required to effect a power recovery from autorotative flight and altitude lost in accomplishing same as well as establish standard test techniques for making this determination for future tests.

• Determine the amount of lift available from the kinetic energy stored in the rotor system at various gross weight, rotor speed and airspeed conditions.

• Reassess height-velocity test techniques utilized in past government qualification of single engine rotary wing vehicles.

• Recommend handbook presentation methods for all above data for the operators manual.

The flight tests are nearing completion and the results are very promising. The data analysis from the sea level and high altitude test sites is currently underway. It is anticipated that we will be able to present much more meaningful information to our most important customer, the Army aviator.

The Cheyenne Twist

Although the camera lens distortion makes it look like a protective umbrella over the Army's AH-56 Cheyenne helicopter, the pictured 25-foot (7.5-meter) long rotor blade is actually only 28 inches (71 centimeters) wide. Almost undetectable to the untrained eye, blade twist, taper and camber—a new rotary wing design combination—greatly improve helicopter flight performance, according to Lockheed-California engineers. Now being flight-tested by Lockheed for the Army, the Cheyenne—which cruises at 230 miles per hour—is the world's fastest and most heavily armed helicopter gunship. Circular striped pattern on the ground is a "compass rose" used in checking and adjusting the aircraft's compass.

NIGHT HUNTER OPERATIONS

Annual Awards Monthly Winner CONTEST

Captain Richard C. Keehn

With a bright moon, artillery flares igniting at about 400 meters over the target area provide good illumination

FROM 31 OCT 68 through 4 Nov 68 a new operational concept directed against enemy forces and logistical traffic in the Mekong Delta was put into effect. This new operation, called the "Night Hunter Concept," was tested by A Troop, 3rd Squadron, 17th Cavalry in support of the 1st Brigade, 9th Infantry Division.

For this type operation to be successful, the terrain had to be sparsely populated with only scattered heavy vegetation and the area of the Mekong Delta just south of Saigon proved to be ideal. This area was level, open country, with easily definable waterways lined with nipa palm and large areas of rice paddies with scattered patches of trees and brush.

Populated areas proved to be no problem in most cases as these areas were usually in concentrations adjacent to the rice fields or in clusters along the navigable waterways where the nipa palm was the thinnest and did not obstruct access to the waterways.

The Night Hunter operation was designed to exploit targets acquired by ground surveillance radar. The Night Hunter Task force consists of a mobile AN/TPS 25 radar set, an air cavalry element, roving waterborne patrols, infantry ambush sites and supporting artillery.

The command and control element was located at the ground surveillance radar detection center and included the infantry brigade commander, the direct support artillery battalion commander, commander or S-3 of the air cavalry element and the command element of the waterborne forces.

The command and control element directed the radar search patterns and analyzed the sightings as they were acquired and plotted. Small isolated sightings were attacked by artillery alone. When a target of sufficient magnitude and concentration was detected, the entire task force was put into action.

The maximum shock action, surprise and fixing of the enemy timetable was carefully followed. When all the elements of the task force had been briefed, an artillery time-on-target (TOT) was initiated which would bring variable timed high explosive rounds, illuminating rounds and the air cavalry elements into action simultaneously. When targets were within population overlays, only illuminating rounds were used. Continuous artillery illumination was adjusted by the air cavalry fire team leader until the entire enemy target area had been searched. When a target was acquired by the air cavalry elements, it was subjected to an immediate and devastating attack by miniguns, 40 mm grenades and 2.75 inch rockets. The waterborne forces were maneuvered into an area adjacent to the target area, water routes permitting, to engage enemy personnel attempting to flee the target area.

The operation scored 67 kills and destroyed 15 sampans with two secondary explosions in four nights of operation. On the first operation, the night of 31 October, the air cavalry element registered 14 kills on four separate engagements, three of which resulted in later contact for the waterborne forces and resulted in three additional KIAs. The second night, the air cavalry scored one kill and destroyed two sampans in two engagements, and the waterborne forces killed 15 enemy attempting to flee the target area. The third night the air cavalry killed 15 enemy and destroyed four sampans, two of which resulted in secondary explosions.

The fourth night, there was no operation due to heavy daytime cavalry commitments. The last night, 4 November, the air cavalry killed 16 enemy and destroyed eight sampans, three of which were loaded with supplies. The waterborne forces killed an additional four of the enemy in a later engagement.

The mobile AN/TPS 25 radar utilized during the operation covered a searching radious of 20

The entire area was broken down into four equal quadrants. Each quadrant was searched as directed by the command complex. As targets were sighted, they were recorded and plotted on the master overlay. As radar sightings accumulated, definite patterns emerged, showing numbers of personnel, direction of movement and density of movement in a given area.

Two-way radio communication was established between the radar operator and the air cavalry element in the air. When a target complex was under attack, the radar would scan the area 2 kilometers either side of the target. With minimal training the radar operator was able to vector an aircraft to the center of target below 200 feet above ground level and all other aircraft were at a higher altitude.

The OH-6A was normally used because it returned a special radar echo that made it easy to distinguish from other type aircraft. When the cavalry scout element was directly over the target the radar operator would transmit the word "target." The OH-6A would thoroughly search the area and call in AH-1Gs to destroy the enemy. The use of radar to adjust rocket fire into an isolated, heavily vegetated area was experimented with successfully. The Cobra team leader would expend one pair of rockets on the target area and the radar would adjust the fire. The team leader's wing man would necessary corrections and devastate the area.

The enemy position which had been destroyed would be monitored later from time to time to see if any movement recurred in the area. As each target in the complex was neutralized the radar would direct the pilot to a new target in the area. In several instances the radar plotted sampans moving along a river and was able to plot to which side of the river the enemy had fled and the direction of his movement.

Three tango boats were used during the operation, without troops on the first night and with two platoons of infantry the remaining nights. The tango boats were armed with machineguns,

The re-arming pads had stockpiles of varied ordnance

grenade launchers and a 106 mm gun. Starlight scopes were used for initial target acquisition. The starlight scopes proved extremely effective in all engagements. Illumination for engagements was available by flares shot from T Boats or an artillery battery located at the command complex.

Stategic numbered check points on navigable rivers were plotted on all maps of the cavalry elements, tango boats and the command and control complex. The entire Night Hunter Task Force kept track of the tango boats movement. When a significant contact was made, troops could be dismounted and air cavalry located at the staging area could be scrambled and airborne over the engagement in less than five minutes. If the air cavalry was airborne neutralizing another target area, it could be diverted immediately to the tango boats engagement, giving sustained close air support to the infantry on the ground pursuing the retreating enemy.

Two artillery batteries were used during the testing, one battery of 155 howitzers and one battery of 105s. Sufficient illumination rounds were on hand for six hours of continuous illumination. Varied heights and amounts of illumination were tried during the first two nights of the operation. Ideal illumination was attained on the third night. With a bright moon two artillery flares over the target area igniting at an altitude of 400 meters and followed immediately by two more flares at an altitude of 600 meters provided good illumination. Continuous illumination, one round every 60 seconds at an altitude of 600 meters, was provided following the initial rounds. During dark moon phase the same initial illumination was used. Continuous illumination was shot every 30 seconds. When more than one target complex was sighted and plotted, data was sent to the artillery batteries for the primary and secondary targets. One battery was utilized on the initial target while the second battery of artillery was primed and ready with high explosive and/or variable time and illumination rounds. They were on call from the air cavalry team leader when the primary target had been fixed and neutralized.

When a significant target complex had been sighted and plotted, the data was transmitted by radio to the air cavalry team leader, to include target coordinates, type of targets, number of enemy personnel, route of flight, type of artillery ordnance to be used and projected time-on-target. After the remainder of the flight crews had been briefed, a 10-minute projected time-on-target was initiated, as this proved to be the most effective response time for all elements of the task force. Within five minutes of the projected time for on target, all aircraft were ready for takeoff. Takeoff was on order of the command element based on the calibrated mission data.

When a target was acquired by the air cavalry elements, it was subjected to an immediate and devastating attack by miniguns, 40 mm grenades and 2.75 inch rockets. Meanwhile, waterborne forces blocked escape routes

On command the aircraft would take off and form a staggered trail formation in the following order: one OH-6A, two AH-1Gs and one UH-1H. The cavalry elements would fly the flight route based on a given airspeed and prominent check points easily distinguishable from the air at night. The cavalry would arrive over the release point 2 miles from the target complex at one minute projected time-on-target. The cavalry team leader was then given 10 second count downs and artillery "shot" and "splash" information from the command element. The team leader had to traverse the final distance to arrive one-half to one-fourth mile from target at zero hour.

During the initial approach to the target area the formation was changed to staggered three abreast, with the OH-6A in the middle. The UH-1H remained one-fourth mile behind the attacking elements. A shallow dive was initiated from 1,500 feet into the target area with each aircraft 200 yards apart. If the enemy was seen fleeing the area, they would receive immediate fire from any one of the three cavalry elements. If no enemy were seen the two Cobras would level out at 75 feet and continue their pass through the area. The OH-6A would continue its descent to normal scouting altitude and be joined by the UH-1H "firefly." The four aircraft flying low level through the area gave maximum eye coverage to the enemy target. The AH-1Gs would climb alternately to the right or left on command of the team leader, and assume the standard close-air support formation over the firefly and scout aircraft.

Normal daytime scouting procedures were employed by the OH-6A. The UH-1H flew at approximately 100 feet, roaming back and forth across the area assisting the scout element. Concentrated illumination was afforded by the firefly element.

On the first night of operation two starlight scopes were used on the mission to search the target area without illumination from the UH-1H. This proved unsatisfactory because of the vibration level of the aircraft and the limited area of vision with the scope from a moving aircraft. On subsequent missions only artillery illumination

and the firefly were used. Additionally on the first night, flares dropped from helicopters were tried. This proved unsuccessful compared to the artillery illumination. It would have required four additional UH-1Hs loaded with flares to provide enough sustained illumination over the target area. This would have congested the airspace and interfered with the effectiveness of the mission.

Throughout the entire four nights of operation standard daylight cavalry tactics were employed after initial illumination.

At the completion of each mission the aircraft would return to the tactically lighted staging area which consisted of two-way radio communications, a refueling area and two re-arming pads. The two re-arming pads each had a stock pile of varied ordnance: 2.75 inch rockets were pre-stacked in two piles of 100 each, consisting of 10 pound and 17 pound VT; 250 rounds of 40 mm grenades and 4,000 rounds of 7.62; two preloaded 7.62 minigun ammo boxes for the OH-6A were also located at the re-arming pads. The replenishment of the two re-arming pads came from the main ammo point located nearby.

A standard mini-pump refueling point was used with a fuel reserve of 5,000 gallons. The mini-pump was preplanned to accommodate 10 aircraft in case airmobile operations were initiated.

The two AH-1G helicopters were armed with 4,000 rounds of 7.62 minigun ammo and 250 rounds of 40 mm grenades in the nose turrent. The wing stores consisted of four rocket pods per aircraft. The two outboard pods were loaded with a total of 38 ten-pound VT 2.75 inch rockets on each aircraft. The inboard pods on one aircraft were loaded with 14 seventeen-pound VT 2.75 inch rockets. The other aircraft's inboard pods were loaded with 14 beehive 2.75 inch rockets. The OH-6A was armed with the standard XM-27E1 minigun, with 2,000 rounds of ammunition. The UH-1H had its two standard M-60 machineguns with 4,000 rounds per gun mounted, plus the firefly apparatus.

An additional phase of the operation was to develop an early morning target complex into a significant contact for the deployment of airmobile forces at daybreak. This was attempted at 0430 hours on 3 November. A radar sighting of 50 personnel was made in a heavily populated area along a river. The findings of two large motorized sampans, trails less than 30 minutes old and direction of movement verified the radar sightings. No visual contact was made due to the density of hooches. Airmobile assets were not available until 1000 hours. When insertion was finally made in the area, 10 of the enemy were either killed or captured. Two POWs admitted that 50 NVA troops armed with AK-47s and two machineguns had landed by sampans at approximately 0400 hours that morning and moved to the southeast. The POWs further stated helicopters had been over many of them early in the morning and they were in fact hiding in the hooches. All the facts collected on this one early morning operation gave significant support to the concept's effectiveness.

Two significant facts were established during the Night Hunter Operations:

• Maximum results were obtained with a minimum use of available assets and aircraft flight time. The amount of flight time logged each night by the four aircraft was as follows: 31 October, 02 ± 15 per aircraft; 1 November, 01 ± 30 per aircraft; 2 November, 03 ± 00 per aircraft; 4 November, 01 ± 50 per aircraft.

• Enemy movement was reduced significantly each night that the air cavalry was employed. On 30 October, the night before the concept was initiated, there were 138 radar sightings. On 31 October there were 82 radar sightings. On 1 November, only 52 targets were sighted. On 2 November only 38 radar targets were sighted. On 3 November, the cavalry wasn't utilized and the radar sightings jumped to 96. On 4 November a total of 58 targets were sighted.

Each night the air cavalry was deployed virtually all movement stopped in the radar surveillance area shortly after 2230 hours. Movement resumed in widely separated areas around 0430 to 0500 hours the following morning, thus effectively denying the terrain to the enemy for night movement.

Certain facts were established that helped to successfully accomplish this type of night operation.

• All elements of the task force must be located in the same immediate area with landline and radio communications.

• All key members of the task force, to include all aircrew personnel, must receive a thorough briefing each night to insure all friendly positions are plotted and all operational procedures and contingency plans are completely understood.

• Close co-ordination and timing are absolutely essential to the successful execution of the mission. To obtain split second accuracy the command structure must work side by side using the same clock, maps and overlays.

One of the greatest potential uses of this type of night operation is to deny the enemy the use of the terrain at night. If the enemy is unable to maneuver, he will be ineffective.

Sixty-Nine Dash Ten

The author presents a review of general information contained in dash ten operators manuals for all Army aircraft

Major William H. Gardner

IN THE FEBRUARY issue of the ARMY AVIATION DIGEST there appeared an article entitled "A Wink, A Nod and a Smile" which was concerned, in a humorous vein, with the use and misuse of checklists and operators manuals. The article "At Last—User Oriented Checklists and Operators Manuals" in the March issue provided a broad brush treatment of past problems, recent developments and future trends in these two interrelated areas. "The New CL" in the April issue presented a detailed analysis of the format and content of the new Department of the Army approved checklist. This article is the last in the series and is concerned with the content and format of the Operators Manual (dash ten).

There have not been as many changes to the operators manual as to the checklists. However, few aviators, other than in flight school, have much use for the dash ten and even then their attention is focused on only one or two areas within the document. This is somewhat surprising especially in view of the fact that paragraph 3a(1) of AR 750-31 specifically requires that the operators manual, including all changes and related technical bulletins, be "located in the aircraft."

Thus, the purpose of this article is twofold—the first is to update the reader on the information available in the dash ten, its format and future considerations and

to remind the pilot what information is available to him in the aircraft should he need it.

The operators manual consists of 14 chapters—these same chapters are found in all manuals even if there is no application to that particular aircraft. The chapters are:

1. Introduction
2. Description
3. Normal Procedures
4. Emergency Procedures
5. Avionics
6. Auxiliary Equipment
7. Operating Limitations
8. Flight Characteristics
9. Systems Operation
10. Weather Operations
11. Crew Duties
12. Weight and Balance Computation
13. Aircraft Loading
14. Performance Data

Actually the first page now in the dash ten is the warning page. On this page, certain warnings, underscoring important and critical instructions as they appear in the manual, have been extracted for additional emphasis. A warning is defined (in the general section of Chapter 1) as "an operating procedure, practice, etc., which, if not correctly followed, will result in personnel injuries or loss of life."

Each chapter has specific sections identical in all operators manuals. Just as certain chapters have no application to various aircraft (e.g., Chapter 11, Crew Duties, for the O-1) many sections within the various chapters also are without application to various aircraft. The specific table of contents, regardless of application, is "locked in concrete" by the military specifications for the preparation of operators manuals. This document is "Military Specification, Manuals, Technical: Manuscript Requirements for Army Aircraft," MIL-M-63026 (TM). The responsibility for the preparation of this "DA Writers Guide" as well as MIL-M-63029 (TM), the Writers Guide for Checklists, belongs to the Equipment Manual Field Office (EMFO), Letterkenny Army Depot, Chambersburg, Pa. The responsibility for the publication of all DA aircraft manuals rests with the U. S. Army Aviation Systems Command (USAAVSCOM), St. Louis, Mo. The U. S. Army Aviation School (USAAVNS) has been delegated primary coordinating authority for five chapters in the operators manual—Chapters 3, 4, 6, 10 and 11.

A brief description of each chapter follows. Those areas within the sections of each chapter that are discussed have been se-

lected because it is felt that they are of interest to the reader and also tend to identify the type of information in each chapter.

Chapter 1 (Introduction) is divided into two sections: Scope and General. The Scope identifies by serial number those type, model and series aircraft of which the manual has application. The General Section is important because here the terms "warning," "caution" and "note" are defined. Also, it is in this section that the user of the operators manuals is encouraged to forward any errors, omissions and recommendations for improving the manual, utilizing a DA Form 2028, to the Commanding General, U. S. Army Aviation Systems Command, ATTN: AMSAV-R-M, P. O. Box 209, St. Louis, Mo. 63166. These same comments should also be sent to the Commandant, USAAVNS, ATTN: AASDI-E, Ft. Rucker, Ala. 36360.

Chapter 2 (Description). Again, there are two sections: Scope and Aircraft Systems and Controls Description. The latter section presents a detailed description to include charts and diagrams of all systems and controls in the aircraft. The subheadings will include (but are not limited to) the following: engine(s), propeller(s), oil supply system, fuel supply system, electrical power supply, flight control system, landing gear system, instruments and auxiliary equipment.

Chapter 3 (Normal Procedures). This chapter also has two sections: Scope and Flight Procedures. The various checks in the Flight Procedure Section are condensed for incorporation in the new checklist but the sequence is identical.

Chapter 4 (Emergency Procedures). There are 10 sections in this chapter: Scope, Engine, Propeller (Tail Rotor), Fire, Fuel System, Electrical System, Hydraulic, Landing and Ditching, Flight Controls and Bailout (Ejection). These latter nine sections are identical in sequence to the breakout of emergency procedures in the new DA CL as well as with the inserts in TM-1500-1 into which the new checklists are designed to fit. (TM 1500-1 is authorized on the basis of one per Army aircraft worldwide.) The procedures outlined in Chapter 4 have been condensed, maintaining sequence, for the checklists. The fact that USAAVNS has been delegated coordinating authority for Chapters 3 and 4 is one of the major reasons for the standardization that now exists between the dash ten and the CL.

Chapter 5 (Avionics). There are four sections: Scope, Description, Operating Controls and Operating Procedures. Electronics Command (ECOM), Ft. Monmouth, N. J., provides the aircraft manufacturer with the technical manuals for all avionics equipment to be installed in the aircraft. The manufacturer develops the operating procedures for this equipment from the TMs for inclusion in Chapter 5. This presents certain problems as it can be readily seen that the procedures for the ARC-55 in Chapter 5 of the dash ten for the U-6A made by DeHavilland will differ considerably from those for the UH-1 series made by Bell. Secondly, this system does not always provide for pilot oriented procedures in Chapter 5.

Chapter 6 (Auxiliary Equipment). The 10 sections of this chapter, for which USAAVNS has also been delegated primary coordinating authority, include: Scope, Heating, Ventilation and Pressurization Systems; Anti-icing, Deicing and Defrosting Systems; Lighting Equipment; Oxygen System; Auxiliary Power Unit; Armament System; Photographic Equipment; Automatic Stabilization Equipment; and Miscellaneous Equipment. There is a similar situation with regard to armament systems as existed with avionics. The manufacturer of the aircraft is furnished the necessary manuals on the armament systems themselves. The pilot must know, however, the considerations pertinent to the system with regard to the aerial platform on which they will be mounted (e.g., optimum airspeed, dive angles, slant range, etc.). The development of pilot oriented procedures, particularly for the armament section, for Chapter 6, required that USAAVNS become the coordinating authority for this chapter. The procedures for other auxiliary equipment, such as heaters and stabilization devices, also need to be developed with the pilot in mind. The manufacturer is not always in a position to anticipate the Army's requirements in these areas.

Chapter 7 (Operating Limitations). The two sections in this chapter are: Scope and Limitations. The Limitations Section contains all aircraft and engine limitations that must be observed during normal operation. The instrument markings shown in this section are not repeated anywhere else in the manual. Limitations for a specific phase of an operation may be found in the section for that particular phase of the operation.

Chapter 8 (Flight Characteristics). Three sections comprise this chapter. They are: Scope, General Flight Characteristics and Control Characteristics. Emphasis is placed on advantageous flight characteristics as well as on any dangerous tendencies.

Chapter 9 (Systems Operation). In addition to Scope, this chapter has one other section entitled "Systems" which contains additional discussion material in the form of operating techniques for various aircraft systems. The material in this chapter supplements and amplifies information given elsewhere in the manual. It gives

amplification, as necessary, to brief coverage given in other chapters where detailed description would have destroyed continuity of thought.

Chapter 10 (Weather Operation). Here are found six sections: Scope, Instrument Flight Procedures, Cold Weather Operation, Turbulence and Thunderstorm Operation and Ice, Snow and Rain. Because of the Aviation School's considerable interest in the Instrument Flight Procedures Section as well as the Army's interest in the other areas, coordinating authority for this chapter was also delegated to USAAVNS. This entire chapter should be carefully read by all pilots and/or crewmembers. No one fails to read these considerations in the booklet that accompanies a new car but, surprisingly, many aviators are not at all familiar with the contents of this chapter (and possibly forgot it existed) with regard to the aircraft they fly!

Chapter 11 (Crew Duties). USAAVNS was coordinating authority for this chapter and its two sections (Scope and Responsibilities). This chapter, having no application for most aircraft, has now become extremely important because of the introduction of the AH-1G Cobra, in particular, into the inventory and the planning for the procurement of the AH-56A Cheyenne.

Chapter 12 (Weight and Balance Computation). The necessary information and guidance is presented in its four sections (Scope; Introduction; Definitions and Chart Explanations; and Weight and Balance Clearance Form F, DD Form 365F) for the computation of the weight and balance data for the aircraft, if necessary or applicable.

Chapter 13 (Aircraft Loading). The four sections in this chapter (Scope; Aircraft Cargo Features; Preparation of Aircraft and Personnel Cargo for Loading and Unloading; and General Instructions for Loading, Securing and Unloading Cargo) provide the necessary information and guidance for the loading of aircraft where this area is a consideration.

Chapter 14 (Performance Data). This final chapter has just two sections: Scope and Charts. This particular chapter is one where significant advances and changes have taken place. Although USAAVNS has not been delegated any responsibilities in this area, considerable effort has been expended by the school to eliminate all unnecessary charts and to introduce only those charts that are aircraft related and pilot oriented. The reasons for this interest are twofold. The first is purely economical. Considerable savings have accrued by eliminating what isn't needed. Secondly, the pilot needs only meaningful and required performance data presented in a format that he can readily interpret.

The last item other than the index is an appendix listing all references which provide supplementary information relative to the material in the particular operators manual and are required for use by personnel operating and working on the aircraft.

USAAVNS exercises the necessary coordination on the various aircraft manuals through a series of conferences. All aircraft manuals are subject to review on the following basis (the aircraft in parentheses are current examples):

(1) New aircraft (AH-56A Cheyenne)—90 day interval.

(2) In-production complex aircraft (CH-47)—120 day interval.

(3) In-production simple aircraft (OH-6)—180 day interval.

(4) Out-of-production aircraft (U-6A)—based on funds.

(5) As scheduled by contact or depending on product improvement or changes to aircraft.

These manual review conferences are scheduled and coordinated by the USAAVSCOM and normally include representatives from some 15 to 20 activities including, besides USAAVSCOM and USAAVNS, organizations as the Electronics Command (USAECOM), the Weapons Command (USAWECOM), the Aviation Test Board (USAAVNTBD), the U. S. Army Board for Aviation Accident Research (USABAAR), the aircraft manufacturer and the contractor who will or does publish the manual. Prior to attending a review conference, a pre-conferenee review is held at USAAVNS which includes representatives from the Office of the Director of Instruction; the Departments of Advanced Fixed Wing, Rotary Wing and Maintenance Training; USABAAR; USAAVNTBD; and the USAAVNS Element when applicable. This system of manual review to include the pre-conference reviews at USAAVNS has contributed significantly to more user oriented operators manuals.

There are five areas presently under study which should be incorporated into the future operators manuals.

There is a requirement now to separate the format for the operators manual between categories of aircraft. Consideration is being given to a separate Writers Guide for the dash tens for rotary wing and fixed wing aircraft. It is hoped and anticipated that, when these separate DA Writers Guides are published, they will include certain other changes which have been recommended by USAAVNS. The format and content of the operators manuals must be changed to eliminate the redundancy and the unnecessary information that still remains and to present all chapters in the manuals in an easy reading and appealing format. Al-

though USAAVNS has coordinating authority for five chapters, the school cannot change the present criteria for the chapters beyond the guidelines established in the Writers Guide.

A second area presently under study is the requirement for a chapter on armament systems to be broken out separately. When it is, a similar breakout will occur in the format for DA checklists as mentioned in the article "The New CL."

With the advent of the turbine engine a special consideration has developed with regard to salt water operations. The ingestion of salt water into helicopter engines (particularly the CH-54A Flying Crane) requires a special set of procedures and it is anticipated that a section will be added to Chapter 10.

USAAVNS has initiated a program to eliminate maintenance information from the operators manuals. There is still considerable information in the manuals that is not only unrequired by the operator but duplicated in the various maintenance manuals for the aircraft.

USAAVNS has also submitted a draft format for Chapter 5 to USAAVSCOM. The adoption of this format will standardize the procedures for avionics equipment in the operators manual for the different aircraft in which the equipment is found. The format has been designed to present the operator with only the information he really needs.

It is hoped this article will accomplish its overall purpose—to update Army aviators on the changes that have occurred in the areas of operators manuals and checklists and to reacquaint aviation personnel with the information contained in these documents —documents required (commanders take note) to be aboard every Army aircraft.

How Low Can You Go?

The Lockheed-California Company used the XH-51A compound helicopter (above) and a Lockheed Model 286 "pure" helicopter to conduct this nap-of-the-earth flight test for the USACDC

George Zuments

WHAT IS THE MINIMUM flight altitude that a rotary wing aircraft can be flown at various speeds? How does low level, nap-of-the-earth flight affect maneuverability, controllability, pilot efficiency, geographical orientation and mission effectiveness? What is the relationship between aircraft speed and altitude to ground observation and tracking?

To obtain answers, the U. S. Army Combat Development Command (CDC), Ft. Belvoir, Va., requested that the U. S. Army Aviation Materiel Laboratories (AVLABS), Ft. Eustis, Va., conduct a nap-of-the-earth flight program over flat, rolling and rough terrain.

This flight program was conducted by the Lockheed-California Company under contract to AVLABS. The XH-51A Compound covered a speed range of 150 to 225 knots true airspeed.

At the request of CDC, a second phase was added to the program to cover the low speed range (50 to 125 knots). A Lockheed Model 286 "pure" helicopter, designed and constructed as a company-funded project, was used for this phase.

Lockheed designed, built and flight-tested two XH-51A "pure" helicopters under a joint Army/Navy contract awarded in 1962. This was a research program to investigate the rigid rotor concept using a three-bladed rotor. At a design gross weight of 3,500 pounds, the XH-51A flew to speeds of 140 knots and proved the "rigid" rotor concept.

Upon completion of this program government accountability was turned over to the Army and in 1964 under an AVLABS contract, one of the XH-51As was converted into a compound helicopter.

A 16.8-foot span wing was added to help unload the rotor

and a 2,500-pound thrust J-60 turbojet was installed for increased forward thrust. In addition, a new four-bladed "rigid" rotor was installed.

During this program, the compound attained a maximum speed of 210 knots and provided much valuable data about high speed compound helicopter flight.

In 1966 an additional contract was awarded to investigate high-speed maneuverability and extend the previous flight envelope. It was under this contract that the XH-51A set an unofficial rotary wing aircraft speed record of 263 knots (302 mph). Much of the information gained from these programs was applied directly to the AH-56A Cheyenne design effort.

Pertinent data about the XH-51A compound helicopter are presented in Figure 1. The Model 286 helicopter, shown in Figure 2, presents Model 286 data.

Description of Terrain. The three flight test corridors were located in the vicinity of Oxnard, Calif., and were selected so that each contained a single type of terrain. Each of these courses provided a corridor length of approximately 20 nautical miles (Figure 2).

This length provided time for sufficient data gathering, yet did not exceed the maximum high speed range of the XH-51A. For the flat and rough terrain courses, sufficient corridor length was obtained by making runs in both directions.

Flat Terrain Corridor. The Santa Clara River between Saticoy and Fillmore was the flat terrain course, as shown in Figure 2. This corridor was composed mainly of sandy river bottom broken by trees and shrubs.

Because of heavy rains prior to L-286 testing, it was necessary to relocate some of the original ground observer stations. Some of these original locations were under several feet of water at the time of testing. Several obstructions were located approximately 3 miles from the east and west ends of the course.

At the east end, the course was bracketed by high-tension towers that supported power lines crossing the flight path. A low highway bridge and power lines crossed the flight path at the west end of the course.

Rolling Terrain Corridor. Situated between South Mountain and the Camarillo Hills (Figure 2), the rolling terrain course provided a usable test distance of 20 nautical miles. The terrain consisted of gently sloping hills with ground cover, a mixture of grass, brush and trees of varying heights.

This course was relatively free of obstructions such as power lines. However, there were several cattle ranches along the test corridor and the cows did prove to be potential hazards. As the program progressed, the cattle refused to move and the pilots were forced to take evasive action to avoid cattle strikes.

In addition, a major forest fire burned approximately 20 percent of the course area prior to initiation of data runs. As a result, some of the hills were blackish-gray creating a pilot depth perception problem since it was difficult to distinguish ground contours.

Rough Terrain Corridor. As mentioned previously, the rough terrain course had a usable length of 10 nautical miles necessitating a return run (Figure 2). The terrain consisted of closely spaced steeply sloped mountain ridges intersecting the flight path at various angles as well as cuts and canyons. Ground cover consisted of grass, brush and trees. However, most of this cover was burned off as mentioned above, resulting in pilot depth perception problems. In addition, many power lines, including

Figure 1

XH-51A Compound	
Design Gross Weight	4,500 lbs.
Fuel Capacity	700 lbs.
Overall Length	42.6 ft.
Overall Height	9.0 ft.
Main Rotor	
Diameter	35 ft.
Type	4-blade rigid
Blade chord	13.5 in.
Airfoil	Modified NACA 0012
Solidity	.0818
Wing	
Span	16.8 ft.
Area	70 ft.^{2}
Chord (MAC)	51.7 in.
Aspect ratio	4.05
Airfoil	NACA 23012
Powerplants	
Primary	
Type	PT 6B-9 Turboshaft
Takeoff power (5 min. limit)	550 SHP @ SL
Military Power (30 min. limit)	500 SHP @ SL
Auxiliary	
Type	J-60-P-2 Turbojet
Military Power	2,490 lb. thrust @ SL
Thrust axiis inclination	+7 deg.

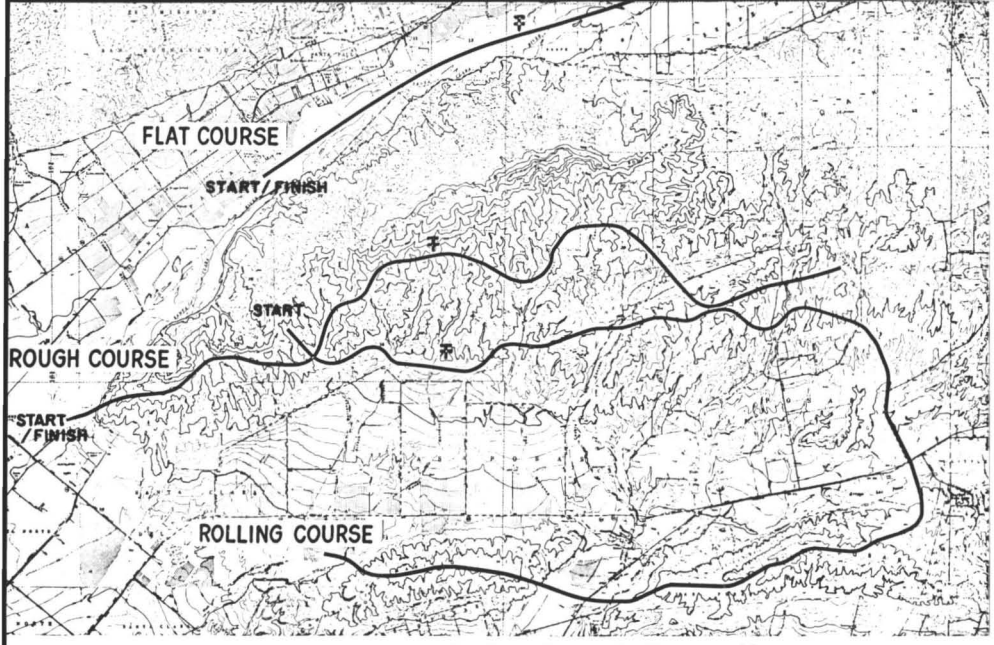


Figure 2 Terrain and Course Map
‡ Observer Locations
Heavy Lines—200 Feet Contour Intervals

high-tension lines, crossed the flight path at the east end of the course, necessitating sharp pull-ups.

TEST PROCEDURES. For the purpose of this program, nap-of-the-earth flight was defined as "flight as close to the earth's surface as vegetation or obstructions will permit while generally following the contour of the earth.

"The pilot preplans a broad corridor of operation, based on known terrain features, which has a longitudinal axis pointing toward his objective.

"In flight, the pilot uses a weaving or devious route within his pre-planned corridor while remaining oriented along his general axis of movement to gain maximum cover and concealment."

The test flights were flown by three contractor pilots over the three corridors at target true airspeeds of 50, 75, 100 and 125 knots for the L-286 and 150, 175, 200 and 225 knots for the XH-51A. This resulted in 24 data flights per corridor or a total of 72 data flights.

For each data run, the following parameters were recorded at five-second intervals:

- True airspeed—knots
- Tapeline altitude utilizing radar altimeter—feet
- Longitudinal cyclic stick position—inches
- Lateral cyclic stick position—inches
- Directional pedal position—inches
- Pitch angle—degrees
- Sideslip angle (XH-51A only)—degrees
- Yaw rate (L-286 only)—degrees/seconds
- Roll angle—degrees
- CG vertical acceleration—g's

For flight safety no pilot was allowed to fly two consecutive data flights. Since this was an evaluation of aircraft capability and not a competitive test of pilot skill, the pilots were identified to the ground observers only as pilot A, B or C.

In order to obtain oral and visual identification from ground observers, a U.S. Army Combat Development Experimental Command (CDEC) team was located at a prominent position across each corridor. No attempt was made to reproduce a tactical situation.

The observers were placed on open ground with no attempt at concealment, the main requirement being that they be able to observe the predicted flight path. Nor was any attempt made to surprise the observers. They were informed of each pending flight and knew the expected flight path of the test aircraft. A visual reference point was provided for the pilots at each ground observer location and all flights were flown to pass within 300 yards of the observers.

Each CDEC ground observer team consisted of two people. Team equipment included a stop watch, standard watch, preplanned data sheet, clipboard, writing instrument, aircraft recognition photos and a portable radio. The following information was recorded by each ground observer:

- Observer post number
- Date
- Terrain
- Observation number
- Time of day
- Length of time aircraft heard
- Length of time aircraft seen (timed from initial sighting to final sighting without accounting for visual masking of aircraft)
- Shortest distance away
- Altitude above ground
- Direction of flight
- Time to come abreast
- Comments

Figure 4 is a sample ground observer data card.

TEST RESULTS. The variation of mean altitude versus airspeed for the L-286 and XH-51A is shown in Figure 5. The "mean value M" is defined as:

$$M=\frac{EX}{n}$$

where EX is the sum of observations and n the number of samples. It should be noted that all data points were not included in the samples. Several data points representing pull-ups and turns at the end of the courses to clear power lines and bridges were deleted.

As seen from the figure, mean altitude increases with increased airspeed for all three types of terrain. This is to be expected since

the pilot has to fly at a higher altitude with increasing airspeed to obtain terrain clearance; the radius required to perform a pull-up or turn varying directly with airspeed squared at a given load factor.

For both aircraft, the trend and level of mean altitude with increasing airspeed is similar. The flat terrain data, however, is an exception. This break in the mean altitude curve for the XH-51A is a result of attempting to hold constant airspeeds under turbulent weather conditions. In addition these were the initial data flights of the program and the pilots had not attained their maximum proficiency.

As shown in Figure 5, mean altitude also increases as the ground contour progresses from flat to rough, reflecting the added altitude margin necessary to maintain terrain clearance. Since more maneuvering is required to follow the ground contour as the terrain becomes more severe, the frequency of application and the magnitude of load factor increases. The pilot has to focus more attention outside the aircraft to clear terrain obstructions. The increased workload lowers the pilot's ability to maintain airspeed and altitude.

Figure 6 presents mean time seen by ground observers versus airspeed for both aircraft. Time seen varies immensely with airspeed for the same type of terrain. However, for the same target airspeed, time seen increases directly with the severity of the terrain, i.e., time seen is greater for rough terrain than for rolling terrain and even greater than for flat terrain, particularly for the Model 286. As terrain severity increases, it is necessary to increase flight altitude to clear terrain obstructions, thereby increasing the time seen.

It can be seen from Figure 6 that there is a significant step decrease in the time seen for the XH-51A data for rough and rolling terrain. However, there is no corresponding step change in the mean altitude versus airspeed data (see Figure 5). This difference in time seen between the L-286 and XH-51A appears to be a result of differences in flight paths.

Figure 3

L-286	
Design Gross Weight	4700 lbs.
Fuel Capacity	518 lbs.
Overall Length	42.4 ft.
Overall Height	9.0 ft.
Main Rotor	
Diameter	35 ft.
Type	4-blade rigid
Blade chord	13.5 in.
Airfoil	NACA 0012
Solidity	.0788
Powerplant	
Type	PT 6B-9
Takeoff Power (5 min. limit)	550 SHP @ SL
Maximum Continuance Power	500 SHP @ SL

Below: The Lockheed Model 286 rigid rotor helicopter maneuvers one of three courses used in the program

GROUND OBSERVER DATA COLLECTION SHEET

Post No. B-1 Terrain Rolling

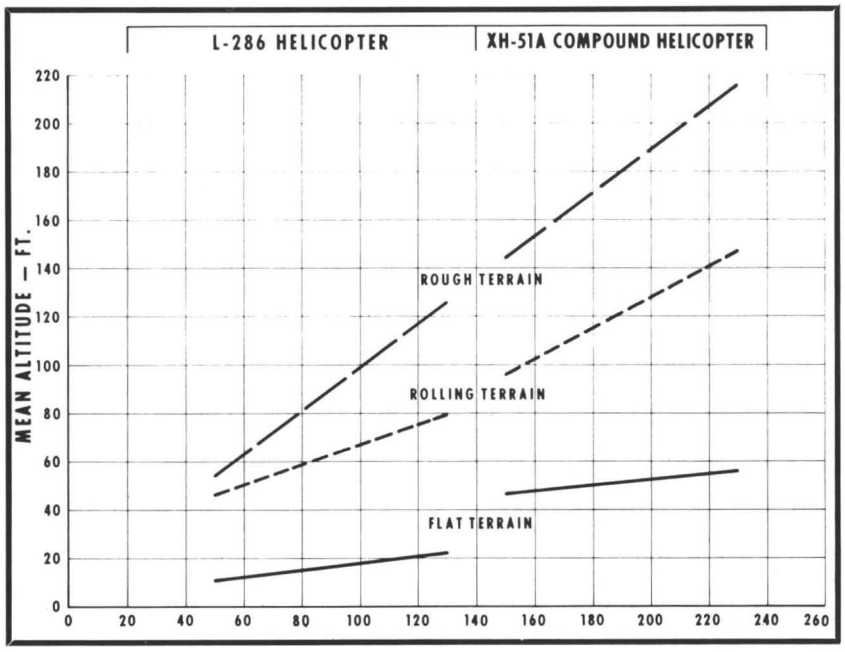
Observation No.	Test	Flt	Pilot	Time of Day	Length of Time Heard ~ Sec	Length of Time Seen ~ Sec	Shortest Distance Away ~ Meters	Altitude Above Ground ~ Ft	Direction of Flight	Comments Time To Come Abreast ~ Sec
1 (1A)	638	844	B	0917	180	94	50	50	W-E	78 *
2 (2A)	639	845	C	1124	128	130	250	50	W-E	70 *
3 (2B)				1144	80	83	250	50	W-E	50 *
4 (3A)	640	846	A	1315	75	90	250	20	W-E	40 *
5 (3B)				1334	66	64	250	20	W-E	44 *
6 (4A)	641	847	B	1435	67	89	50	20	W-E	60 *
1 ●				*Aircraft masked and out of sight for 30 + 20 + 10 + 12 = 72 sec.						
2 ●				*Aircraft masked and out of sight for 7 + 26 = 33 sec.						
3 ●				*Aircraft masked and out of sight for 12 + 10 = 22 sec.						
4 ●				*Aircraft masked and out of sight for 12 + 7 = 19 sec.						
5 ●				*Aircraft masked and out of sight for 8 + 12 = 20 sec.						
6 ●				*Aircraft masked and out of sight for 12 + 13 + 4 = 29 sec.						

* Write appropriate comments on reverse side

Signature _____

Figure 4
Sample Ground Observer Data Card

Figure 5
Mean Altitude vs Mean Airspeed



The rough and rolling terrain observer stations were located on a hill and, as previously mentioned, both aircraft were required to pass within 300 yards of the base station.

Both aircraft approached the ground observer's base station by flying in the valleys. The XH-51A was able to utilize the J-60 auxiliary thrust to climb out of the valleys and fly directly pass the base station. However, without benefit of auxiliary thrust and an effective wing the L-286 was required to fly further down the crest of the hill without sacrificing airspeed. This more devious route significantly increased the time seen, especially for the rough terrain corridor (see Figure 7).

CONCLUSIONS. Based on these nap-of-the-earth flight test results with the XH-51A compound helicopter and L-286 helicopter, it is concluded that:

- It is possible to fly nap-of-the-

earth at true airspeeds between 50 and 225 knots over the flat and rolling terrain corridors.

- Nap-of-the-earth flight can be accomplished over the rough terrain corridor if the airspeed is varied to suit the ground contour.
- At an airspeed of 50 knots over rough terrain, there is a tendency for the pilots to wander and lose their sense of direction.
- The time the aircraft is seen by ground observers decreases as airspeed increases.
- Aircraft maneuverability and controllability are acceptable at all test conditions.
- Air turbulence causes the pilot to increase terrain clearance altitude to provide necessary margin of safety.
- Nap-of-the-earth flight can be maintained more easily over a familiar area. Knowledge of terrain features and obstructions aids low altitude flying, while unfamiliar areas impose a higher pilot workload.
- Good cockpit visibility is needed for visual nap-of-the-earth flight.
- Nap-of-the-earth flight is fatiguing to the pilot and increases his workload.

The results of these nap-of-the earth flight tests demonstrate that the ability of a helicopter, "pure" or compound, can be improved by varying airspeed to follow terrain contours more closely.

Since altitude above the terrain increases with both airspeed and severity of the terrain, it is more suitable to choose an airspeed that allows maximum concealment from ground observation, yet provides minimum enroute time to the objective.

These results also seem to indicate that helicopters with auxiliary forward thrust capabilities not only can operate at higher speeds but are also better suited to nap-of-the-earth flight than conventional helicopters.

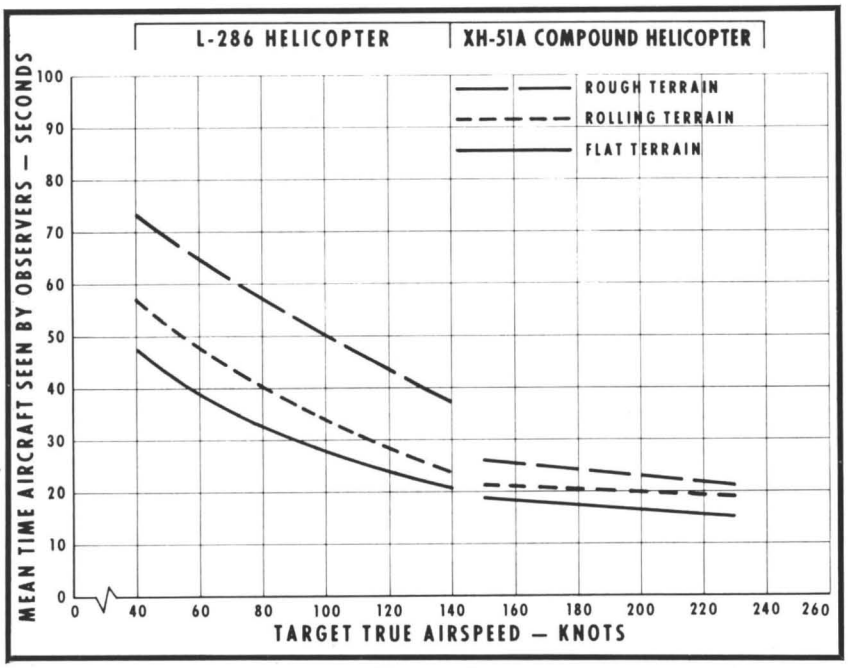
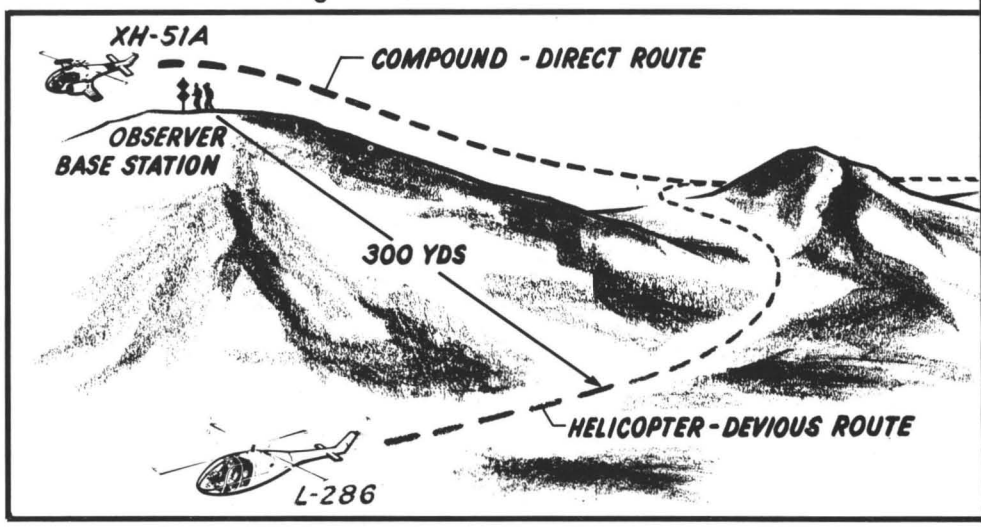


Figure 6
Mean Time Aircraft Seen By Observers vs Airspeed

Figure 7
Flight Path Differences



The conventional helicopter experiences severe attitude changes when maneuvering, and large cyclic control motions are required to achieve the desired match of rotor lift and forward thrust. However, in the compound helicopter, auxiliary thrust provides the capability of accelerating or decelerating the aircraft without an attitude change.

At the lower and intermediate airspeeds, main rotor lift may be used to supplement cyclic maneuvering and also provide additional acceleration or climb capability. Hence, with the aid of auxiliary thrust the compound helicopter can operate at higher airspeeds and is more maneuverable.

REFO

REFORGER IS AN acronym
Forces from Germany." I
agreement of the North Atlant
send 35,000 U.S. Army and A
nate bases in the United Stat
mitted to NATO. Under this p
would return to Europe annu

In February, in Exercise Re
soldiers from units based in t
military training maneuvers in

The exercises, which began
jected series of annual exercise
units based in Germany. The
ficiency in operating procedur
ments pertaining to the Europe

The overall exercise began
States to European locations
distribution of equipment, the
at Grafenwoehr.

The military exercises were
of the U. S. European Comm
General James H. Polk, comm
Europe and Seventh Army, dir

WO1 J

General W. C. Westmoreland, Army chief of staff, looks through an observation scope at a gunnery range at Vilseck training area in Germany prior to the start of Reforger I exercises. With General Westmoreland is Lieutenant General Donald V. Bennett, commanding general, VII Corps, U. S. Army Europe

DURING REFORGER I, the giant training exercise recently conducted in the Grafenwoehr and Hohenfels areas of West Germany, the mission of operating all air traffic control facilities was assigned to the 14th Aviation Company (ATC).

The exercise was conducted to test the dual-based NATO concept of troop deployment and to introduce to Europe new airmobile assault techniques which were de-

RGER I

from the phrase "Redeployment of
1967, the United States, with the
ic Treaty Organization, decided to
r Force military personnel to alter-
s, where they would remain com-
lan, some of the redeployed units
lly for military exercises.
orger I, about 12,000 U. S. Army
e United States completed major
Europe.
in January, were the first in a pro-
s for these units and for some other
were designed to maintain pro-
s and to deal with special require-
an Theater.
with the airlift of troops from the
where equipment is stored. After
troops participated in field tests

sponsored by Commander-in-Chief
and, General Lyman L. Lemnitzer.
nander-in-chief of the U. S. Army,
ected the exercises

ack D. Jory

Top: One of the helicopters that arrived from the United States, this Cobra was assembled at Rhein Main Airbase to be used during Exercise Reforger I. The AH-1G is the Army's attack helicopter that has proven so successful in Vietnam. Below: M-60 tanks move by rail from the Seventh Army training center at Grafenwoehr, Germany, to the maneuver area

veloped in the Republic of Vietnam and the United States.

In addition to Reforger I, the "Fighting 14th" took part in the related exercises Carbide Ice and Pegasus as well as operating Vilseck Army Airfield for all three exercises. Vilseck is located on the southern edge of the Grafenwoehr training area. This area was devoid of all equipment prior to the exercise and the 14th had to move in and assemble all the equipment to

Among the troops were Vietnam veterans experienced in airmobile operations

make it a fully instrumented airfield.

The equipment and facilities involved were a portable tower, a flight operations center (FOC), a telephone switchboard, a high freqency radio, a non-directional beacon (NDB), a ground controlled approach radar (GCA), a base operations facility and various support equipment such as power generators, portable heaters and maintenance shops for all equipment. Also, the company operated a 250 man mess hall for its own men and for headquarters personnel of the 15th Combat Aviation Group, the 14th's parent unit.

The 14th also operated:

- a second flight operations center and high frequency radio facility at Hohenfels,
- a mobile combat team including a portable control tower and non-directional radio beacon in the training area,
- an operations section at Grafenwoehr Army Airfield,
- a radio relay site at Amberg,
- a radio relay site at Roetz,
- an Army border camp near the Czechoslovakian border.

The two radio relay sites were established to insure radio communications between aircraft and the air traffic control facilities at Vilseck and Hohenfels.

The base operations facility at Vilseck included a ramp control team which coordinated refueling, maintenance, VIP transportation and aircraft parking for the 114 helicopters stationed at Vilseck. The operations section conducted daily briefings for all pilots to make them familiar with local flying rules and regulations.

No operation of this size would be complete without crash rescue and a security platoon. The operations section set up and operated both functions at Vilseck. A crash rescue team consisted of four complete fire companies, three ambulances, three UH-1B medical

There are five different aircraft on this airfield used in Reforger I. Can you identify them?

evacuation helicopters and two U. S. Air Force HH-43 fire fighting helicopters.

The Flight Operations Center at Vilseck had the mission of controlling the flight following all of the aircraft in the exercise area as well as transient aircraft. This area covered more than 4,000 square kilometers of airspace. The center operated 24 hours a day, seven days a week throughout the exercise and was responsible for all aircraft below 4,000 feet.

The FOC at Hohenfels was responsible for aircraft flying in one area of the exercise and functioned as a backup center for the facility at Vilseck which went off the air twice due to power failures. There was no break in control during these power failures. These incidents pointed up the necessity of having back-up facilities available during any large scale operations such as the one just concluded.

Vilseck center handled over 5,000 individual flights during the exercise which lasted from 29 January through 4 February. One of the most important functions of the center during this period was to advise Army helicopters when high performance aircraft were in the area. The USAF was flying F4C jets in the Reforger I training area every 20 minutes from 0200Z to 2300Z each day in support of the Army ground forces.

The Mobile Combat Team, a name which originated with the 125th ATC in Vietnam, established a portable control tower and a radio beacon in the section of the Grafenwoehr training area where the airmobile demonstration was held 1 February. This team was responsible for controlling all aircraft taking part in the demonstration. The airmobile demonstration was code named PEGASUS and included AH-1G, CH-34, CH-47, CH-54, UH-1B, UH-1D, UH-1H, OH-6 and OH-13 aircraft.

The 14th ATC is one of three air traffic control companies in the Army. The others are the 72nd ATC at Ft. Rucker, Ala., and the 125th ATC in Vietnam.

The mission of the 14th is to flight follow and control all Army aircraft in USAREUR and Seventh Army including those aircraft which fly within the Air Defense Identification Zone (ADIZ). The ADIZ was established to prevent Army aircraft from crossing the border into one of the Communist block countries which border on West Germany.

Six air traffic control facilities are operated by the 14th and several new sites are in the planning stage. Three of these facilities are located within the ADIZ. These three—Carlile Radio at Fulda, Gordon Radio at Bayreuth and Laramie Radio at Regensburg—provide the necessary flight following and positive identification for all aircraft which penetrate the ADIZ.

The ATC experience gained in Vietnam by many of the "Fighting 14th's" personnel was instrumental in aiding the unit in their task of establishing and operating all facilities for the exercise while at the same time maintaining day-to-day operations at the six other locations.

German Hueys participated in Reforger I

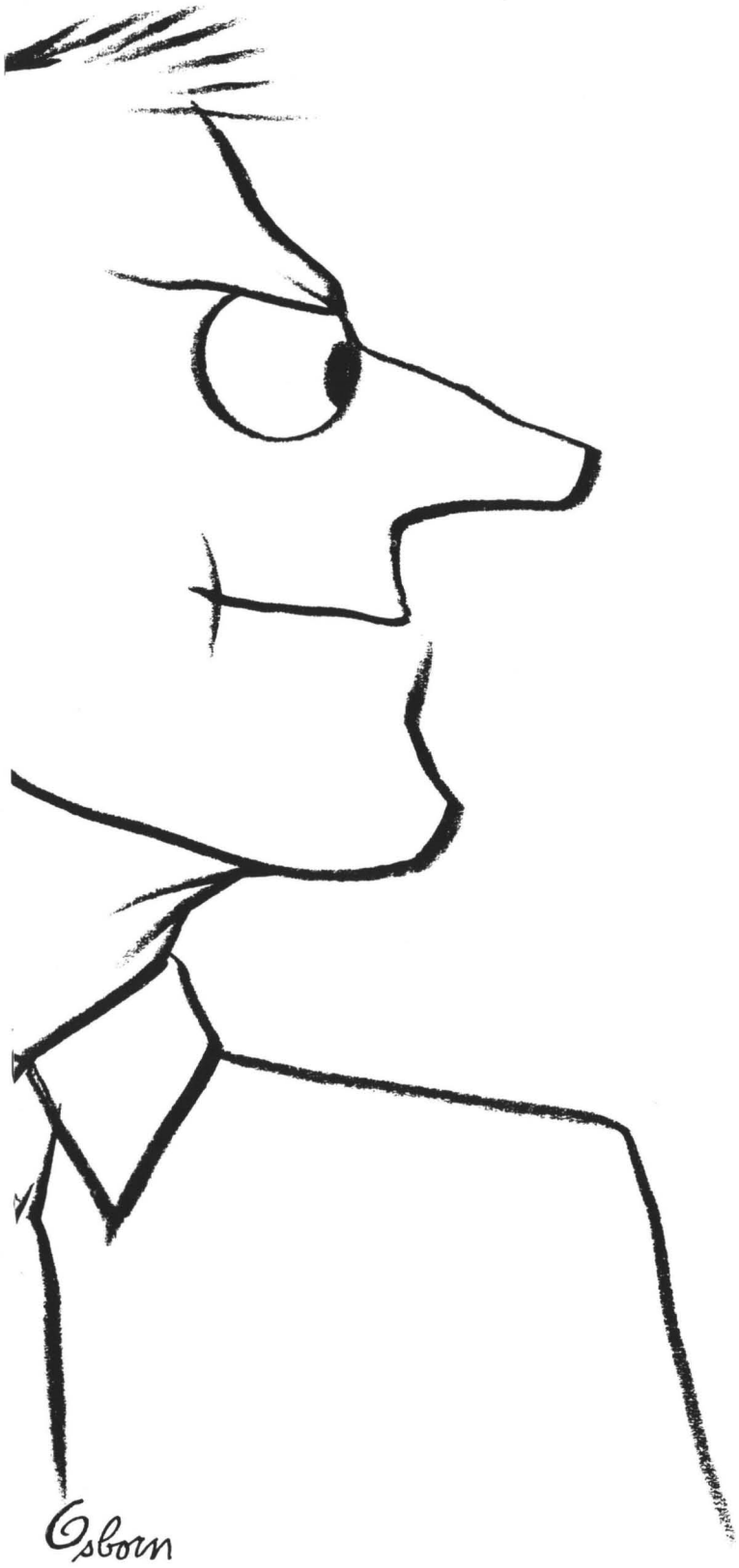
crash sense

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

Adapted from
DA Pamphlet 95-3
November 1959

HUMAN SENSE

Major Chester Goolrick



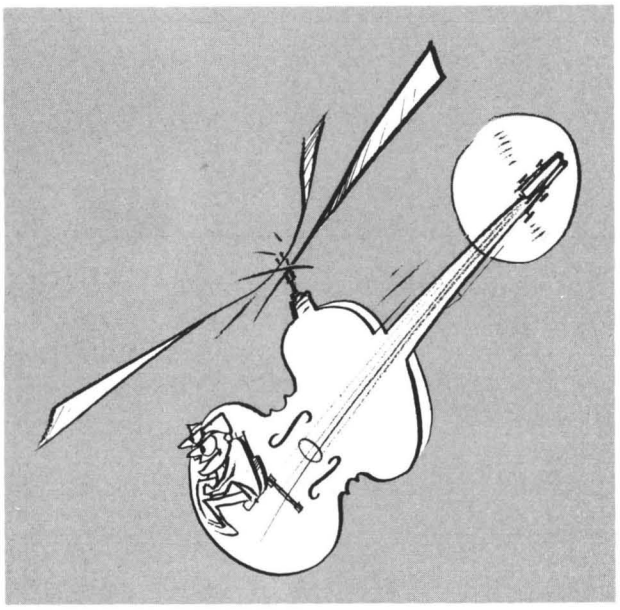
UNDER ABSOLUTELY IDEAL conditions, a pilot is as finely tuned as a good violin and a joy to one and all. Old Stradivarius Cloudman whips around up there with the finesse of Fritz Kreisler sawing away with his magic bow.

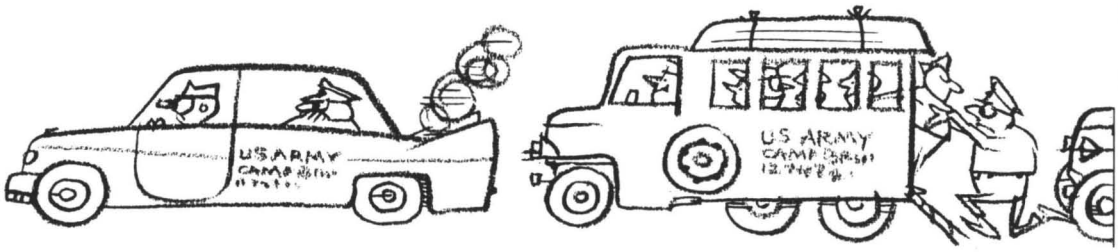
It would be dandy if this were always true. The trouble is, a pilot is a human being just like everybody else and human beings get out of tune as easily as a violin, even Kreisler's. And it doesn't take a broken leg or a heart attack to put a man out of whack or off his feed. One morning, for no apparent reason, he wakes up feeling flatter than the guitar in a fourth-rate band.

A pilot gone slightly sour needs a tuning job immediately. If he doesn't get one, he may provoke squawks from all directions by landing on Joe Doakes' chicken house instead of the strip he was aiming for, or plunging three counties into complete darkness by dragging down several miles of high-tension wire. The din is terrific.

When such events take place, dozens of people converge on the scene to launch an investigation that would make Sherlock Holmes reel with admiration. The aircraft is pieced back together, witnesses are questioned, weather charts are consulted. If he happens to be available, the pilot has his brains thoroughly picked. Every stone for miles around is turned at least once. And all too often the investigators can only pack up their statistics and move on, dolefully muttering "Pilot error."

Pilot error?





There is more here than meets the eye. The investigators know that as well as anyone else. The term is a large one and covers certain mysteries of human behavior.

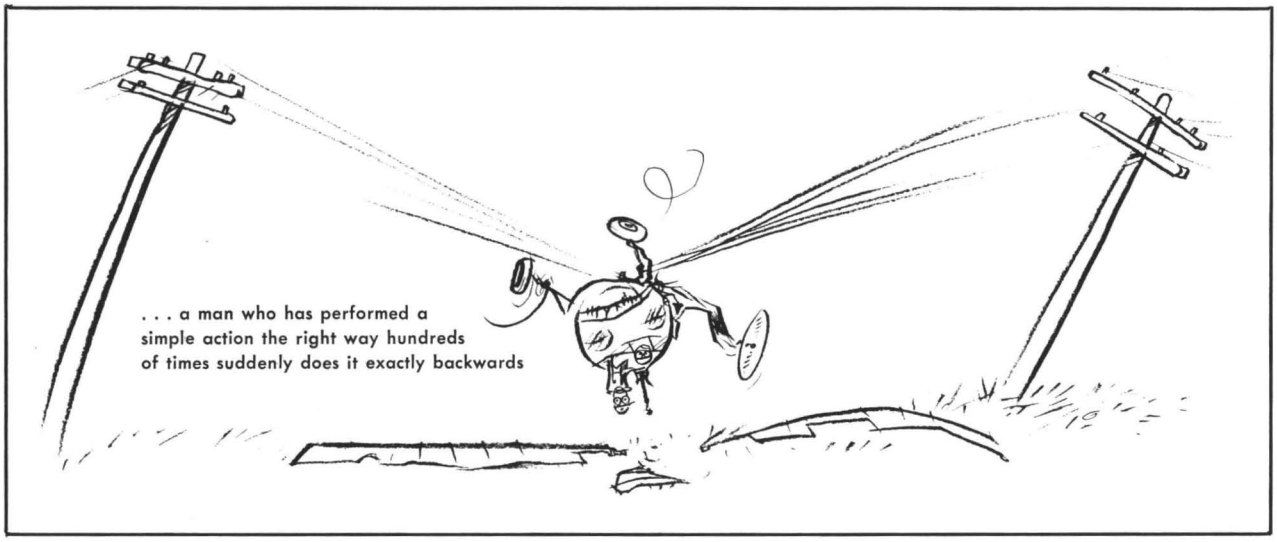
SAY AGAIN

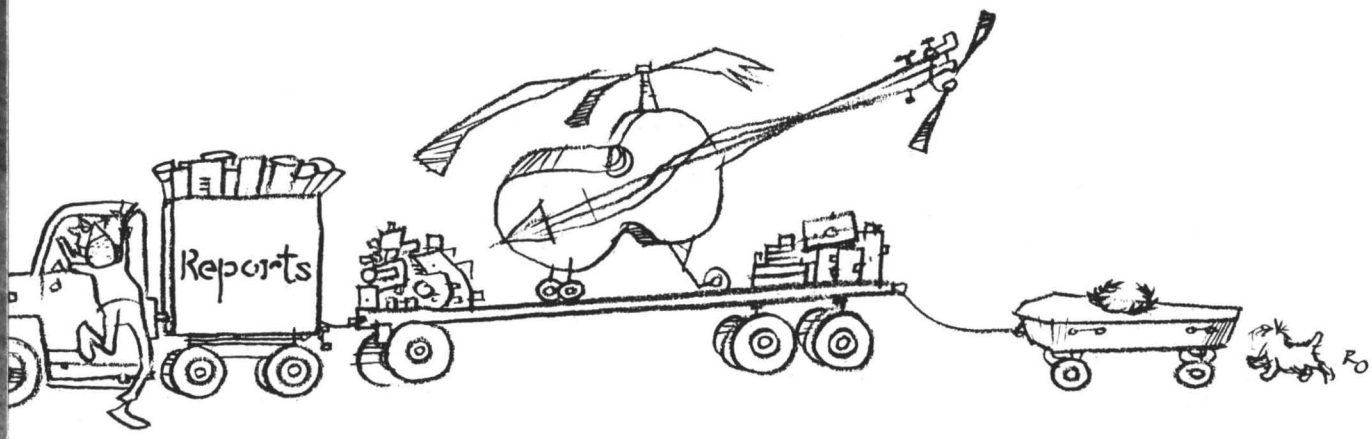
Is simple ignorance pilot error? Obviously, if you install Elmer Snodgrass, National Plowing Champion of 1956, behind the controls of a helicopter, something pretty awful will happen. Tussling with tractors is Elmer's cup of tea, but helicopters are plain poison. No matter how hard he struggles to keep in the air, he can't manage, at least not for long. So he is not guilty of pilot error. The fault lies with the fellow who allowed Snodgrass to try.

An error can be committed only by a man trained to know better. Experts sometimes refer to this kind of error as the "human factor" behind accidents; *everything* the pilot did or failed to do that led to the crash. And *why*.

The *why* is often the mysterious part. Many times the pilot can't say *"why"* himself; if he could, he wouldn't have crashed in the first place. But here is the cold truth: a man who has performed a simple action the right way hundreds of times suddenly does it exactly backwards. An old hand who could fly a barn door if he really put his mind to it fouls up on final and strips the landing gear from his aircraft. What goes on here?

One answer is that accidents involving the human factor occur when the human machine at the controls is not functioning the way it should. It's out of tune, running a little rough, developing a ping. Nothing really wrong, you understand, and nothing that can't be easily fixed. But ripe for the conditions investigators have to label "pilot error."





The medics, the CO, the instructor, the other lads in the outfit can easily spot a man in the clutches of chilblains, whooping cough or the seven-year itch. No trouble at all. Pilots with such ailments are kept on the ground until cured. But spotting the man just slightly out of whack, ready for one of those sudden reversals of form that confuse everybody, is not quite so simple. He may be out of tune

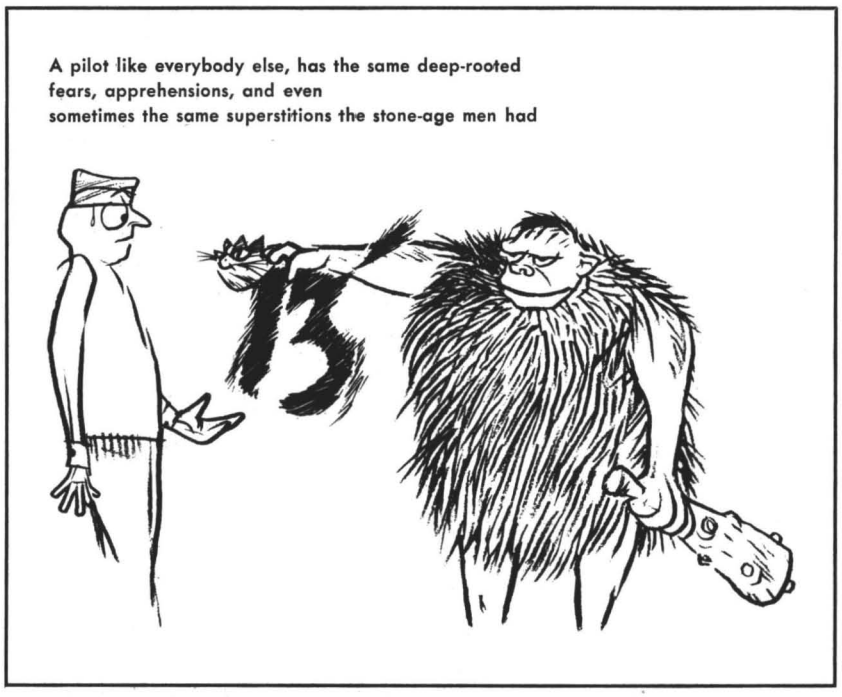
1. physically
2. emotionally or
3. both and

the naked eye sees nothing. He may act cheerful as a chipmunk and yet be gnawed on by money problems or the state of a sick child. Or be ready to blow his top because the in-laws are running him into the ground and still look as serene as a poker player with four aces.

The human being is a complicated critter and some emotional disturbances are brought on by causes so deep a pilot doesn't even know they're there. All of us are constructed out of such a mass of instincts, fears, anxieties, resentments, frustrations, reactions and desires that it's a wonder we operate at all; or have sense enough to roll over. But we do and we usually make out all right. Still, if one of these inner anxieties gets out of hand, maybe without our even being conscious of the same, we can be in for trouble.

Take this matter of flying. For all of us, it's an "unnatural" act. Man is a creature of the land, designed to operate on the surface of the earth. Put him in a submarine, keep him under water too long and he gets the fidgets. Hoist him as much as two feet in the air and he's out of his element—uneasy. He may get used to being airborne in time but will never be fully at home aloft. Like everybody else, he is a descendant of men who lived in caves and carved out a living, hunting with stone axes. He has the same deep-rooted fears, apprehen-

A pilot may be cheerful as a chipmunk and yet be gnawed on by money problems . . .



A pilot like everybody else, has the same deep-rooted fears, apprehensions, and even sometimes the same superstitions the stone-age men had

sions and even sometimes the same superstitions the stone-age men had. Of course Oog the Caveman would be scared stiff in a UH-1. What's hard for us to face up to is that we all share a touch of the same natural fear or apprehension about being up there with the birds.

Older pilots know this uneasiness is just something that has to be lived with. Placed in proper perspective, it turns into healthy caution, a respect for the peculiar problems of flying. They also know this uneasy feeling can assume such proportions it clouds a man's judgment. So far as the Army knows, few recorded accidents can be laid directly to downright fear of flying, but there is no way of telling how many young pilots right now are repressing an abnormal apprehension that may someday bring them to grief. The uneasiness turns into the freezing kind of fear that causes the sudden reversal or brings on the one false move that upsets all the right moves a man has been trained to make.

A sudden emergency can pop repressed fear into catastrophic results. Helicopter pilots have the importance of rotor rpm drummed into them from before they set foot in a chopper until they draw their first retirement checks. All know there is only one place for the collective when the engine stops upstairs. But how many forced landings have been upgraded to major accidents because of low rotor rpm? Don't bother removing your boots—you'll need an adding machine.

So the inexperienced pilot trying to sit on an outsized sense of fear needs to do a little leveling. He ought to ask himself why he became a pilot in the first place. After all, there's nothing shameful in the simple fact that some people are no more suited to flying than others are to playing the tuba. A pilot who confesses he's a flyer principally because the pay is better or because he wanted to avoid assignment to the 187th Messkit Repair Battalion owes himself some strong second thoughts. *No man ought*

The inexperienced pilot trying to sit on an outsized sense of fear needs to do a little leveling. He ought to ask himself why he became a pilot in the first place

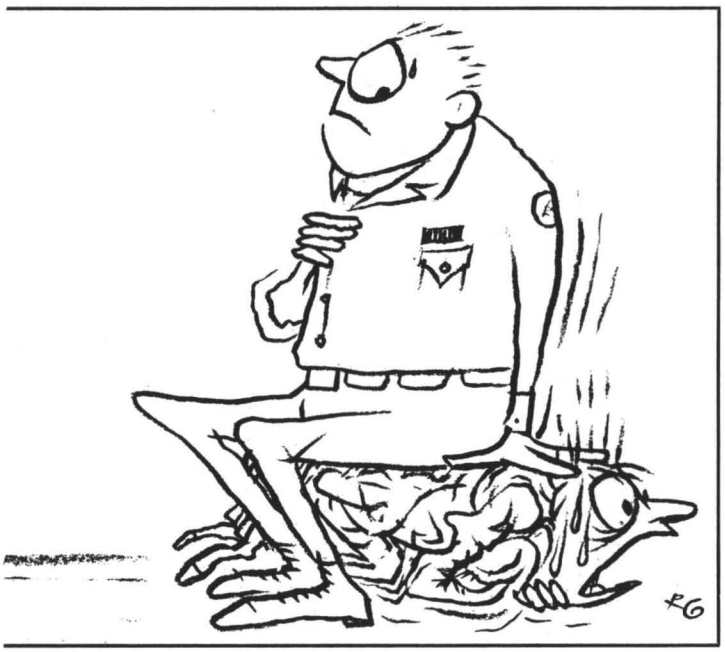
to *fly unless, deep down, he really wants to.* The pilot who basically dislikes flying but insists on sticking with it is very likely to be the one who pushes the wrong button, yanks the wrong lever or just plain chokes up when the going gets rough. He's not a coward, just a fellow in the wrong line of work.

A perfectly normal respect for the abnormal situation of being off the ground makes a better and safer flyer out of practically anybody, that's for sure. But once let that respect develop into outright fear and fail to face up to it honestly and real trouble is on the way.

SCAT, CAT!

Our beetle-browed ancestors also handed down to us a number of superstitions, some of which may have had a certain amount of horse-sense behind them at the time. In our enlightened age, superstition is supposed to be as out-of-date as the high-wheeled bicycle, mustache cup and rain dance. Is it? How many people really like to light three on a match? Who doesn't go out of his way to avoid walking under a ladder? How about that black cat—just as well for him to turn out of our path, right?

A curious fact about superstition is that you don't actually have to believe in one to have it affect your actions. An Army pilot lost two of his friends in closely-spaced accidents. They had gone through school together and were a kind of team. Now the pilot knew that stuff about accidents happening in threes is strictly stupid—and in theory he was having none of it. Still, his flying mates noticed he was



A pilot who confesses he's a flyer
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No man ought to fly unless,
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becoming moody and withdrawn and his ability deteriorating almost visibly. In spite of himself, he was becoming obsessed by the idea his number was up, superstition or no superstition. Coming in for a routine landing one day, he overlooked a fence running across the end of the strip and snagged his underpinnings. Luckily he got out with only a few bumps and scratches but his lapse could have made the it-happens-in-threes mumbo-jumbo come true.

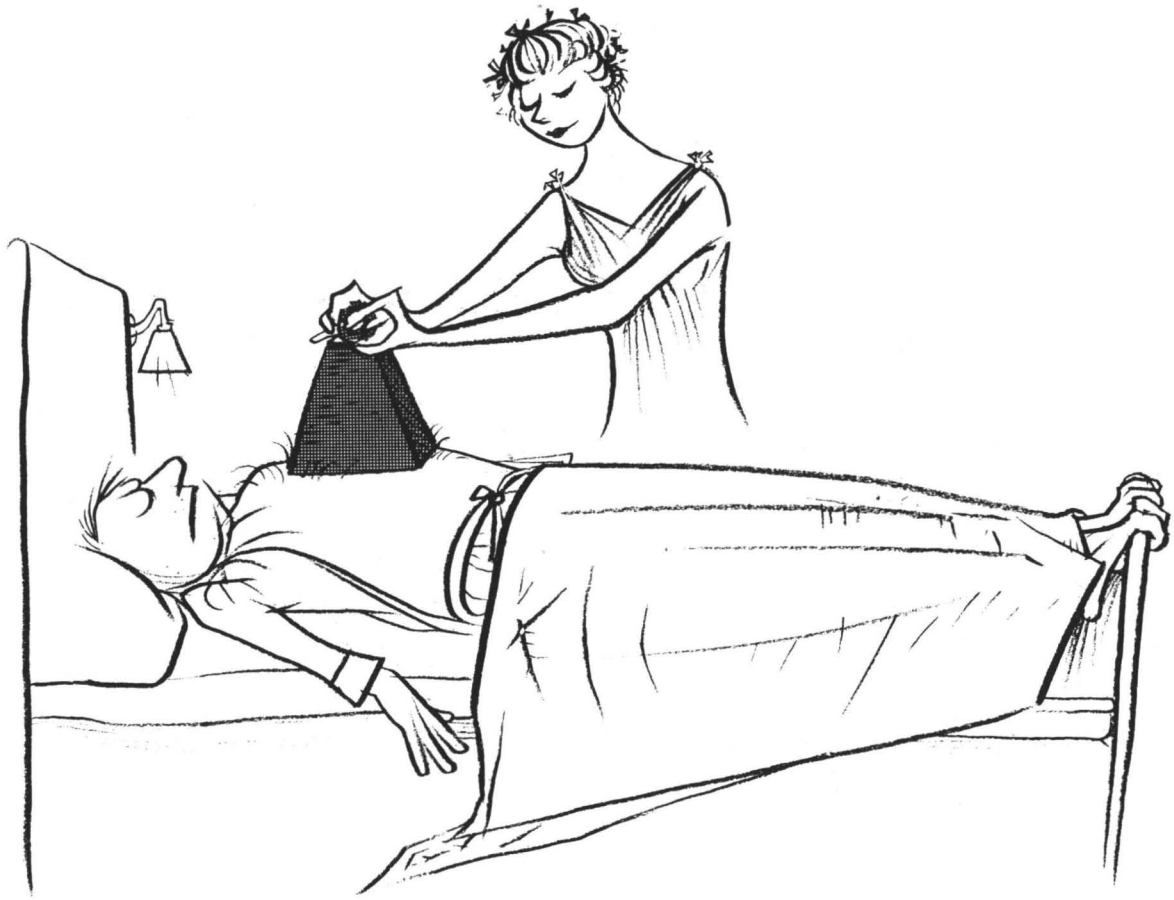
That pilot was not really superstitious; under normal circumstances, in fact, he was a more level-headed fellow than most. What happened, apparently, is that he allowed his natural grief to affect his judgment so that gradually plain raw emotion took over. Chances are that if this unhappy fellow had had the good sense to tell *somebody else* what was eating on him, the whole affair might never have happened. Bottled up emotion and weird ideas can grow in the human mind. That pilot may have been trying to make the old superstition come true.

Nobody wants Army pilots to turn themselves into do-it-yourself flight surgeons or psychologists.

True. Nevertheless, a capacity for mature self-appraisal is a valuable asset, a very important part of which is knowing when the time has come to go to somebody else for aid and comfort. No grown man is really afraid to ask others for help.

Pilots upset by genuine fear of flight or haunted by old superstitions are rare. People, pilots included, with some sort of trouble, great or small, are not. Any gnawing little fear or anxiety can grow to absurd dimensions unless a fellow does something about it. The thing to do, of course, is to *tell somebody*. A curious truth is that the strong, silent fellow is very often the first one to fly all to pieces or find his blood pressure shooting 'way out of sight because he feels it's a weakness to get something off his chest.

Bottled up emotion and weird ideas can grow in the human mind. The thing to do is to tell somebody, and the first person a man ought to turn to is his wife



The very first person a man troubled in body or spirit ought to turn to is his own wife. More on this shortly.

Unfortunately, some Army pilots have no wives and many who do find themselves separated from their better halves by 10,000 miles. We repeat—the thing to do is to tell *somebody*. Unless you are completely isolated, there are friends, fellow crewmembers, roommates (or tentmates) and others within earshot. While you may consider these poor substitutes for a wife (Amen!), they can and most will lend a sympathetic ear, *but only if you tell them.*

For those who can, our advice is . . .

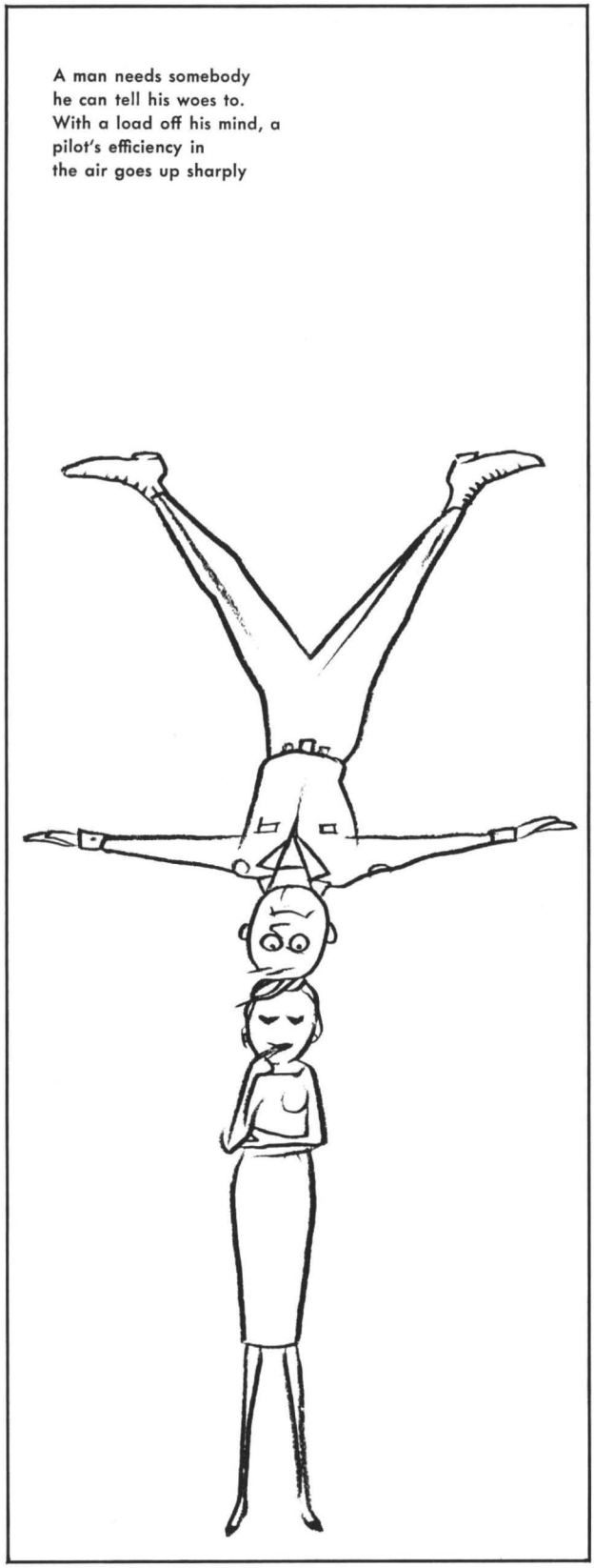
GET A KITCHEN MECHANIC

The pilot who has acquired a good kitchen mechanic can count his blessings. In fact, if there were any way of doing it under the Constitution, the Army would probably insist that all pilots get married as a prerequisite to earning their wings. Actually, except for a scattering of resolute women-haters, nearly all Army pilots *do* get married and a good thing it is.

No woman can live with a man very long without getting to know him fairly well. His whims and quirks—he prefers bow ties and likes to spread chocolate syrup on salami and rye sandwiches—become a part of her storehouse of knowledge. She becomes the world's leading expert on one subject, her husband.

A good mechanic can cock an ear at an aircraft engine and tell immediately if it is out of whack. A good kitchen mechanic can listen to her husband for a while, or watch him moping around the house, and tell that he's not in top shape either. Not only that, but, like the aircraft mechanic, she knows what to do about it.

A man needs somebody he can tell his woes to.



Worry causes confusion. Confiding usually brings relief. With a load off his mind, a pilot's efficiency in the air goes up sharply. So an experienced wife spends more of her days listening than her husband will admit. If you log a typical Army wife's listening hours you've got more time each month than it takes to fly a U-1A from Rucker to Rangoon.

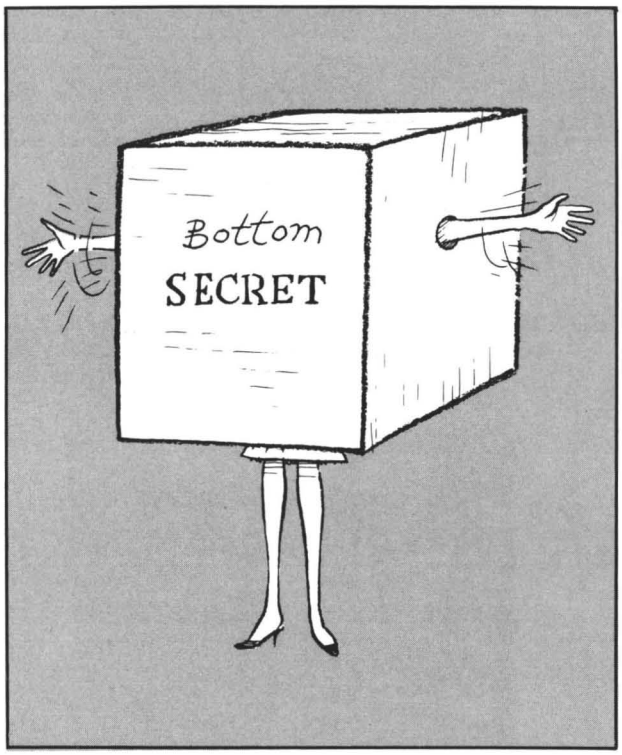
She learns early, too, that her job is just about as complex as her husband's. It has at least four separate functions:

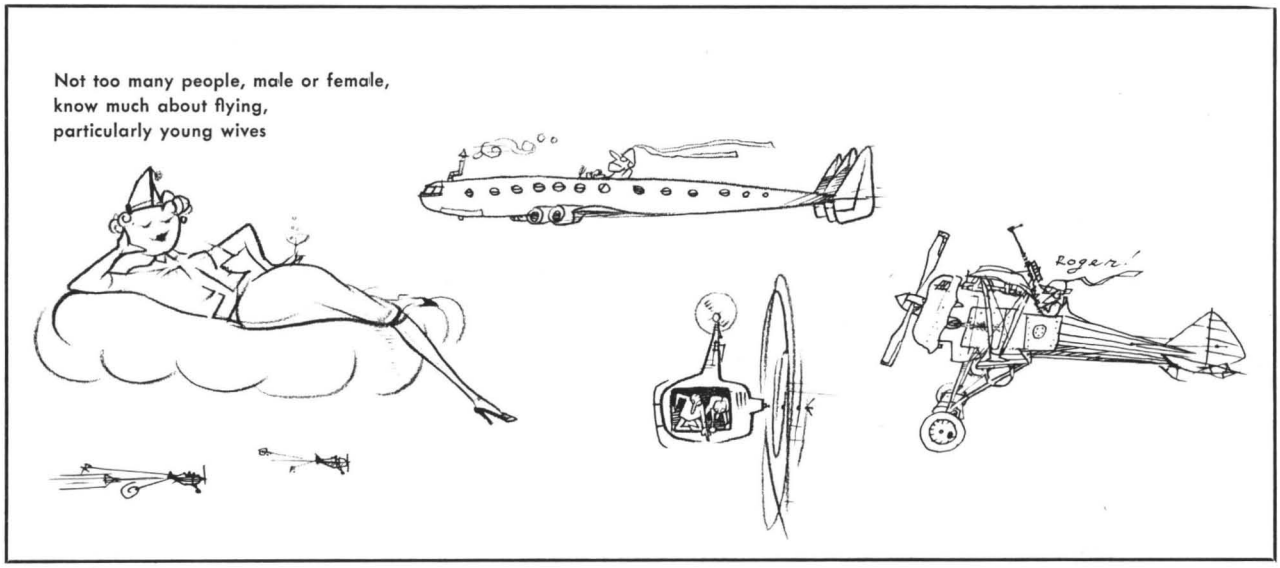
1. Providing a well-run, happy home,
2. Keeping the lad in tune,
3. Encouraging him to do his best, and
4. Understanding the nature of an Army pilot's job.

UNCLASSIFIED STUFF

Most of the time, when a wife doesn't understand what her husband is doing, it's not her fault. After all, she can't go to work with him. So, if he chooses to clam up about his job, she can spend considerable time speculating whether he's managing a parakeet farm or maybe counterfeiting three-dollar bills, a very poor recipe for a contented wife or happy home. That is, unless she plain doesn't care, which won't help either. Most wives *do* care, very much, and lucky the man with sense enough to let his wife help him.

Not too many people, male or female, know much about flying, particularly young wives. Many of them have not so much as set foot in an aircraft. Their notions of flying are derived from old television

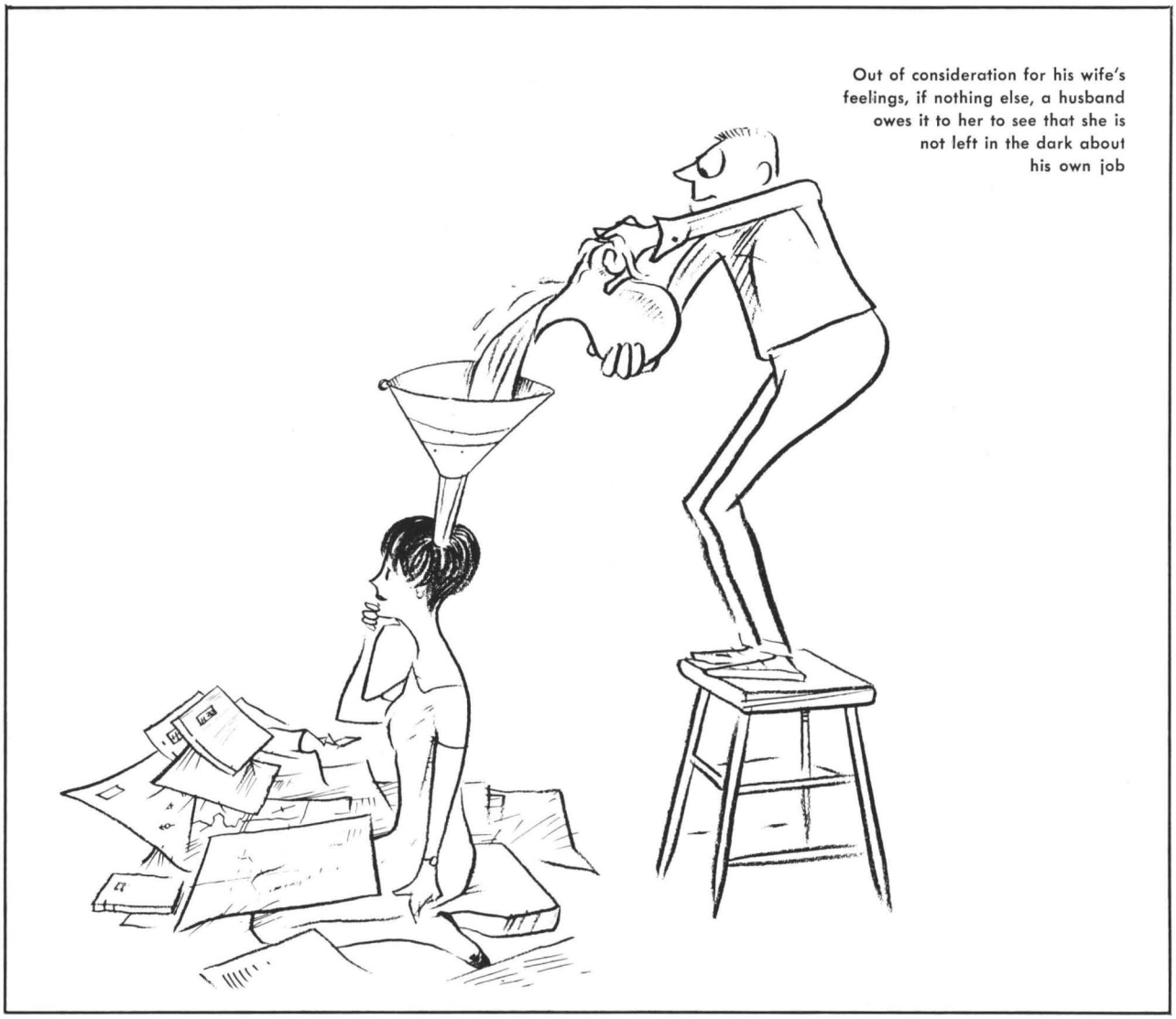




movies, magazine articles about airline hostesses and an occasional glimpse of the nonstop Stratocruiser to L.A. The young wife may be dimly aware that her husband's job is (a) glamorous and (b) dangerous and why don't pilots wear those darling riding britches anymore? Or she may come fully equipped with the Wild-Blue-Yonder set of ideas. Her man goes down to what they call the flight line, climbs aboard, shouts "Roger" a few times to anybody standing around and zooms off for a nice morning sail through the skies. And she can't understand it when he comes home from work looking as if he'd spent the day digging ditches. (Can there be another woman?)

Indoctrination is in order, men. With help, a young wife quickly acquires a more realistic set of ideas, which is one reason the Army itself has stepped in. At many posts, new wives and wives of students will assure you, maybe a little grimly, that they have put in more hours of instruction and orientation, actual flying time aside, than their husbands have. They will also assure you that every minute was worth it.

Vast as its resources are, the Army can't do everything. Out of consideration for his wife's feelings, if nothing else, a husband owes it to her to see that she is not left in the dark about his own job. She doesn't have to know how to operate every gimmick



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When Bullfiddle arrives home he is met by a tale of woe that would wring the heart of Ebenezer Scrooge

in the cockpit, but she must realize what her husband's problems are. Take the case of one veteran pilot who didn't get around to marrying until fairly recently. *His* wife knows because he makes a point of preparing his flight plans at home. The first time she saw the floor of her living room strewn with maps and had a look at his flight log, she quickly gained a healthy respect for the problems of flying.

A wife properly checked out by a husband like that is an understanding wife, the kind to keep a stiff upper lip when he calls in from 500 miles out to say he's weathered in and won't be home until morning. She may be disappointed at missing the club dance, but you won't hear her complain. She's one wife who will never encourage her man to stick his neck out and try to beat the weather. She knows what happens to overstretched necks. That girl is a sound member of the family team because her husband has let her in on the tricks of his trade.

Unless a wife does know what is going on, she can't be expected to provide the kind of home a pilot needs.

CASA BULLFIDDLE

Be it ever so humble, there's no place like it but there are homes and homes. Take the one lived in by Second Lieutenant Rhett Bullfiddle and his little brood.

Bullfiddle is a darned good pilot—or would be if he ever got the chance. Most of the time he is so tired and jumpy he doesn't know whether he is flying an aircraft or driving a coal truck. He's about as out of tune as it's possible for a human being to get. Bullfiddle doesn't know it but he's suffering from chronic fatigue, and more than one good night's

rest is needed to repair him. Not that he's likely to get even that.

When Bullfiddle arrives home in the afternoon he is met by a tale of woe that would wring the heart of Ebenezer Scrooge. The washing machine has given up the ghost, the beagle has bitten the postman again, Junior sat on his glasses and the landlord has called up to announce a raise in rent.

Staggering under this burden, Bullfiddle sits down to a meal that develops into a losing battle to force the baby to eat its oatmeal. Dinner is followed by a trip to the club and another unsuccessful effort to win the grand prize, a 50-foot cabin cruiser. It is well past midnight when the last lights go out in the Bullfiddle household.

The next morning, Bullfiddle has to get up at five in order to be on the flight line by six. He tiptoes from the bedroom so as not to wake his wife, gulps a couple of cups of black coffee to get his motor turning over and goes off to work, already in the hole, kicking from behind his own goal line. "Pilot error" is lying in wait for him because he doesn't have enough fuel to push a perambulator, much less pilot an aircraft. (More about that later.)

What poor Bullfiddle needs is a *home*. He needs a placid atmosphere and an orderly household to come home to. He needs a wife who appreciates the fact that the world holds more than Bingo, however alluring the prize. He needs a wife who will get up in the morning and cook his breakfast for him to start the day right. He needs somebody who will share his worries with sympathy and understanding. He needs consideration.

A man who has those things is ready to fly. Not Rhett Bullfiddle. All he's ready for is trouble. Anybody in that lad's shoes is ready to build up a head of steam strong enough to blow his own top into orbit. Bullfiddle becomes vaguely discontented with his lot, a state the psychologists call developing a resentment complex. He's ready to snap a string, go flat and act mean, the same condition that makes a golfer bend a club around a tree because he has missed a putt or a driver bang a car with a monkey wrench because he has flooded the engine. The world is against him.

Now letting off steam by jumping on your hat or kicking a door is perfectly normal and usually doesn't make any difference. You can always get another hat or another door. But carrying this resentment complex (Bullfiddle Syndrome) behind the wheel of an automobile or into a cockpit is another matter. Safety experts believe it to be one of the great unknown causes behind highway accidents. The same may apply to flying. A man doing a slow burn inside is likely to wrench his flying machine around as if it were a bulldozer. In short, caution goes over the side. Then he's in trouble.

A few years ago a national magazine carried an article calling attention to this unhappy state in connection with auto crashes. The piece was entitled "Your Emotions Can Kill You." What applies on the highway applies in the air, doubled in spades.

Fatigue Resentment The World Is Against Him

THE LOWS

Though Bullfiddle's home life is fortunately an extreme case, all of us have days when it just doesn't pay to get up. Even in the best-ordered households, wives weep and strong men shudder. To start such a day, the baby wakes up with the heaves. The pilot hacks off an inch of skin when he shaves. The wife burns her hand in the bacon grease. And after snagging a fender against the garage door, the pilot is halfway to the field before he discovers he's left his ID card on the bureau. He should have stood in bed.

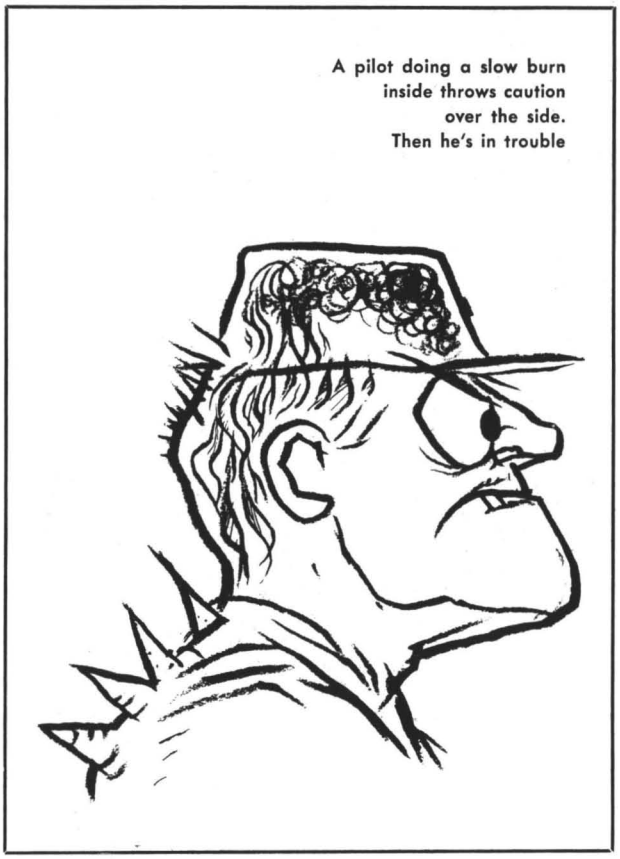
What to do? Well, a man visited so early in the morning by such a series of minor calamities ought to sit tight, take a couple of deep breaths and face the fact that this is not going to be his day. He applies the brakes. If he's going to live through this one, extra caution is strictly in order. He's just not up to the mark.

Since everybody is different from everybody else, there is no exact yardstick by which human beings can measure just how far off the mark they are. The man whose day has started off badly can only check the way he feels now against the way he *usually* feels and act accordingly. The point is to stop and take a long, cool look at the situation. This is no job for the flight surgeon. The pilot himself is the only one who can do it.

THE HIGHS

Even feeling too good can be bad. Has your mean, rich uncle in Seattle finally cashed in his chips and left you loaded? Has your wife just presented you with a strapping son? Have the powers-that-be recognized your merit and come through with a well-deserved promotion? All cause for rejoicing, sure, but the lucky flying man must keep a firm grip on himself or he'll turn into as much of an aerial cowboy as the sufferer from Bullfiddle Syndrome.

Have a care. Complacency or inattention, whether caused by weal or woe, can lurk behind the error that lies behind the accident. Nobody can put his finger on precisely how many major and minor crackups are caused by letting high spirits cloud the judgment but it is a safe guess that some of them are. Everybody admires the man who whistles while he works. The trick is not to let the whistling take up more attention than the job at hand.



A pilot doing a slow burn inside throws caution over the side. Then he's in trouble

DOWN TO EARTH

One definitely tough job for whistlers and non-whistlers is bringing the flying machine back to solid ground. Old stuff indeed. About the first lesson every budding pilot learns is that more skill and concentration are required to come down than to go up. Despite this, a good many accidents with the "pilot error" finger pointed at them take place under excellent flying conditions and in routine situations.

There's no real mystery about it either. Though every pilot knows the facts of life about touchdown, what he may not consider are the special physical and psychological factors involved that lower his capabilities and catch him off guard. In other words, he may be droopy as a stale begonia when he should be alert as a terrier as he gets around to what is often the roughest part of any flight.

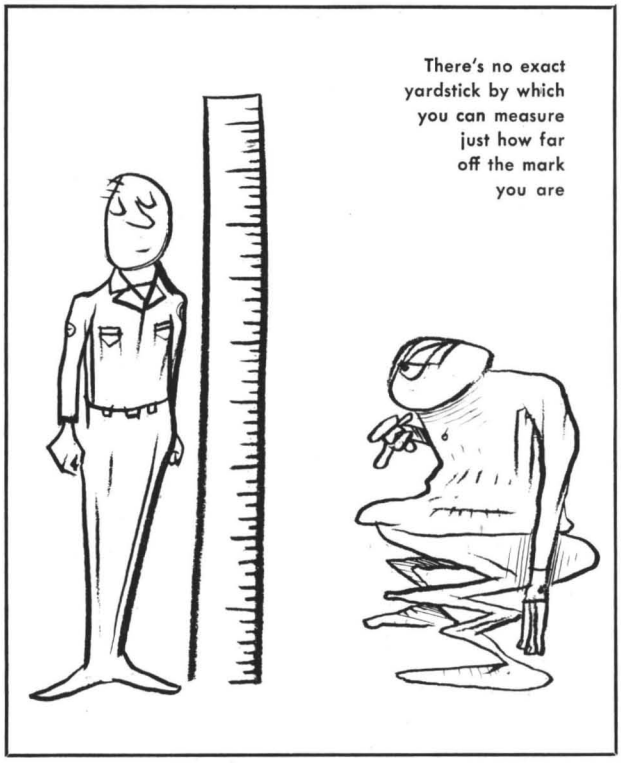
A fellow taking off in the morning for a fairly extended flight may not be at nearly 100 percent of his physical and emotional capability, but he won't even notice. Takeoff is no great strain or pain, requiring little more than 50 percent of his capability.

So up he goes. At altitude he tries some simple maneuvers. Still no strain; all he needs to exert is perhaps 30 percent. Now level flight for a while—a cinch, calling on no more than 20 percent. All seems well.

Our man flies for a couple of hours. And here's what the experts say—every second the flight goes on, he expends energy and lowers his capability. Toward the end of the flight, at the time when he needs to be at his peak, the pilot has narrowed the margin between what he *needs* and what he *has*. Landing may require 60 percent of his full potential or more, depending on conditions. And at this point our friend has left only 80 percent of what he started out with. So the gap is closing; he can't afford to play around. What's more, this deterioration of capability is not precisely measurable, varying wildly from one person to another.

Nobody escapes some sort of physical and mental erosion while flying. As you well know, long flights can be especially tiring and boring. Toward the end, with the field in view, a weary pilot's mind gets to wandering. He considers how pleasant it will be to get home again. He wonders if the little woman will be down there to pick him up and whether she remembered to pick up that thick steak she promised. With all these thoughts in his mind, he "lands," in effect, in the traffic pattern instead of on the strip or pad. *Crump*. Chalk up another victim of "pilot error." He was trying to set her down with 40 percent capability instead of 80, which doesn't figure.

Canny pilots bear in mind this interesting fact—no flight comes to an end until the aircraft has been put to bed for the night. Knowing how bushed they can be at the end of a long or strenuous flight, they guard themselves accordingly. Maybe some lads can land a crate with their eyes shut—the smart pilot opens *his* twice as wide.



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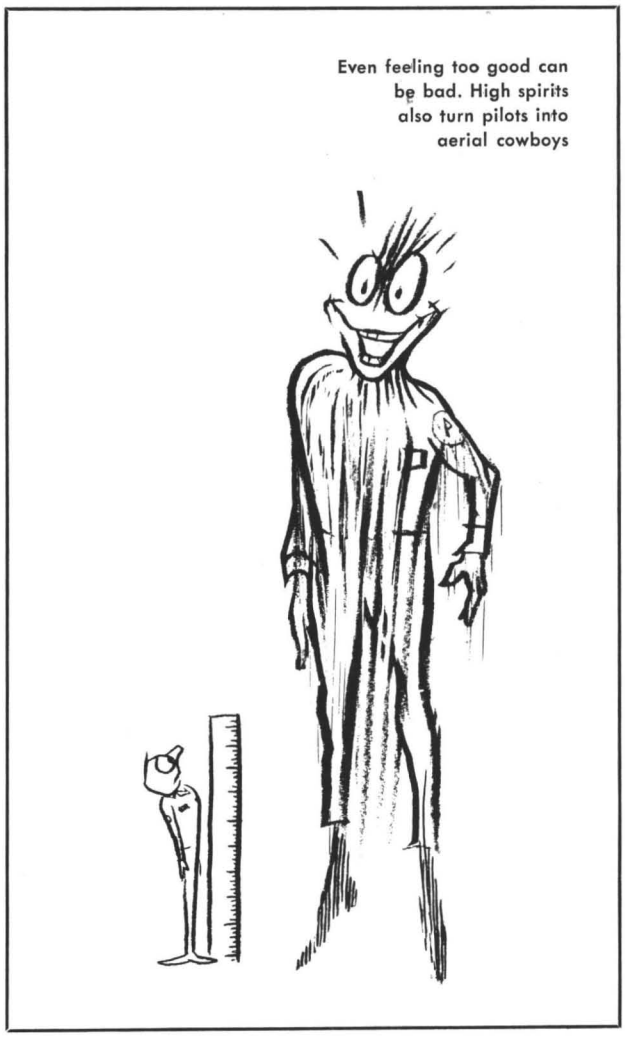


Even feeling too good can be bad. High spirits also turn pilots into aerial cowboys

FRESH OUT OF FUEL

What pilots eat, or fail to eat, is another major factor behind "pilot error" accidents. The carelessness of some folks, young and old, never ceases to amaze the medical men. What a man takes in, of course, is directly related to his efficiency as a human being.

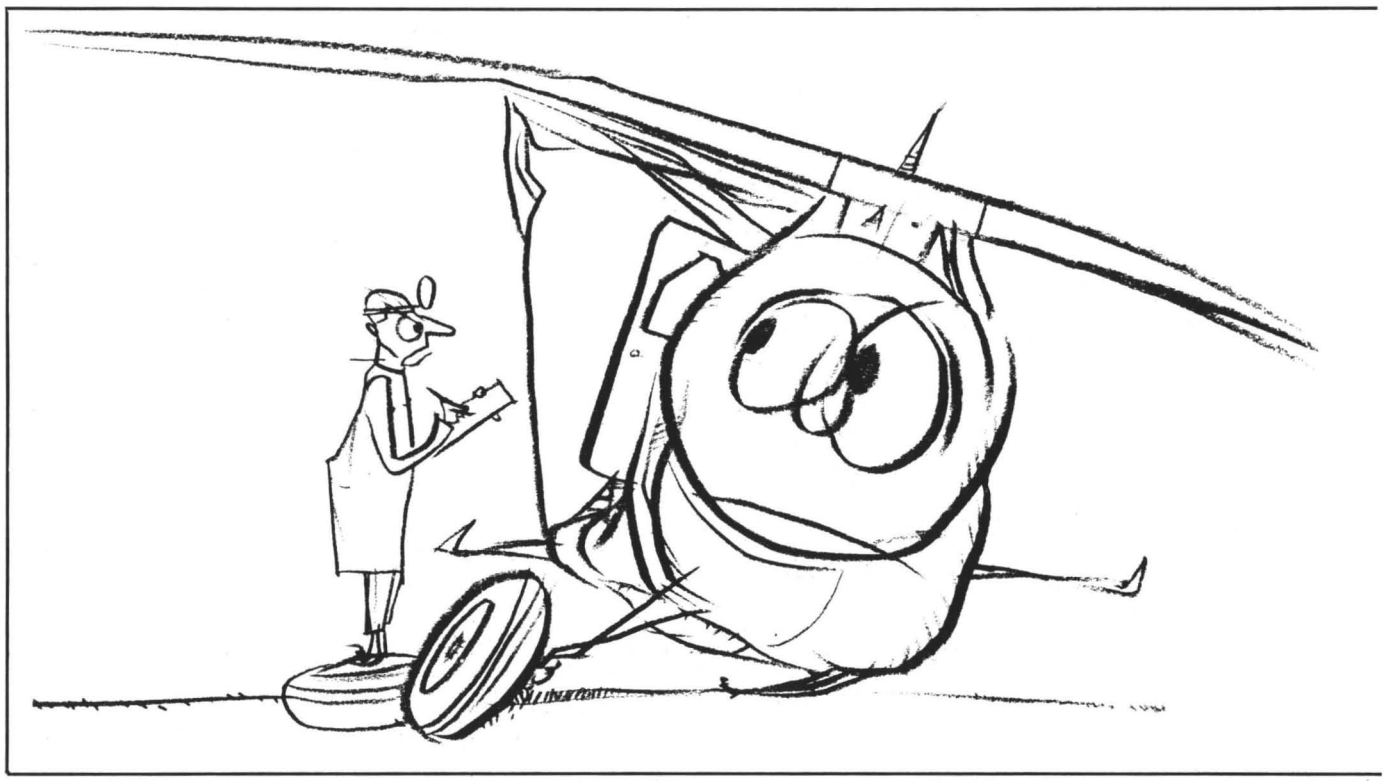
The human body is a machine that works on the energy manufactured from the food it consumes. A body needs fuel just as an aircraft does and it has to be the right octane too. Nobody ever attempted to fly an aircraft fueled with dishwater and old ground-up rubber boots. Still, some lads who laugh at that idea don't give much thought to what kind of fuel they consume themselves. They ought to know better; after all, they passed Fourth Grade Basic Health. The trouble is, they seem to think the rules don't apply after they get to be big boys. So they either eat: (1) too much; (2) too little; (3) or improperly. If they happen to be Army pilots, they're sure candidates for that "pilot error" label.

The human body works on the glycogen stored in the liver and produced by glucose, a first cousin of lactose, or blood sugar. Carried by the blood, glucose —or blood sugar—is a highly desirable item to have floating around in one's insides. In fact, if blood sugar level drops below a certain point, anybody is in trouble—*anybody*. Below 50 milligrams per 100 ccs. of blood, for instance, a fellow can have convulsions, though levels as low as that are rare.

Normally the blood stream should contain about 100 milligrams of blood sugar per 100 ccs. Naturally it will not stay on the line all the time but will fall a little or rise slightly. Under ordinary circumstances the movement down or up is not drastic.

Let us return to Rhett Bullfiddle. We saw that he did not get a real breakfast. A cup of coffee, stimulating as it is, has no calories at all. At the flight line, then, Bullfiddle is still coasting on the food taken aboard the night before. Since he has used up a great deal of this already, his blood sugar level may be as low as 80, so his capability—the energy at his command—has been reduced by so much right at the start.

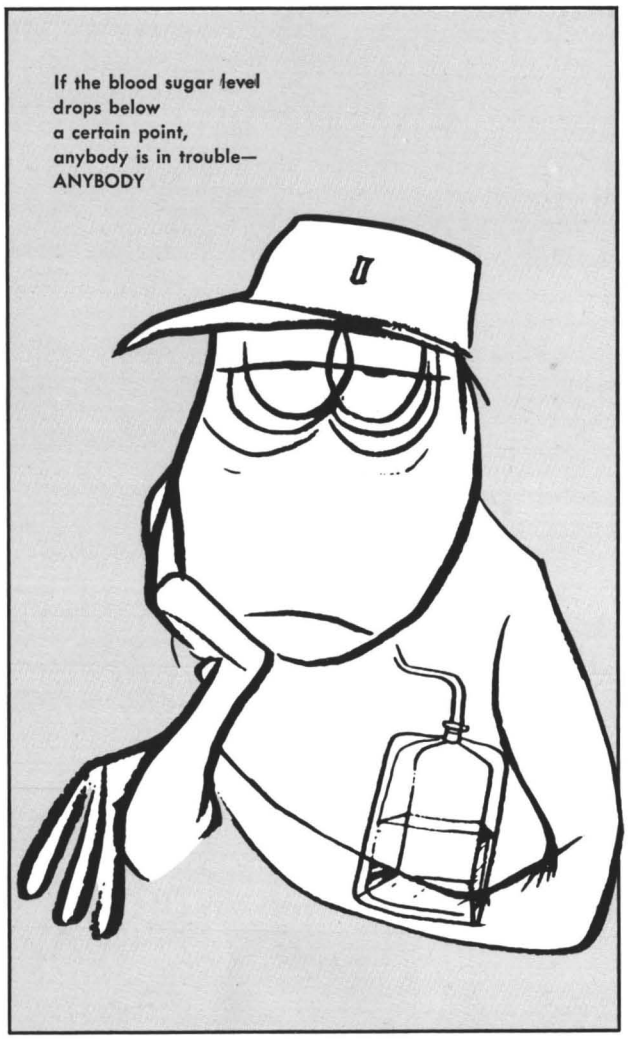
Around 10 o'clock, between flights, Mr. B. has time for the soft drink that raises his blood sugar level briefly. And the level rises again when he eats a light lunch in the snack bar at noon.



But it isn't going to stay there. Bullfiddle has nothing in his reserve tanks. Along about the middle of the afternoon, the level begins to drop again. It's been a hard day and Bullfiddle feels lower than a bargain basement. Coming in for his final landing he has to crab into a light crosswind. At the last second, as he touches down, he forgets to straighten out. Off goes the landing gear.

"Pilot error?" What really happened was that poor Bullfiddle plain ran out of gas, a perfect example of why the understanding wife should not only insist that her husband eat a good breakfast but *get up and cook it for him*. The lack of a sound diet can be the death of a man in more ways than one. Mrs. B. may not look ravishing over a hot stove at 6 a.m., but she won't look any better in black.

Even the person who starts his day with orange juice, sausage, waffles and a covey of eggs sunny side up is going to need some refueling as the hours wear on. This is particularly true of pilots, whose jobs demand more of them. A survey of training accidents over a period of months showed that more mishaps took place during the second flying periods in the morning and afternoon than during the first. As the morning and afternoon went on, the pilots' blood sugar dropped. They were spending energy.



What pilots eat, or fail to eat, is another major factor behind "pilot error" accidents. The careless eating habits of some folks, young and old, never cease to amaze medical men

The remedy? Midmorning and midafternoon snacks to get them back to the proper level.

Pilots facing long hours in the air or out of range of the snack bar need to take along their own boosters. A good cockpit companion is a school lunch box with a Thermos bottle of fruit juice and a meat or cheese sandwich, *made without mayonnaise* to prevent spoilage. The fruit juice gives a quick lift; the sandwich provides a slow-burning fuel to be converted into blood sugar for the long haul, which demands a *proper* diet. Everybody knows about the man who flies nonstop from New York to Lisbon on nothing but a dill pickle and the piano movers who get along on a diet of lettuce leaves and dry toast. Let's face it—those people are freaks. Even they are going to have to pay for their peculiarities

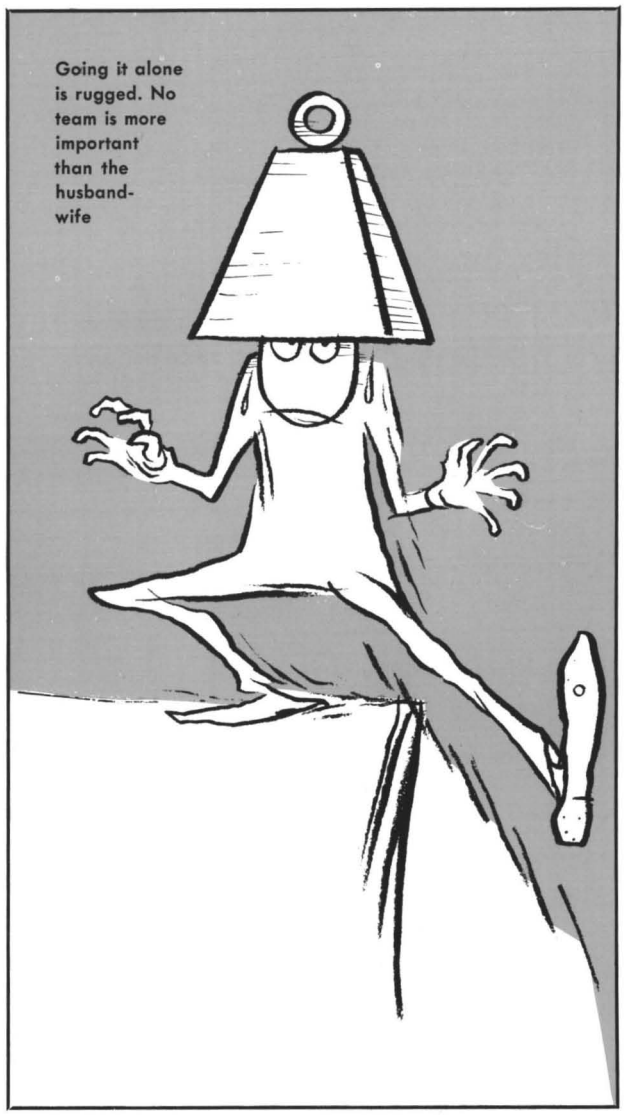
sooner or later. The rest of us have got to watch ourselves.

Overstuffing can be as bad as undereating. Nobody keeps on pouring gas until it runs out on the ground. He stops when the tanks are full. The smart eater puts down his knife and fork when he's had enough but *only* enough. A sound, well-balanced diet is every bit as important to the pilot as a sound, well-balanced mind.

Your expert kitchen mechanic knows this. You'll never see her husband going around looking like a department store Santa Claus in the offseason. And he won't stumble out in the morning with nothing but a cup of coffee to hold him either.

PULLING TOGETHER

Nobody has to go it alone in this world, not even Patagonian sheepherders and stratosphere balloonists. Everybody, regardless of what he does, is surrounded by good people who, given a chance, want to help. In any working society, military or civilian, everybody is on the team. Firemen stand poised to smother the blaze, provided they're called. Doctors rush to the bedsides of the sick. Chaplains are delighted to bring aid and comfort on a 24-hour basis. All these helpful folks know their team assignments and are ready to carry them out.



Going it alone is rugged. No team is more important than the husband-wife

No team is more important than the husband and wife. The smoothness with which they operate makes the difference between a happy marriage and one that spits and sputters like a one-lunged outboard motor with a fouled gas line. Not to mention the difference in a man's career. For people who fly, a well-arranged home life can mean beating down the fears, superstitions, resentment complexes and other interior disturbances that come between doing a job decently or miserably.

A husband's and wife's team assignments are different but related. For his part, the Army pilot should try to cultivate—

1. A reasonably well-adjusted personality.
2. The capacity for appraising himself maturely.
3. An understanding of the natural emotional upheavals that hit all normal human beings.
4. A sensible approach to personal problems.
5. A normal, pleasant home life.

Except for the naturally lucky lads in the world, this kind of cultivation is not easy. It takes work. Above all, a man intent on making the most of his marriage must accept his wife as a partner, not a decoration. He ought to make sure she understands what he does and make every effort to comprehend her problems too. The equation is strictly fifty-fifty.

And any good wife determined to do her share knows she must develop—

1. An understanding of the special requirements of a pilot's job.

2. The capacity to shoulder her share of the family burdens.

3. The ability to keep her husband at the peak of his game (or, as our British friends say, "keen").

4. The considerable skill required to provide a real home. Anybody who has really fought his way past adolescence quickly dismisses the fairy tale about simply marrying and automatically living happily forever after. A good marriage is a work of art produced by a team. And a successful husband and wife combination will be able to tell their youngsters that of course the going was rocky from time to time but they went the distance by taking things in stride. That husband, like the rest of us, will make his share of mistakes. Chances are, though, he is not the kind of fellow to go into the mental tailspins that produce "pilot error."

TAKE ME TO YOUR LEADER!

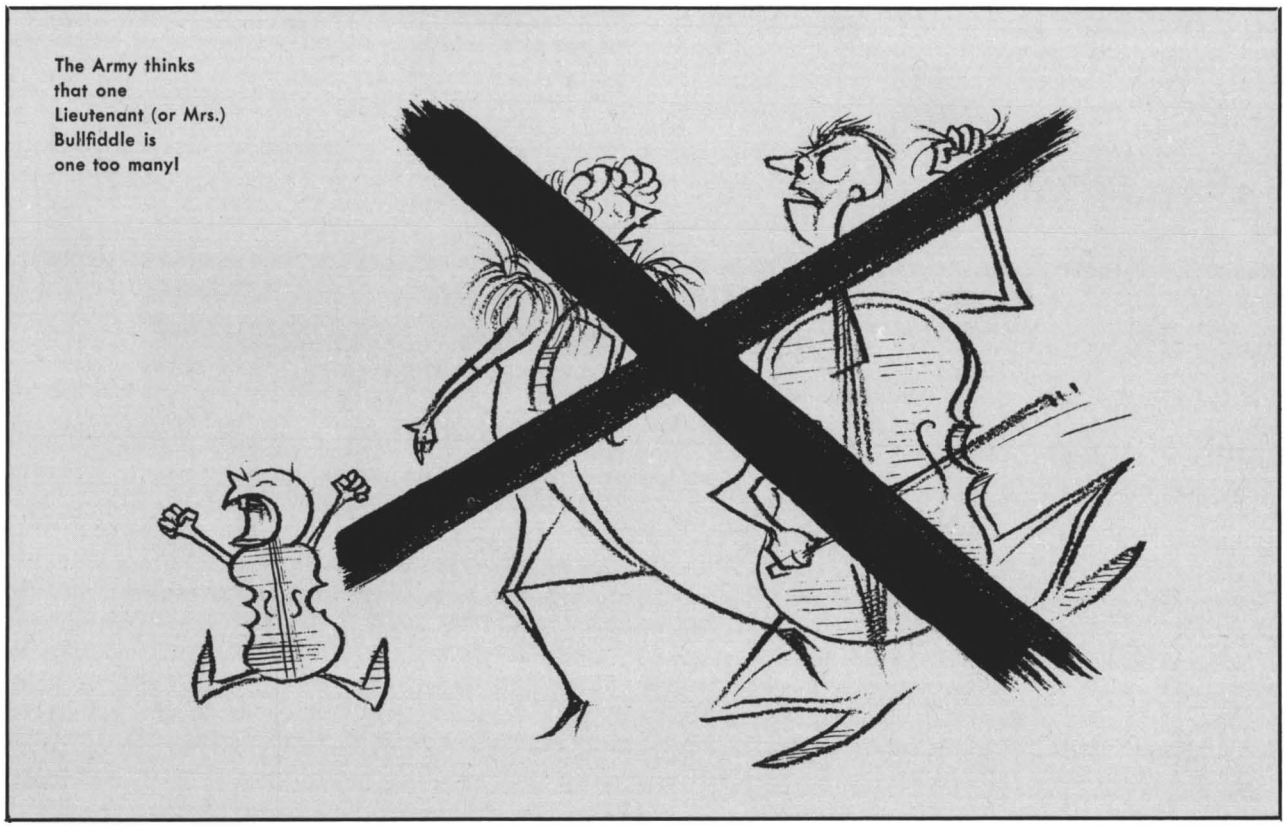
When the little man from outer space asks for the boss of your flying machine, there's only one answer. As an Army pilot, you're it. You're the one with what the commercial airlines people call "pilot responsibility." Your passengers and their families, your life and the happiness of your household are strictly in *your* hands. One small slip can bring tragedy to a great many people.

How well you carry out your team assignments is a measure of how responsible a person you are. The same goes for your wife.

No flat notes, please. No Bullfiddle Syndromes. No curious mental quirks, easily cured by the simple business of Talking It Out, but which lead to "pilot error" when bottled up inside.

A man is the sum total of everything he has ever done. As the medical men say, "If you haven't ever been confronted with a particular kind of emergency, you haven't had enough experience." You can apply that to flying too. The longer he flies, the more emergencies come along to test an Army pilot's abilities. Only a finely-tuned, responsible man can cope with them all as they arise.

The Army thinks that one Lieutenant (or Mrs.) Bullfiddle is one too many.



Lieutenant Colonel Lester R. Kerfoot Jr.

AIRFRAME FOD

FOREIGN OBJECTS HAVE damaged and destroyed aircraft since the earliest days of flight. Today, many of us have an overpowering tendency to associate FOD only with turboshaft engines. This is only one side of the FOD crippler. In engines it usually gives some warning of impending failure. On the other hand airframe FOD seldom, if ever, gives any warning. Considering the high speed rotation of helicopter components and their necessity for controlled flight, FOD can cause catastrophic accidents. These photographs tell the story.

The pilot of an OH-6A Cayuse had been at a forward operating base (FOB) for two nights. Late on the third day he was directed to return to his home LZ for maintenance and crew rest. Because he had been training a non-unit pilot in reconnaissance techniques, his regularly assigned observer had been left behind at the FOB during the day's flying.

When the order to return was received, the pilot carefully loaded his and the crewchief's gear on board, secured the load properly and fired up. The crewchief found the observer who hurriedly stuffed his waterproof bag with personal items. They then returned to the already running helicopter. Since the load had already been stowed, the observer threw his untied bag into the cargo compartment and took his place in the copilot's seat.

Three miles short of the home LZ, while the pilot was decelerating for his approach, the tail rotor failed. He attempted to autorotate into a rice paddy, but the helicopter struck a dike and was destroyed. The crew escaped with no injuries.

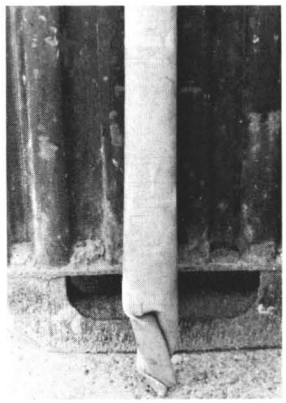
Photos show remains of poncho liner which came out of observer's bag, blew out of cargo compartment and wrapped around tail rotor, causing tail rotor drive shaft to fail in torsion

The investigation required only one look at the tail rotor. There was no damage which indicated rotation at impact. The observer confirmed the investigator's conclusion that his poncho liner came out of the bag, blew out of the cargo compartment and wrapped around the tail rotor. Analysis of the drive shaft clearly proved that the foreign object (poncho liner) stopped tail rotor rotation and caused the drive shaft to fail in torsion.

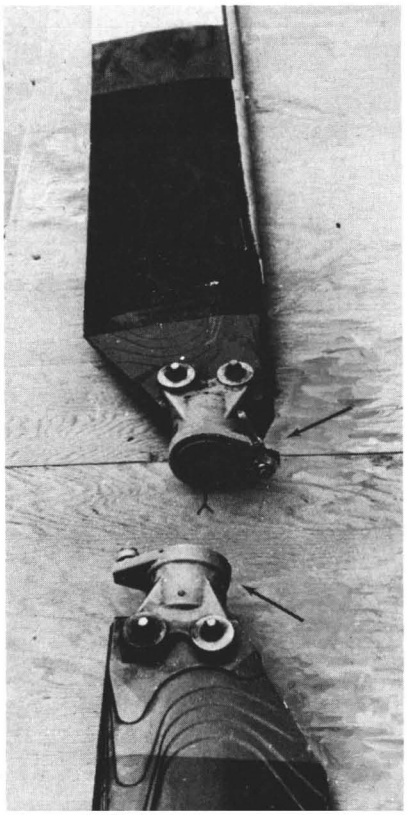
Another OH-6 pilot received a similar quick, go home order. The crew hastily threw their equipment aboard and the Cayuse headed for the stable. Approximately halfway to their destination, the tail rotor failed and the helicopter was destroyed during the attempted landing.

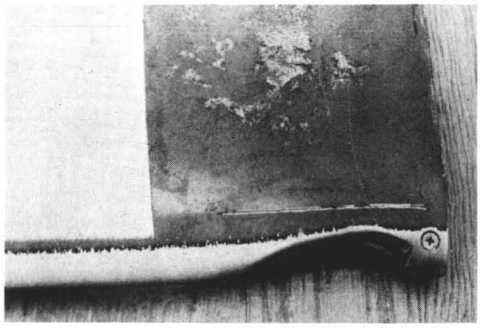
An improperly stowed mosquito net flew out of the helicopter into the tail rotor, stopped its rotation and caused the tail rotor drive shaft to fail in torsion.

These two accidents occurred in the same organization, although in different units, about 10 days apart. After the first accident, the organization commander sent a message to all units, directing them to



Improperly stowed mosquito net flew out of helicopter into tail rotor, stopped rotation, and caused tail rotor drive shaft to fail in torsion





Indentation in UH-1H tail rotor blade matched soft drink can and smoke grenade, one of which flew out or was thrown from cargo compartment, causing antitorque failure

Cracks in tail rotor blade grips are characteristic of FOD tail rotor strikes and revetment strikes

be particularly careful of loose items in helicopters. In their anxiety to get home, neither the pilot nor the crewchief involved in the second accident inspected their load for security.

The pilot of a UH-1H Iroquois, who was also an instructor pilot, dropped off the Huey's former pilot at an airfield. Remaining in the left seat, with the crewchief in the right seat, he returned to his home LZ. There were two passengers in the back, some cases of soft drinks and some smoke grenades. Short of the perimeter fence, the pilot practiced a low level approach. Approximately 20 feet above the ground, the tail rotor failed. Both blades separated from the yokes.

The tail rotor struck or was struck by an unknown foreign object. An investigator searched the area as thoroughly as possible, but was unable to find the object. Clearly visible in the photograph, the configuration of the indentation in the tail rotor blade matched both a drink can and a smoke grenade. The passengers disclaimed any knowledge of what could have happened. However, knowing the decelerative attitude of the UH-1, it was easy to reconstruct what had happened. An object flew out, or was thrown out, of the cargo compartment and collided with the tail rotor blade.

The helicopter was damaged to such an extent that it had to be evacuated for major overhaul.

For helicopter accident investigators, the photos of the damaged tail rotor blade grips tell a complete story. The leading side of the grip of the blade that was struck failed under imposed dynamic overstress (i.e., the dynamic rotation of the blades encountered a force beyond their designed strength criteria). The trailing side of the grip of the blade that was not struck failed from inertia which continued the blade's movement in its plane of rotation after the impacted blade stopped when it contacted the foreign object. This is also a characteristic failure found in revetment strikes. In lower inertia tail rotor blades (OH-13 Sioux, for example), even though the blades are not severely damaged, one or two indicators are usually found. The tail rotor drive shaft shears in torsion, and a characteristic *fish mouth* appears on the trailing edge of the struck blade in the curved area outboard from the grip and inboard from the full airfoil of the blade.

FOD to dynamic components in helicopters, resulting from objects flying out of cargo compartments or cockpits, can be stopped if aircraft commanders and crewchiefs inspect their loads. Combat resources can be preserved by taking one minute more for this brief inspection prior to takeoff. Those who use this minute more show the professionalism and discipline expected of all Army aircrewmen.

A UH-1H was on downwind to a resupply pad at 200 feet and 60 to 70 knots when the crewchief's field jacket blew out of the helicopter and became entangled in the tail rotor. The tail rotor and 90-degree gearbox separated and the helicopter began to vibrate severely. The crewchief and gunner did not tell the aircraft commander what had happened. The aircraft commander entered autorotation because of the vibrations and did not realize he had an antitorque failure. When pitch was pulled to cushion the landing, the helicopter turned 90 degrees, striking the ground in a right turn. The skids collapsed, the main rotor blades struck the ground and separated and the helicopter rolled over and burned. The crewchief had a broken leg and vertebra compressions.

WAS THIS YOUR ACCIDENT?

MECHANIC: "Three people went out to the helicopter. Shortly thereafter they started the engine. They ran the engine for a while at an idling rpm, then engaged the rotor blades. About five minutes later, I saw the rotor blades turning slowly, with a crewmember inspecting each blade as it came round to him. I can't say for certain whether at that point the engine was running or not. Two passengers went on board and the aircraft took off. The preflight inspection was, in my opinion, far more thorough than normal and this was the reason I paid particular attention to the crew and their actions."

Pilot witness: "I was on a dual training flight with a student. We had been carrying out training maneuvers, climbing and descending. At this time I was at 700 feet. My student was reporting a lot of aircraft around. He noted one at 11 o'clock. My heading was about 120 degrees and the other aircraft was on an easterly heading, approximately 70 to 90 degrees. It was flying below me about 400 meters away, straight and level. I had a very good view of it. I was continuing my climb, with the student flying. I kept my eyes on the other helicopter for about a minute, then it started.

"The first thing was that a blade came off—a complete rotor blade. It was starting to retreat when it came off. It left the aircraft, arced up over, went up to the left and then down. The aircraft continued straight and level for a fraction of a second, then started through a 180-degree turn. As it progressed through the turn, the nose dropped. Before it completed the 180-degree, a second blade came off. It sort of fell through the aircraft, straight down. At the same time, the aircraft went completely nose down and straight in. It hit the ground and appeared to take a slight bounce, then explode . . . ."

Witness: ". . . I heard a noise of a helicopter approaching from a southwesterly direction, looked up and saw it. It was about 200 feet . . . I saw what appeared to be a small propeller fall from the aircraft. It started to spin about two half turns and it was obviously out of control . . . ."

Investigation: Investigation showed that after the loss of the first blade the main rotor mast and head, with the remaining blades, separated at the planetary gear attaching bolts. The green blade struck the pilots' compartment and the two remaining blades separated from the rotor head. The helicopter struck the ground in a near vertical attitude and was consumed by fire.

Analysis: A check of aircraft records revealed the helicopter had a history of lateral (2-1) vibrations for a period of nearly three months prior to the accident. These vibrations were reported to increase in magnitude during flight and intermittently feather out. This condition was not reported during hovering flight. Teardown inspection showed that the main rotor head had been assembled with two lightweight and two heavy duty sleeves. The weight differential in the main rotor head due to the installation of these sleeves was two pounds. The long history of lateral vibrations was strongly suspected to have been due to the unbalance in the rotor head and doubtful true track of the main rotor blades.

Investigators were not able to determine when the error in rotor head assembly occurred. Routine inspection at all levels failed to reveal the condition.

Laboratory analysis established that loss of the blade resulted from failure of the main rotor blade spar to cuff retaining bolts due to overstress *generated by a rotor overspeed during a previous flight by unknown personnel who failed to record the overspeed.* The failure was considered to have been accelerated by the unbalanced condition of the head and blades caused by the improper installation of lightweight sleeves on the heavy duty rotor head.

Recommendations: Action to advise all flight personnel of the seriousness of unreported overspeeds.

All flight personnel should be advised of the importance of reporting overspeeds so that required maintenance and inspections will be performed before further flight.

REVETMENTS and command influence

Lieutenant Colonel Lester R. Kerfoot Jr.

REVETMENTS ARE an absolute necessity in combat. During mortar and rocket attacks, they protect vital components, including fuel cells, from damage and prevent destruction of aircraft. Many aircraft have been lost because they were not in revetments during attacks. Many more have been damaged or destroyed by tail rotor strikes and resulting control loss while operating from revetments.

One commander, through aggressive influence, stopped the revetment strikes in his unit. Over a period of three months the unit lost five helicopters through revetment strikes. The commander analyzed these accidents and came up with the following solution: *No helicopter was to be moved into or out of a revetment unless a qualified crewman was in front, clearly visible to the pilot, with full vision of the tail rotor, revetment and perspective of the entire helicopter.*

To violate this rule was to incur the wrath of the commander and invite a severe chewing out for aircraft commanders and pilots. The establishment and enforcement of this rule prevented any further revetment strikes during the remaining time I was with the unit, more than four months.

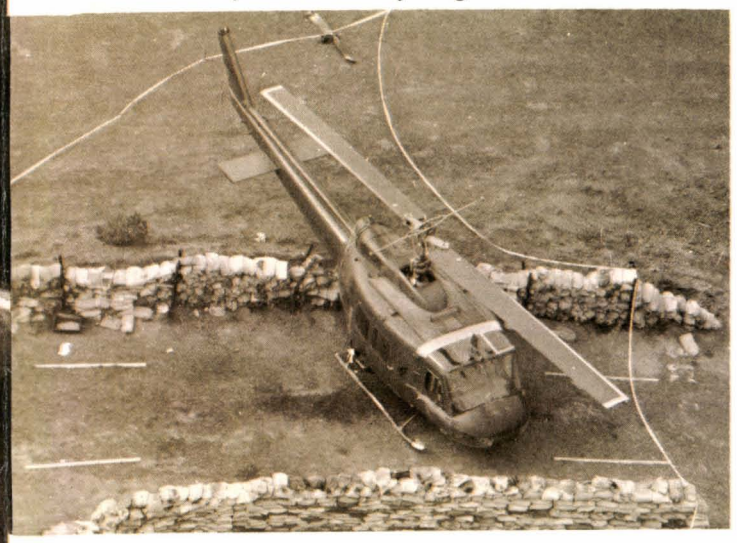
This action is a prime example of command influence on safety. If a commander takes a deep personal interest in safety, his officers and men will reflect that interest. If he only pays lip service to safety, this will be their attitude. Unit personnel usually reflect their commander's thoughts and policies. With proper command influence, they will practice and live safety.

In the March issue of the AVIATION DIGEST, we covered pilot and mechanic induced fatigue failures. In the April issue, it was aircrew communications. In this issue, we wrote about FOD to dynamic components from loose objects flying out of helicopters into tail rotors. All of these bear out the importance of command influence to aviation safety.

However, the role of command influence and emphasis should not be taken to mean that a green-tabbed commander is the *only* one whose influence has a role in aviation safety. The WO1 aircraft commander is every bit as influential. In fact, his influence may be greater.

Our WO1 aircraft commander is admired by his crew. He is their immediate commander and boss, whether he shaves every day, or three times a week. When he tells his crew he is ready to pick up to a hover, then asks "Clear left? Clear right? Clear rear and above?" he makes them aware of his concern and their responsibilities. By requiring them to clear him in a turn, he again reminds them of their responsibilities to the aircraft, to him, to the mission and to themselves. By raising cain if they are slow to clear, or not attentive and reporting clear without really looking, he stimulates their performance.

By requiring his crewmembers to keep their heads on a swivel, really looking and seeing all obstacles and other aircraft, he insures their alertness. By personally checking aircraft loading and instructing them about securing loads, he shows his interest and the necessity for thoroughness. By these actions, the WO1 makes his crew live, experience and think aviation safety. At the early stages of an aircraft commander's career, this may sound stuffy and overly academic. But his concern for safety, if he practices the actions outlined, will teach him safety management.



At times it becomes necessary for the *old man* (unit commander) to intervene to achieve desired results. In this instance, *intervene* may be defined as violent verbage or painful removal of excess money. In most instances, the real payoff is in the individual safety efforts of aircraft commanders. Their direct influence over their crews is contagious. It will overflow into the maintenance section because the crewchief becomes extra attentive. It will follow into the armament section because the gunner is critical of the quality of work performed. It extends into POL because of the attitude of both the crewchief and gunner. This influence can be directly responsible for preventing a high percentage of Army aircraft accidents.

Are *you* assuming your responsibilities?

MORE
on revetments

P. R. Thompson

A UH-1 pilot called for takeoff instructions, picked up to a hover and moved forward until the tail cleared the end of the parallel revetments. The tower requested him to hold at that point for departing traffic. After holding 10 to 15 seconds, the helicopter drifted back and a tail rotor blade struck the corner of the revetment to the left rear. The blade broke off, throwing the tail rotor out of balance and tearing off the 90-degree gearbox. Antitorque control was lost and the UH-1 turned right. The pilot closed the throttle and put the helicopter

on the ground. The tail boom struck another revetment before it stopped turning.

Another UH-1 was started, run up and the aircraft commander prepared to move from the revetment. In the revetment to his left, the pilot of another UH-1 had completed his start and the engine was at 6000 rpm. At the same time, a third UH-1 had just departed and was about 75 feet in front. The aircraft commander brought his aircraft to a hover and moved left toward the second UH-1. As he moved left, his main rotor blades hit the main rotor blades of the second UH-1 and flying debris damaged the helicopter in front.

Another UH-1 pilot hovered to his parking revetment. As he started to set it down, he decided he was not in straight and began hovering from the revetment on a heading of 60 degrees, to align the helicopter. The wind was variable, 130 degrees to 150 degrees, at 18 knots. As he started out of the revetment, a gust of wind hit the UH-1 and the tail rotor and left synchronized elevator struck the left side of the revetment. The helicopter spun 360 degrees to the right and the pilot cut the throttle and tried to remain level. It landed hard and broke in two.

A fourth UH-1 pilot had just hovered into his revetment when control told him to move to another area. He picked up to a hover, facing a steady 10-knot wind. He intended to lift up and veer right to avoid overflying a parked aircraft in the revetment to his front, but he let the tail swing left and the tail rotor struck a 5-foot metal stake used to hold the sandbags in place. The crewchief was unable to warn the pilot in time to prevent the strike. The pilot cut the throttle and set the helicopter down, tearing a hole in the fuselage on another stake.

A fifth UH-1 pilot terminated his approach at a hover and moved forward at about 10 feet between two steel-framed revetments which were about 5 feet high and 44 feet apart. The revetment to his left was about 3 to 4 feet lower than the one to his right, because the heliport was built on a slight grade. Passing between the revetments, the pilot made a hovering turn to enter the revetment to his left and the tail rotor struck a corner of the revetment to his right. The tail rotor assembly and gearbox were severed and the tail pylon damaged. The helicopter spun right, out of control, and the pilot applied full left pedal, but the turn continued. He cut the throttle, stopping the turn and held what pitch he had until the helicopter settled hard on the edge of the revetment, collapsing the skids.

Cause factors for these accidents included: "Lack of attention to aircraft position; operating in congested area without ground guide; failure to insure proper clearance for hovering clear of revetment; attempt to fly into revetment in gusty wind; revetment width allowed only 6-inch clearance on each side of aircraft; lack of crew coordination; and failure to enforce unit SOP."

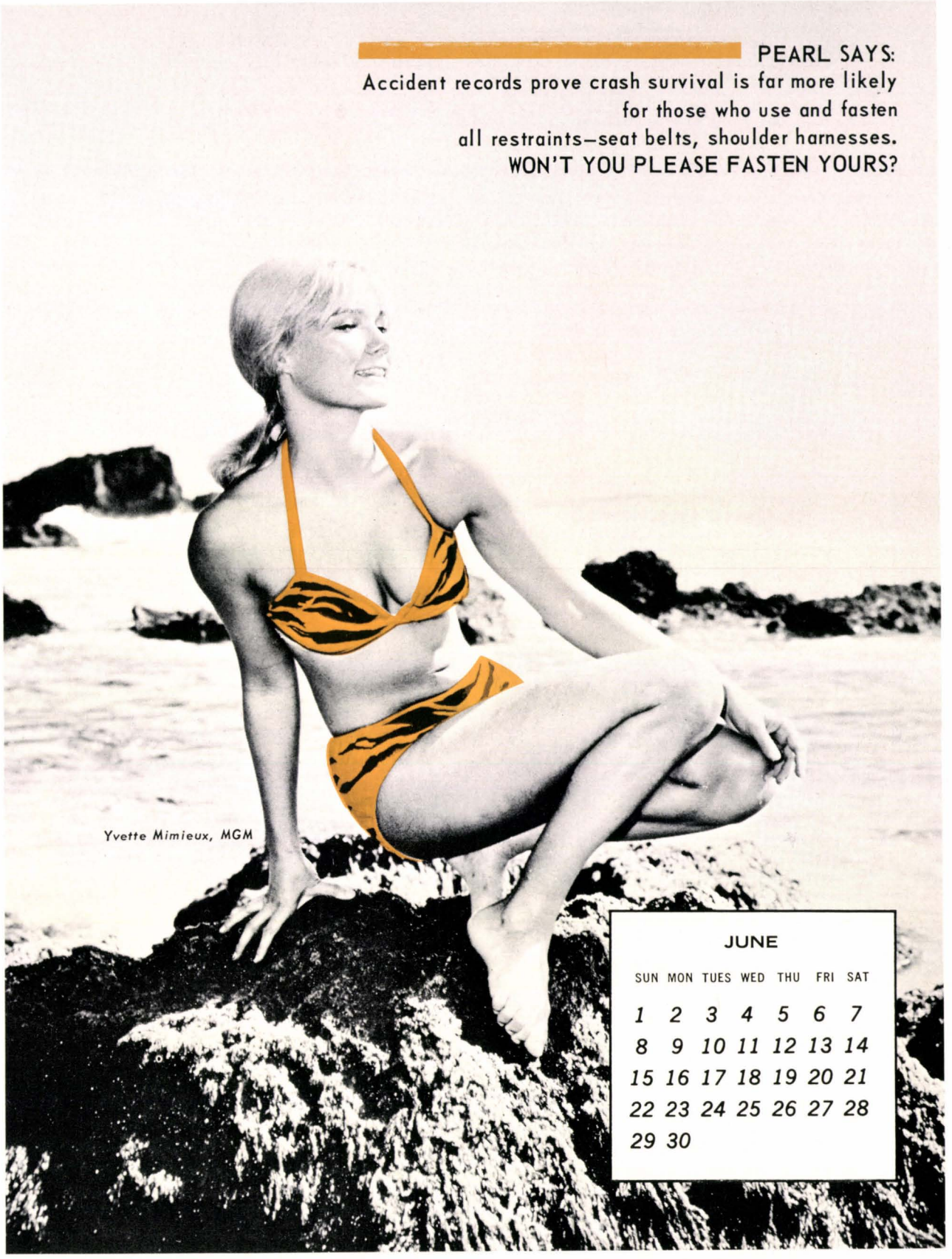
Hovering operations in and near revetments still result in many mishaps. Most are crew induced by failure to properly clear revetments. To insure adequate clearance, aircraft commanders and pilots *must* insist on ground guides and crew coordination.

Improperly constructed revetments also often appear as cause factors. Some are built too close together and do not allow proper clearance or spacing within revetments. As a general once said, "It is of little value to protect aircraft from mortar or small arms damage if we build obstacles to cause them to be damaged during routine parking or departure operations."

Some prevention suggestions are:

1. A letter on revetment construction, approved by Headquarters, USARV, 14 December 1967, requires that revetments for UH-1B and UH-1C models be 4.8 feet high, 25 feet wide and 50 feet deep. Revetments for UH-1Ds should be 5.5 feet high, 20 feet wide and 50 feet deep. One unit in RVN suggested that some thought be given to marking the tops and extremities of revetments to assist pilots in maintaining proper clearance and in recognizing dangers. Night markers (lights, reflectors, light reflecting paint) could prove valuable.
2. Insure revetments are spaced far enough apart.
3. Insure that ground guides are available when crewmembers cannot provide 360-degree obstruction clearance.
4. Insure that crewmembers are continuously briefed on the hazards of revetment operations and the need for crew coordination. *Revetment hovering must receive continuous emphasis if these accidents are to be prevented.*
5. Insure that landing pads, when used, are properly located within revetments.
6. Place windsocks in parking revetment areas.
7. Avoid hovering into revetment areas during gusty wind conditions. Taxi, when possible, under these conditions.

PLEASE CUT HERE AND POST IN PROMINENT LOCATION



PEARL'S

personal equipment and rescue & survival lowdown

If you have a question about personal equipment or rescue/survival gear, write Pearl, USABAAR, Ft. Rucker, Ala. 36360

THE COMMENTS I have overheard from pilots, crewmen, and mechanics concerning . . . Pearl and her safety lessons prompts me to make a suggestion.

It appears you may have the resources (?) to feature a different Pearl each month. I would recommend that alongside, nearby or over Pearl's picture you place next month's calendar, e.g., the January 1969 issue would show Pearl next to a February 1969 calendar with a monthly safety slogan in bold print and a dotted line in the center fold indicating "cut here."

This might appeal to clock-watchers, RVN short-timers, young "tigers" and old tired safety officers.

Major Art Conroy
Deputy Chief, Attack Helicopter Branch
U.S. Army Transportation School
Ft. Eustis, Va.

Dear Major Conroy:

Your recommendation should certainly appeal to everyone with an eye for beauty. How's this for a starter?

PEARL

Dear Pearl:

Please inform me of the correct survival equipment to be carried in an OH-13 helicopter. If there is a survival kit available, please send me the Federal Stock Number of this item.

CW2 Gary P. Bortolus
Airfield Commander
Bad Kissingen AAF, Germany

Dear Mr. Bortolus:

I regret to inform you that survival kits are not authorized by aircraft type, except for the OV-1 which has an ejection seat.

CTA 50-901 lists several kits which may be issued to aviators or aircrewmen when authorized by the overseas command. I am inclosing the operators manual for the one I consider most appropriate for your climate.

Another kit that is probably most adaptable to the OH-13 is the Survival Kit, Lightweight Individual, FSN 8465-935-4728. This kit replaces the SEEK 1 kit in the SB 700-20 and CTA 50-901 and is currently being procured in quantity.

PEARL

Dear Pearl:

We need information on survival gear and safety equipment for crewmembers of the LOH, preferably Vietnam oriented. Also, we need references for publications and regulations governing the use and maintenance of this equipment.

This might be of interest to some of your readers as well.

CW2 George Francioni
C. W. McRae, Jr.
OH-6A Section, RWD, AMTD
USATSCH
Ft. Eustis, Va.

Dear Mr. Francioni and Mr. McRae:

There is no survival gear or safety equipment peculiar to the LOH. Publications and regulations governing the use and maintenance of personal equipment apply equally to LOH crewmembers. DA Technical Manual, TM 55-8465-206-13, Organizational and DS Maintenance Manual for Survival Kits, Army Aircraft, dated December 1966, is applicable.

PEARL

No items of personal equipment and survival gear are more important than the restraint devices provided in aircraft for crews and passengers. Several recent accidents have involved crewmembers and passengers being thrown from aircraft at impact because they were not wearing seat belts. Following is an account of a crewchief who fell to his death because of . . .

COMPLACENCY

A UH-1 had just completed an emergency medevac flight and was at the hospital pad ready for takeoff. The AC turned, looked at the crewchief and asked if he was ready to go. The crewchief replied, "Yes, sir." The AC saw that the crewchief was sitting in the right troop seat, leaning forward, with his hand on the door, and the door was approximately 6 inches from the closed position. The jump seat, which had been removed from its normal position to load the stretcher for the emergency medevac, had been placed in its original position. Neither the AC nor the pilot noticed whether the seat was secured to the floor and they did not know whether the crewchief had his seat belt fastened or not.

AC: "After a 90-degree hovering turn to the left, the pilot made a normal takeoff. . . . At approximately 200 feet and 70 knots, I told him to make a left turn. Just as I completed this transmission, I heard a loud noise, turned around and saw that the crewchief, the jump seat and the right cargo door had fallen from the aircraft. I told the pilot the crewchief had fallen, took control and called operations, while continuing a left turn.

"I saw the crewchief's body on the ground. As we were close to the hospital I landed and dropped off the pilot with instructions to get an ambulance with medical personnel and go to the scene. I then took off and flew over the scene until the ambulance and medical personnel arrived. Then I landed at the hospital pad and checked the aircraft for damage. I found no major damage that would present a hazard for flight and returned the aircraft to the airfield."

"Did you see the crewchief close the door all the way?"

"No."

"How far was it forward when you saw it?"

"Approximately 6 inches from being closed. His hands were on the door when I looked back."

"Was this before takeoff?"

"This was while we were sitting on the helipad."

"You say the crewchief was sitting on the right troop seat, leaning forward?"

"Yes."

"Did you at any time see his belt fastened?"

"No."

"Were you aware the crewchief was moving around the back of the aircraft after you took off?"

"No, I was not."

"Was the left door closed at the time of takeoff?"

"Yes, the left door was completely closed."

Ground witness: ". . .When I first saw the man, he was standing in the helicopter . . . backwards, like he was doing something . . . they came out in this order—the door, the chair, the man . . ."

Flight surgeon: "In reviewing the statements and physical evidence, it is my professional opinion that the following sequence of events led to the fatal fall. . . .

"In his habit pattern, the crewchief sat in the right cargo seat, with the door partly open and his safety belt unsecured.

"Because the jump seat was not in the fastened position, his attention may have been diverted to getting this back into place.

"Perhaps he was pushing the door forward when it fell from its tracks, or his attention was drawn to the fact that it had come off the tracks. It is my opinion that he was pulled off balance by the door as it was torn off and back. . . .

". . . a single predisposed situation becomes glowingly evident—a very unhealthy disregard of basic safety fundamentals. Because there was much evidence to indicate the crewchief was not psychologically unsound or troubled, this disregard was an involuntary and insidious loss of caution. This psychological entity is *complacency*. It is complex, involving original training, unlearning, frequent reemphasis and overconfidence.

"It had been approximately five years since the crewchief had his original training. Over this period, the process of unlearning tends to depreciate that original foundation to a certain degree unless it is reemphasized frequently . . . .

"In speaking with the crewchief's colleagues, statements were made to the effect that he indicated disregard for certain safety procedures, in particular that of wearing a safety belt. He also had a habit pattern of leaving the right door open on takeoff . . . .

"Since his original training, the crewchief undoubtedly must have forgotten many of the fundamentals he learned at that time, merely on a time basis. Additionally, he had only been "crewing" for the past two months and this, in itself a learning and training process, may not have been long enough for him to regain safety proficiency.

"It is my opinion that the most important factor in the cause of this fatal injury was the fact that the crewchief probably disregarded personal safety. He was *complacent*. . . ."

USAASO Sez

The U. S. Army Aeronautical Service Office discusses

Interpretation of instrument chart legends
Use of FLIP index
Requisitioning ATC personnel

On Instrument Chart Legend: An aviator who becomes confused in flight or during planning for flight because he cannot readily relate chart legend to its intended function can normally be suspected of not having done his homework. Chart legend symbols are designed to be meaningful to the user without relying on extensive explanatory material. Most legend symbols and their meaning and application are provided on pages or areas within FLIPs for which they are applicable.

When determining authorized minima and weather requirements for filing purposes, some pilots are prone to consult the approach charts and select the lowest authorized minima commensurate with aircraft and navaid applicability. Such determination may be incorrect simply because radar minima data was not also consulted.

The PAR/ASR symbol located along with air/ground frequency information in the plan view section of approach charts tells the pilot that PAR/ASR service is normally available for that location. This theme is also applicable in both enroute and SID charts. When this appears, it serves notice to consult radar minima data (along with NOTAMs) for possible lowest operation minima.

Users should report chart legend errors or recommendations for improvement to USAASO. Stay awake—stay aware!

On the Use of the FLIP Publications: Having trouble finding what you're looking for in FLIP? Section II of Planning contains a handy index which will assist you in readily locating those little bits of information which seem to prove important in planning and conducting your flights.

On Personnel Shortages—The Constant Thorn in the Commander's Side: This pain has always been with the commander, but is all the more severe when it is discovered that available balm has not been applied. Several instances have been brought to light where proper and timely requisitioning of personnel in accordance with AR 614-202 would have precluded any personnel shortage.

USAASO is particularly interested in air traffic controller personnel and reminds commanders that air traffic controllers are now Special Category personnel. This designation was effective 1 Jan 69 and is shown in Change 25 to AR 600-200, dated 30 Dec 68. We recommend you review AR 614-202 and AR 600-200 before submitting requisitions for these personnel.

WARNING
THIS BOX CONTAINS
F O D !

F2