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UNITED STATES ARMY
AVIATION DIGEST
MAY 1981

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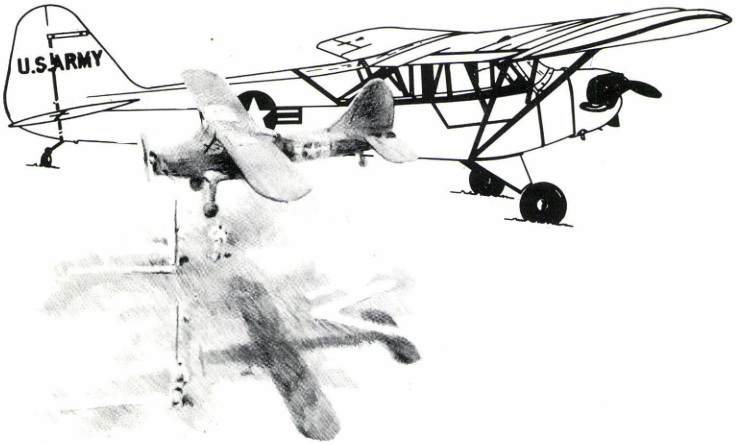

TO...

IN 40 YEARS

MAY 1981 • VOLUME 27 • NUMBER 5

★
Brigadier General Richard D. Kenyon
Army Aviation Officer
ODCSOPS, Headquarters,
Department of the Army

★★
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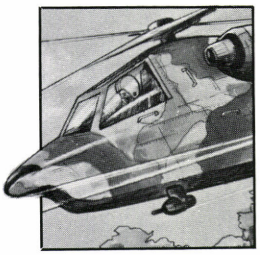

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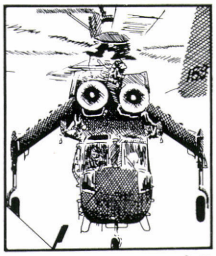

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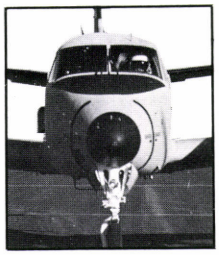

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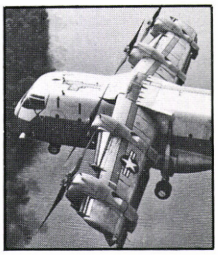

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Cover: **Illustrates the progress of Army Aviation through the past 40 years, from the L-4 and L-5 to the UH-60 and AH-64. For more insight into these advances and what capabilities are planned for the 1980s and beyond read "DARCOM Today," page 2, and related articles on pages 4, 9, 12 and 16. Cover art by Fred Martin**

Richard K. Tierney
Editor

The mission of the ***U.S. Army Aviation Digest (USPS 415-350)*** is to provide information of an operational, 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 Commanding General, U.S. Army Aviation Center. Views expressed herein are not necessarily those of the Department of the Army nor the U.S. Army Aviation Center. Photos are U.S. Army unless otherwise specified. Use of the masculine pronoun is intended to include both genders unless otherwise stated. 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,*** P.O. Drawer P, Fort Rucker, AL 36362. Manuscripts returned upon request.

This publication has been approved by The Adjutant General, Headquarters, Department of the Army, 25 April 1980, in accordance with Army Regulation 310-1.

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THE THEME FOR this special Army Materiel Development and Readiness Command (DARCOM) issue is set by its commander, General John R. Guthrie, in the lead article beginning on the next page. He very aptly points out that time will be of the essence in any present or future calls for mobilization and that, to ensure national security, we must "have in place a workable, adequately sized and immediately responsive force before a crisis arises." DARCOM is dedicated to supporting such a force, and General Guthrie gives an overview of some of that vital work being done for Army Aviation by his command. Those areas are further developed in the four following articles.

In "The Advanced Attack Helicopter," Major General Edward M. Browne, the AAH program manager, discusses the AH-64—the most modern attack helicopter in the world—the many tactical advantages it will offer, requirements for the crew who will fly it, and the combat applications for which it is optimized. His answers to questions from the field clarify numerous points on this eagerly awaited addition to the Army's helicopter family.

A look at what the future helicopter family of the 1990s may include is provided in "LHX—Light Helicopter of the Future." Dr. Lewis L. Feaster, an aerospace engineer who is the LHX project leader for the Army Aviation Research and Development Command, states that a need has been identified for a new development effort to respond to the threat in the 1990s and beyond. One result of that identification is the LHX. Reading about it provides a sense of excitement for Army Aviation's future.

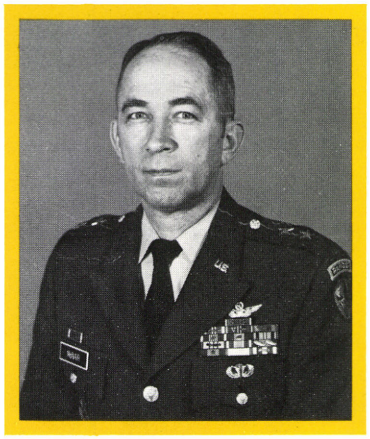
Another part of that future includes work being done at the Army Missile Command and described by Bob Hubbard in "MICOM Pledge: A Good Weapon Today—A Better One Tomorrow." Mr. Hubbard reviews MICOM's role and efforts which have led to the development of weapons of today and acquaints us with what is being researched for tomorrow.

Equipment available now or soon forthcoming must be first placed in the hands of the troops and must be maintainable in the field. Logistics support to ensure such actions is provided by the Army Troop Support and Aviation Materiel Readiness Command and TSARCOM's Major Leslie C. Mingus, the Fixed Wing Readiness Project Officer, explains how this takes place in "Aviation Maintenance in the 1980s."

This issue contains an abundance of information on the very fine aviation equipment we have or will have during this tremendous period of Army modernization, the greatest in our history. It also reminds us that this hardware still depends heavily on the human factor, the crew's input, for success. That is brought home vividly by Major Jacob E. Starr of the Army Safety Center in his article, "Success and Failure." He describes crew coordination on two Cobra flights—how the lack of such coordination following an engine failure resulted in a fatal crash and how its presence in another with a malfunctioning tail rotor caused the aircraft to be landed safely. There is a life-saving lesson in this article for every aviation commander—lest you forget!!

On the personnel side, an important addition for May is the back cover feature, "That's Just Great! Another Survey!" by Major Victor M. Sathre, Directorate of Training Developments, Army Aviation Center. He describes the just developed Specialty Code 15 Survey which will soon be distributed to company grade aviators worldwide. Responses from it "will be read, analyzed and used in the development of a new aviation training and education strategy for the 1980s and 1990s." A similar survey for aviation warrant officers is also being prepared. These surveys are important for the trainer and training developer to ensure that our programs meet the needs of the force—so complete your survey with care.

Space simply does not permit me to highlight all the splendid reading you will find in the magazine this month, but in closing I should mention the "Reporting Final" department, its content and purpose. We solicit your contributions here, so, if you have announcements of interest aviation wide, reports on activities that do not require a full-length article or that perhaps occur too late for advance coverage, or any information that you want to share with others in the Army Aviation community, let us hear from you. Our mission and address are highlighted inside the front cover. We always welcome your comments and contributions from the field—for this is your publication to better serve Army Aviation worldwide.



Major General Carl H. McNair Jr.
Commander, U.S. Army Aviation Center
Fort Rucker, AL

U. S. ARMY MATERIEL DEVELOPMENT

DARCOM TODAY

Through both evolution and revolution the aviation user and the development community have conceived, developed and produced a family of combat aircraft which has been carefully designed to provide new dimensions to the battlefield and to materially augment the ground commander's ability to fight outnumbered and win. We in the Army Materiel Development and Readiness Command (DARCOM) are most appreciative for this opportunity to describe to the aviation community some of the things we hope to accomplish in this decade which will assist Army Aviation to fulfill its increasingly important role as a member of the combined arms team.

In the 1960s, using aircraft originally designed for other purposes, the Army developed and proved the concepts for airmobility—both in tests and on the battlefield. During the 1970s, the Army concentrated on developing and producing aircraft specifically designed to live and fight in the forward portion of the battle area to enable the ground commander to better exploit those aviation concepts. These efforts will pay off in the 1980s as we field, provision, support and maintain those aircraft developed in the 1970s and integrate them into our forces. As we gain experience in using their greatly increased capabilities in the most effective manner in support of our ground forces, we will be able to expand and define our organizational and operational concepts beyond those envisioned by the planners.

The growth of Army Aviation in just 40 short years—from the L-4 and L-5 to the UH-60 Black Hawk and the AH-64 advanced attack helicopter (AAH) which is soon to be deployed—is mind-boggling. These aircraft of the 1980s will provide vastly increased capabilities in performance, reliability, survivability, maintainability, armaments and other advances over those aircraft which they are replacing or complementing in the force structure.

& READINESS COMMAND (DARCOM)

General John R. Guthrie
Commander
U.S. Army Materiel Development
& Readiness Command
Alexandria, VA

The battlefield of the 1980s and 1990s presents a great challenge to Army Aviation. The anticipated threat continues its rapid growth in both numbers and capabilities. In our efforts to contain that threat, it is important to keep in perspective that our charter in the DARCOM community must ultimately lead to the development of a totally supportable system, which is operationally suitable to the user while providing him staying power, survivability, flexibility and responsiveness. The "total" force approach to aviation systems development must consider the complementary and concurrent effects each has upon the other and their supported ground forces. The development of aviation assets in support of user requirements must be dovetailed into the overall force effectiveness equation and seldom treated independently.

The introduction of the UH-60 Black Hawk begins the deployment of the new family of Army aircraft to be fielded in the 1980s. The AAH, Army Helicopter Improvement Program, Improved Chinook, Remotely Piloted Vehicle, Special Electronics Mission Aircraft (SEMA-X), and Standoff Target Acquisition System (SOTAS) are all follow-on pieces of the aviation modernization program. Improvements in target acquisition, detection and visionics will be realized through incorporation of the Target Acquisition Designation System/Pilot's Night Vision System (TADS/PNVS), mast mounted sights, forward looking infrared (FLIR), FLIR augmented Cobra/TOW sight (FACTS), and Aviation Night Imaging System (ANVIS). State-of-the-art breakthroughs in advanced technologies are creating an environment of sophistication in the field of aviation which both encourages and concerns—it encourages from the capabilities' viewpoint and concerns when considering supportability. For the first time in the history of Army Aviation a "real" rather than "perceived" friendly air capability is being developed which will represent around-the-clock responsiveness.

The challenge is to optimize fleet enhancement through available technology while recognizing dollar constraints. Affordability must dictate future aviation development efforts. Increased emphasis needs to be put on flight and weapon simulator development, improved design techniques, powerplant efficiency and Component Improvement Programs (CIP). These are the areas where long-term cost reductions can be realized without sacrificing effectiveness. The T-700 engine which is now in our Black Hawk fleet is an excellent example of reliability improvements accomplished under CIP.

The shrinking world in which we live allows us less time for mobilization in response to crises than ever before. Our national security requires, therefore, that we have in place a workable, adequately sized and immediately responsive force before a crisis arises. To maintain our fighting force effectively during the fielding of these new systems is a goal which requires intense coordination among DARCOM (the developer), TRADOC (the user-representative), the major subordinate commands and the using unit. Every aspect must be considered—individual training, spare parts, manuals, equipment turn-in, maintenance, and so on. We must, in short, field an effective deterrent force today that will be, should it be required, an effective fighting force that *will* win when called to action.

DARCOM's long-range Aviation Research, Development and Acquisition Plan provides the springboard for the 1980s and beyond; the systems addressed in the accompanying articles of this issue will give you a glimpse of some of the directions in which that plan is headed—LHX (Army's family of light helicopters), laser technology, hypervelocity rockets, improved avionics, etc. Equipped with increasingly sophisticated aircraft, lethal weapon systems and appropriate maintenance support, Army Aviation will continue to be an important and contributing member of the combined arms team.

Illustration by Paul D. Fretts

the Equipment

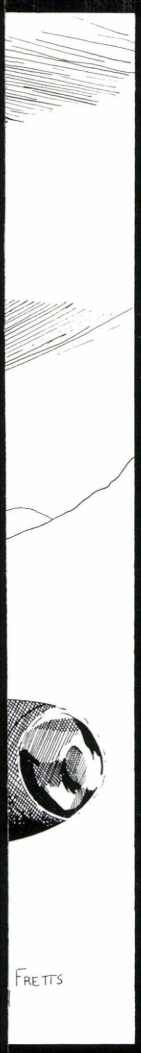
The AH-64 has been viewed as representative of the newest technology available to helicopters. What are the primary differences which set this aircraft apart from past technology?

The primary advances in technology that, as compared to the current attack helicopter fleet, have been included in the AH-64 design are:

- The extensive use of electro slag remelt (ESR) steel for many ballistically critical components. Tests have shown ESR to have improved ballistic tolerance as compared to vacuum melt steel.
- The improved crashworthiness of the AH-64 design incorporates such features as a high strength and energy absorbing crew seat, cockpit protective roll-over structure, crashworthy fuel system, crash force attenuation through controlled structural deformation, collapsible optical relay tube and energy absorbing main landing gear.
- The backup flight control system on the AH-64 is a "fly-by-wire" system. Design requirements prohibit simultaneous failure of the primary mechanical flight controls and the backup controls from a single projectile hit.
- The Target Acquisition Designation System (TADS) and Pilot Night Vision System (PNVS) provide the AH-64 with the capability to fly and fight at night and in adverse weather.

Could you describe the design characteristics of the AH-64 which are believed to contribute to its battlefield survivability?

Design features are as follows:



An Interview with the AAH PM

the Advanced Attack Helicopter

MG Edward M. Browne

The U.S. Army's Program Manager for the AH-64 advanced attack helicopter (AAH) is Major General Edward M. Browne. In the job since June 1976, Major General Browne has brought the AAH through Phase I competitive development for selection of the helicopter airframe and Phase II full scale engineering development. Phase II is almost completed (integration of the subsystems—missile, cannon, rocket, target acquisition and night vision) and the Operational Test on the AAH will be conducted in June through August this summer. Major General Browne recently briefed Ft. Rucker personnel on the AAH and as a result the *Aviation Digest* conducted the following interview with him. (An earlier interview with Major General Browne on the AAH was carried in the January 1979 issue.)

Integral Design Features

Multiple load paths
Separated structural members
Damage tolerant alloys
Twin engine
Transmission dry run capability
Backup control system
Separation/masking of wiring/linkages
Dual hydraulic systems
High flashpoint hydraulic fluid (MIL-H-83282)
Crashworthy fuel system

Parasitic Armor

Pilot and copilot-gunner (CPG) seats
Transparent and nontransparent crew barrier
Pilot and CPG side and floor armor
Reticulated foam, fuel cells
Tail rotor driveshaft deflector
Hydraulic heat exchanger
Rigid foam, fuel cells
Tail rotor pitch horn armor
Stabilator actuators

Integral Armor

Main transmission
Intermediate gearbox
Tail rotor gearbox
Main rotor pitch links
Tail rotor swashplate, pitch horn and links
Actuators, main and tail rotors
Hangar bearing liners

Active Countermeasures

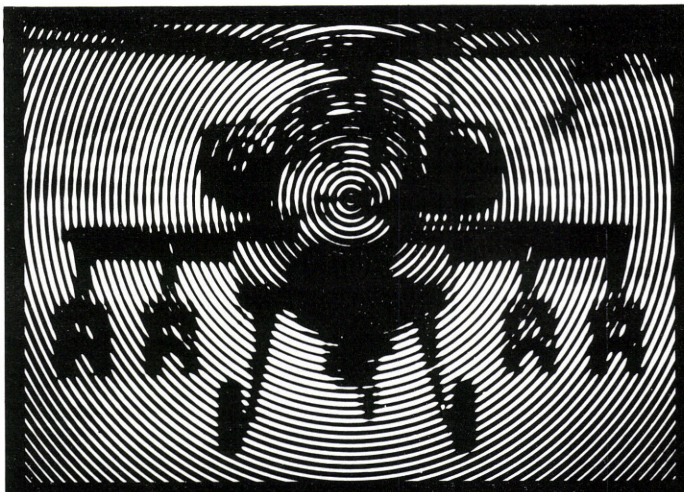
Radar warning receiver, AN/APR-39(V)1 (installed)
Chaff/flare dispenser, M-130 (complete provisions)
Infrared jammer, AN/ALQ-144 (complete provisions)
Radar jammer, AN/ALQ-136 (space, weight, power)
Laser warning receiver, AN/AVR-2 (space, weight, power)
Radar warning receiver, AN/APR-39(V)2 (space, weight, power)

Nuclear, Biological, Chemical

Inherent nuclear hardening level
Crew protective suit

Reduction of Detection

IR suppressor (Black Hole)
Hot metal shielding
Antidoppler main rotor fairing
Low flicker rotor
Low reflective finish
Low glint canopy



"... The Mission Is To Get The Advanced Attack Helicopter In Production And To The Field For The Troops..."

BELOW: AH-64 firing a tactical prototype HELLFIRE

Please address the fuel capability/flying time/logistical support for this aircraft.

Full internal fuel capacity is 2,398.5 pounds/369 gallons. This capacity will provide a flying time of 2.54 hours for sea level, standard day conditions. (A 30-minute reserve is included in the 2.54 hours.) The design philosophy for the AH-64 has been to provide the Army with an attack helicopter that is easily maintainable and supportable under the present three level maintenance concept. The entire thrust of all logistics planning and subsequent actions has furthered this philosophy. Included in the maintenance concept are modular replacements, warranty provisions, contractor depot and supply support for the first 3 years, technical manuals written to the Skill Performance Aid concept, extension training materials, onboard Fault Detection and Location System (FDLS) as well as maximization of automatic test equipment. The above elements as well as many other logistics functions have been developed through an extensive application of logistics support analysis.

The AH-64 appears to be electronically sophisticated; will it present special problems with regard to maintenance?

The sophistication of the AH-64 electronics is offset by maximization of automatic test equipment and an onboard FDLS.

What sound decibel levels will the AH-64 expose the crew to, and what type of noise attenuation will the cockpit design provide?

The most recent actual sound measurements showed that the crew will be exposed to 73 decibels at hover and 81 decibels at 130 knots. This is roughly the same as the Cobra. Since these measurements, however, the thickness of the two windshields has been increased,

and a slight compound curvature has been put into the other five cockpit transparent panels. These efforts, although primarily done for aerodynamic reasons, should attenuate even more of the external noise. Additionally, the Integrated Helmet and Display Sight System (IHADSS) has very stringent noise attenuation requirements. Therefore, ambient noise should not degrade communications or subject the crew to risk of hearing loss.

What purpose does the new tail configuration serve?

A redesign to incorporate a movable lower horizontal stabilizer (stabilator) was implemented to alleviate flight handling qualities and structural problems encountered with the "T"-tail configured aircraft. The stabilator, which is programed as a function of airspeed and collective pitch, provides for an acceptable aircraft attitude and flight handling qualities that meet or exceed specification; and it alleviates the structural flight loads and structural dynamics problems.

How were aircraft instrumentation and lighting designed to reduce pilot fatigue? Have other human factors received special consideration?

Unlike any other Army aircraft, the pilot or CPG will fly the AH-64 while looking at a 1-inch cathode ray tube image reflected into one eye, using an IHADSS. This picture, which is received from a forward looking infrared (FLIR) sensor within the PNVS on the nose of the aircraft, includes not only the thermal imagery of the FLIR but also flight instrumentation symbols for heading, altitude, airspeed, engine power management, attitude and trim, as well as weapon firing information. This allows the pilot's view to stay "outside the cockpit" while flying nap-of-the-earth, which significantly reduces workload and pilot fatigue. Workload is reduced in the CPG station with the use of the optical relay tube (ORT) handgrips. The CPG can select sensors, fields of view, tracking modes and polarity; use the laser; select and fire weapons; and store targets in the fire control computer without moving his hands off the grips. In addition to these major fatigue-reducing devices, the basic aircraft instruments are functionally grouped for rapid scan and status assessment, and the audio warning system alerts the pilot of an engine or stabilator failure. The aircraft has a standard lighting system which includes a primary and flood-lighting system.

What type of environmental control system is used to establish adequate ventilation, heating and cooling of the cockpit?

Cockpit heating and cooling are provided by the environmental control subsystem. The normal air supply to the environmental control unit is from the shaft-driven compressor. The subsystem is thermostatically controllable by the pilot up to a maximum cockpit entry air temperature of 170 degrees Fahrenheit. Through an environmental control unit shutoff valve and selection of standby mode, ambient air is supplied to the cockpit. In the event of shaft-driven compressor failure, engine standby bleed air will provide the air supply for the subsystem.

The forward avionics bays are cooled by electric motor-driven fans which move crew compartment conditioned air through the bays and overboard. Crew compartment conditioned air is also supplied to the ORT and TADS/PNVS turret.

the Crew

What has experience to date revealed about prerequisites for pilot and copilot-gunner and maintenance training?

As of this month, 22 Army aviators have been trained. Pilots have been graduates of the Naval Test Pilot School or were senior AH-1 pilots. During the Operational Test II (OT II) 12 warrant officers will be trained in the AH-64. Data collected during their training will enable the Army to establish prerequisites for future institutional training considerations.

Maintenance training to date indicates no special requirement other than that received via advanced individual training.

Will the same people be qualified in both aircraft stations (pilot and copilot-gunner), or will they be qualified as one or the other?

Present plans require that students who complete the institutional course of instruction will be qualified in both crew stations.

When will institutional training commence on the AH-64?

Academic training is scheduled to begin 15 May 1984; actual flight training will begin 1 June 1984.

What is the current thought on pilots who wear glasses; will they be excluded from this aircraft?

There is no reason, to date, to exclude pilots who wear glasses.

What will be the transition requirements for the AH-64 versus AH-1S?

Research and development is underway to field a Combat Mission Simulator which should reduce the actual AH-64 flight hours. Until that simulator is available in the 1986-87 timeframe, we are looking at a 65-hour flight program with about 100 hours of academics over a 12-week period.

Will AH-64 qualified personnel be tracked with specialty skill identifier?

Yes.

the Use

What increase in combat effectiveness can we expect to see when the AH-64 is fielded?

The AH-64 is the first Army attack helicopter developed to live with the troops in the forward battlefield environment specifically for the day, night or adverse weather antiarmor mission with emphasis on the ability to fight, survive and return to fight again. The combination of the TADS and PNVS with the HELLFIRE modular missile system offers the potential for long-range kills of hostile armor at night and during periods of obscured visibility.

Target acquisition, engagement ranges and missile accuracy and lethality will increase dramatically. The flexibility of HELLFIRE will offer opportunities for both direct and indirect fire and autonomous or remote laser designation either by another aircraft or by the FIST (fire support team) ground laser locator designator. The AH-64's improved fire control and stores management system will offer improved 2.75 inch rocket delivery accuracy for suppressive and special purpose ammunition while the XM-230 30 millimeter (mm) cannon will offer not only suppressive fire capability but light armor kill potential.

What are the fielding plans for the helicopter?

The fielding plan hasn't been finalized as yet because new and different concepts are being evaluated. As in any weapon system, the key to its effective employment is the state of training of its crews. To ensure that the crews of the AH-64 are adequately trained, all aircrew training could be accomplished at Ft. Rucker. The AH-64 is of sufficient sophistication and different enough from current inventory aircraft that maintenance personnel also could be trained in an institutional environment.

The solution to solving the problem of achieving quick combat effectiveness of units newly equipped with AH-64s as well as easing personnel and materiel management problems is to train by units. This concept is outlined below:

In most cases, the AH-64 would be introduced into existing units equipped with AH-1S aircraft. Also, 2 to 3 months prior to start of transition training from AH-1S to AH-64, a company-sized unit would receive fillers to ensure adequacy of quantity of personnel as well as quality. The unit would train collectively to achieve level 1 ARTEP (Army Training and Evaluation Program) standards. The unit personnel would then be time phased into institutional courses for maintenance and aircrew training. AH-1S aircraft and equipment would be turned in incrementally as AH-64s and associated equipment were issued. The unit would then train collectively for about a month and should then again be at level 1 ARTEP standards. For units overseas the same procedure would be followed except a host station in the continental United States (CONUS) would be designated for collective training prior to the unit deploying overseas. An anticipated added requirement would be to provide an additional company-sized attack unit to the European force structure to compensate for the loss of combat power caused by AH-64 individual and collective training in CONUS. Once all units scheduled for the AH-64 are filled, then the extra company could be redeployed or other disposition made.

Is the weapons system for the AH-64 being considered for the antihelicopter threat?

The AH-64's 30 mm cannon will give us a good punch and range, and that could provide a marked edge in air-to-air combat with other helicopters and make enemy fixed wing aircraft reluctant to engage us. In addition, air-to-air missiles that are in the inventory are also being examined for use on the AH-64.

How does the AH-64 compare with the HIND-D in tactical capabilities?

The Soviets in the HIND-D have demonstrated the capability to produce and field a modern, highly technical and advanced assault helicopter. The HIND exhibits many of the advance capabilities of the AH-64. It combines the functions of scout, transport and attack helicopters. Its capabilities include tactical airborne assaults, close air support, antiarmor operations and antihelicopter operations.

When will the AH-64 be available?

The operational test for the AH-64 is scheduled for completion in August 1981, with a production decision scheduled in December 1981 and first production delivery in November 1983.

LHX– Light Helicopter of the Future

The night is dark with only a quarter moon showing occasionally through low, scattered clouds. A light rain impacts the canopy of Scout 36. From an automatic hover, the pilot verifies his position on the map display and requests engine condition, fuel remaining and ammo state. Satisfied that all is well, he directs: "Proceed to observation point 23, airspeed-210, terrain clearance-50, weapons-hot, engage at my command, maintain survivability level-95, approach to 5-foot hover, acknowledge." A pilot talking to his copilot? Well, in a sense; but this was the single pilot of an LHX-Scout talking to his voice actuated control system.

The technology emerging from the industrial and Government research and development base is impressive, to say the least. As a brief overview, there are composite materials to make rotor blades, fuselages and even transmissions; advanced flight control systems that use both electronic and optical control paths; new engines operating at higher turbine speeds and greater pressure ratios; and advanced weapon systems with longer ranges, greater accuracy and the ability to engage targets at night. The researchers are also working on programs that greatly improve helicopter rotor performance, communications systems and navigation equipment. Interestingly enough, with a little luck and an adequate funding level, all of these programs will be ready to enter engineering development in the 1985-1986 timeframe; but, more on this later.

What is all this coming to? Well, of course all this equipment can be used to improve Army helicopters that are currently in the field. A look at the threat, however, causes concern that some of our current fleet may lack the growth potential to assimilate enough of this new technology to meet what we are very likely to be facing. It is generally acknowledged that the Warsaw Pact forces in Central and Eastern Europe are our most serious threat. There is strong agreement in the intelligence community that the Warsaw Pact forces will be numerically superior to NATO (North Atlantic Treaty Organization) forces in terms of personnel and equipment. Generalized

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numbers run on the order of 5-to-1; them against us. If specific items of equipment are addressed, the ratios can quickly grow to 15-to-1 with the advantage on the side of Warsaw Pact forces.

The Soviets are the acknowledged motivators and innovators of the Warsaw Pact armies; as such, they supply the bulk of resources within the Pact. Two major areas on which the Soviets are placing a great deal of importance are their air defense and their electronic warfare capabilities. They recognize these two areas provide a high payoff for increasing their overall combat effectiveness and they are rapidly expanding their capabilities in both areas. Other areas of concern are represented by their attention to developing rotary wing, air-to-air tactics and weapons, employment of chemical systems, proliferation of tactical lasers, and development of more exotic systems such as electromagnetic pulse and particle beam weapons. Once these threat factors are considered, it is easy to surmise that today's fielded hardware which incorporates yesterday's technology may have a difficult time surviving and conducting effective combat operations. Obviously, new development programs provide the opportunity to take advantage of the latest technology, provide a far-term response capability, and should be cost-effective in the long term.

Since the latter part of 1978, the Army has sought to improve the capabilities of its scout helicopter fleet to respond to the growing threat. Currently, the status of this effort is to product improve an existing airframe instead of proceeding with a new development effort. While this is an attractive short-term solution for economic reasons, it does not go far in providing sufficient capability for the 1990s and beyond. It is the responsibility of the U.S. Army Aviation Research and Development Command (AVRADCOM) to remain attuned to system deficiencies caused by the threat. When deficient areas have been identified, it is possible to proceed with developing an appropriately responsive system in conjunction with the Training and Doctrine Command (TRADOC). One such system that AVRADCOM has identified as being capable of responding to the threat in the 1990s is the family of light helicopters (LHX).

Basic to the LHX principle is a new development effort. A modification program of existing aircraft or a product improvement will not provide the needed capability. General characteristics to be incorporated in the LHX are simplicity, small size and lightweight. An aircraft in the 6,000 to 7,000-pound category is the current goal. It will be a system that can be easily maintained and logistically supported in the field. A departure from the usual way of doing business will be to emphasize performance of the LHX. Maximum speeds up to 300 knots are being studied to improve mission effectiveness and enhance survivability. Other performance parameters are also being investigated by computer simulation to determine their relative value in air-to-air combat and ability to evade threat ground systems. Through the use of composites and advanced design techniques, the LHX will be able to continue operation in a damaged mode; and, while the mission equipment package, flight control system, radios, etc., may be degraded, the basic mission can still be performed. Crew workload reduction will be accomplished through total systems integration of the communication, navigation, flight control and fire control functions as well as pilot/gunner controls and displays.

A conceptual system which provides the capability for near automatic flight and fire control has been designed by the Avionics Research and Development Agency (AVRADA). This baseline system will be further refined and a brassboard simulation model or flight demonstrator constructed during a 1-year industry effort to begin in July-August 1981. The technology to simplify and decrease crew workload is both feasible and achievable. The challenge will be to integrate only enough sophistication to do the job, keeping the system lightweight and reliable. If crew workload can be reduced sufficiently, a one-man cockpit may be considered for certain applications, further reducing weight and cost.

AVRADCOM's Applied Technology Laboratory (ATL) has recently completed a technological survey to determine candidate weapon systems for armed versions of the LHX. In the coming year, tradeoff studies will be conducted to determine the relative merit of guns, missiles, turreted weapons, high energy projectiles and other advanced weaponization systems. Here again, the purpose is to keep weight and cost down while maximizing effectiveness and reliability. As you can now see, all the advanced technology discussed earlier is being synthesized to produce an Army air vehicle with a new plateau of capability.

An ambitious program schedule has been established to facilitate fielding the LHX system. AVRADCOM is currently sponsoring in-house and contractor studies to assist in the preparation of a draft Mission Element Need Statement (MENS) in

1982. The engineering development phase will commence in the late 1986 timeframe to develop a common set of dynamic components (engines, rotor systems and drive trains) which can be used by three LHX alternative aircraft: LHX-Scout, LHX-Attack and LHX-Utility. The target date for units to receive the Scout version is the early 1990s.

In assembling the LHX development effort, total program costs and schedule are major impact parameters. New aviation program starts are very costly and therefore require maximum return on investment; consequently, LHX will attempt to capitalize on developing a common set of dynamic components during the engineering development phase. Priority of development will be given to the LHX-Scout alternative with the LHX-Attack and the LHX-Utility alternatives following as derivatives. Hopefully, this technique will allow an economical development proportionately shared by three alternatives while assisting the scheduled introduction of three improved aircraft systems. The LHX concept will concentrate on providing a system to complement the AH-64 and UH-60A systems while augmenting or replacing older systems such as the OH-58, AH-1 and UH-1.

Current plans are to field a limited number of AH-64s and UH-60s. While much can be said for sophistication, there is also a big plus for fielding systems in quantities sufficient to gain a numbers advantage or at least parity with Warsaw Pact forces. With the technology available within the next 4 to 5 years, the LHX can be made simple, cheap and mission capable enough to be fielded in large numbers instead of quantities of a few hundred. The LHX, with its small size and high performance and fielded in sufficient quantities, will prove a formidable contender to opposing forces.

It would be unrealistic to expect the ambitious LHX characteristics to evolve without causing some changes in the development and employment arenas. The LHX will represent simplicity achieved through the judicious application of advanced technology and will avoid "gold plating" or over-sophistication. The tactics for employing LHX are very likely to change from those used by today's aircraft, just as tactics were changed by the introduction of the crossbow and later the machinegun. Instead of creeping from tree line to ridge line, more or less in a defensive mode, it will be possible once again to seize the initiative, destroy enemy air defense weapons and attacking helicopters, penetrate his weak spots and attack second echelon forces.

And there you have it—the Army's aircraft for the future. LHX: a small, fast, fighting machine!!!

HOT LINE

The following Hotline numbers can be called on official business after duty hours. They will be updated and reprinted here periodically for your convenience. If your agency has a Hotline it would like included, please send it to the *Aviation Digest*, P.O. Drawer P, Ft. Rucker, AL 36362.

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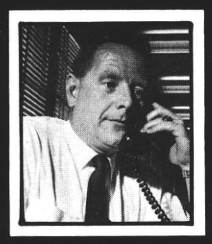
U. S. ARMY MISSILE COMMAND (MICOM)

Bob Hubbard
Public Affairs Office
U.S. Army Missile Command
Redstone Arsenal, AL



the MICOM Pledge:

"A Good Weapon Today, A Better One Tomorrow!"

THE ARMY MISSILE Command (MICOM) at Redstone Arsenal, AL, first met aircraft weaponization in 1951 when the Air Force funded the Rocket Development Division to design and develop a low-cost, 2-inch rocket for training pilots to fire the 2.75 inch rocket. Intended to reduce training costs, the new rocket, with an adapter developed by MICOM, would be launched from existing 2.75 launchers aboard the Air Force F-86, F-89 and F-94 interceptors. So successful was the program that not long afterwards the Air Force asked MICOM to develop a 2-inch tactical rocket to replace the 2.75.

Although the program was cancelled a few years later, and 2.75 was never replaced, MICOM laboratories plunged headlong into development of rockets, launchers and aircraft installation hardware.

By the mid-1950s, the Army began seriously thinking about arming helicopters. As Air Force jets began flying faster and higher, the Army's need for close air support became more pronounced.

So on a gray November morning in 1956, a carload of Redstone engineers traveled to Ft. Rucker, AL, to exchange ideas and make plans.

Ft. Rucker had plenty of ideas, helicopters, maintenance and fuel. Redstone had done a lot of homework on aircraft armaments—rocket, missile and launcher design, aircraft installation and testing. It was a perfect marriage!

Many others would play important roles in adapting missiles, rockets and armaments to helicopters but from that Redstone-Ft. Rucker meeting in 1956, the Army's armed helicopter program took giant steps forward.

It hasn't slowed down since. MICOM continues to develop aircraft armaments, including TOW (tube-launched, optically-tracked, wire-guided) and HELLFIRE missiles, in addition to the 2.75 inch rocket, and is seeking to improve both weapons and aircraft survivability.

Adapting missiles and rockets to helicopters may be one of MICOM's biggest contributions, in the opinion of several Redstone missilemen. That represented a whole new concept and gave the Army a mobility and firepower it never had before.

HELLFIRE

HELLFIRE, the MICOM-developed tank killer, will be the primary armament on the Army's new AH-64 advanced attack helicopter (AAH) which can carry up to 16 of the missiles. Scheduled for production in 1981, HELLFIRE is being developed as a modular missile system that can accommodate a family of terminal homing seekers on a common airframe. HELLFIRE missiles are about 64 inches long, 7 inches in diameter and weigh about 100 pounds.

Laser HELLFIRE is the first application. The technique of guiding missiles with a narrow beam of light is called semiactive laser guidance and was developed in MICOM laboratories. MICOM began working on laser guidance in the early 1960s and pioneered the technology and experimental hardware used by the Air Force in developing the laser guided "smart bomb."

During firings, the laser beam is focused on the target and the missile homes on the illuminated spot.

Tanks and other battlefield targets may be illuminated from the air or ground, another aircraft, or autonomously—designating the target and firing from the same aircraft. MICOM has triservice responsibility for development and production of all ground laser equipment that is the "flashlight" for laser guided missiles, bombs and conventional artillery equipped with laser seekers. This command has demonstrated HELLFIRE's accuracy and versatility with rapid and ripple test firings, direct and indirect launches, from the ground and helicopters, against stationary and moving targets.

The Army has concluded operational tests with HELLFIRE. The Combat Developments Experimentation Command conducted the test program at Ft. Hunter Liggett, CA, complete with live firings and computer battlefield scenarios simulating large-scale, force-on-force battles.

About 300 personnel participated in the tests which included some 1,100 simulated engagements and 33 live firings. Tests were highly successful.

HELLFIRE development tests with the AAH as well as operational tests will be completed this year. The system, highly survivable because of its standoff range, indirect fire capability and shorter time of flight, will be fielded in the mid-1980s.

MICOM also has done extensive work in developing for helicopters a Target Aquisition and Designation System and Pilot's Night Vision System.

Rockwell International of Columbus, OH, is the HELLFIRE prime contractor.

BELOW: HELLFIRE missiles will be the primary armament on the Army's new AH-64 advanced attack helicopter. The AAH will carry up to 16 missiles. Looking at a delivery of missiles to Redstone Arsenal, AL, are COL Stanley Cass (left), HELLFIRE project manager at the Army Missile Command and Tom Murphy, vice president and general manager of Rockwell International's Missile Systems Division

TOW

Once it was all a Soldier could do to throw a 2-pound grenade 90 feet. Then MICOM developed a weapon that could hurl a 40-pound missile 2 miles with bullseye accuracy and destroy what it hit. Today that weapon, TOW, is the Army's current tank stopper on the Cobra attack helicopter (AH-1S).

TOW earned a niche in Army missile history when deployed to Vietnam in 1972 aboard two UH-IB helicopters, becoming the first American-made guided missile to be fired in combat by U.S. Soldiers.

TOW, the most heavily produced U.S. guided missile, is deployed with 32 countries.

MICOM has begun two major improvement programs with TOW that will keep the tank killer abreast of the enemy armor threat for years to come. The first, called Improved TOW, is intended to counter near term enemy threats and will feature a 5-inch diameter warhead similar to the present warhead size and weight but will penetrate heavier armor. The longer range program, called TOW 2, will counter even more sophisticated enemy armor with its 6-inch warhead, new flight motor and improved guidance system for dirty battlefields.

Other major members of the TOW team, in addition to MICOM and Hughes Aircraft Company, are the Armament Research and Development Command and Firestone.

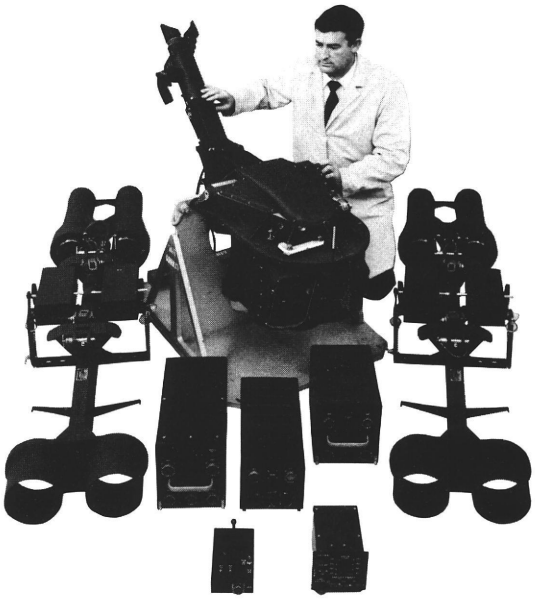


Photo by Hughes Aircraft Company

ABOVE: This package of airborne TOW equipment, when mated with missiles, is the Army's current tank stopper on the Cobra attack helicopter. A Hughes engineer inspects the telescopic sight which enables gunners to fire from standoff ranges against tanks and other battlefield targets. The three bigger boxes in front of the sight are electronics units, and the two smaller are aircrew controls. Also shown are two twin-barreled missile launchers

TOP: AH-1S Modernized Cobra attack helicopter with M260 (7) and M261 (19) lightweight 2.75 inch rocket launchers

2.75 Rocket

Although the 2.75 rocket has been around for three decades, the Army's only aerial rocket isn't limited to 30-year-old technology. In fact, the 2.75—originally developed by the Navy in the 1940s and modified for Army use in the 1950s—is better than ever and likely will be around for years to come, thanks to improvements already made or planned by MICOM.

Coupled with the Army's new helicopters and fire control equipment, the effectiveness of the present 2.75 has increased many times over that of the old rocket.

The 2.75 rejuvenation program includes a new generation of warheads, fuzes, launchers and a new rocket motor, to adapt the 2.75 to the Army's AH-1S Cobra and the AH-64 advanced attack helicopter.

Improvements include smoke, illumination and submunition warheads, remote set fuzing concepts which allow the pilot to set the warhead to go off at the desired range, a new rocket motor that improves helicopter range and accuracy and a rocket management system that lets the pilot select the rocket configuration, depending on the target.

MICOM also has in production two new lightweight launchers, a 7-tube and a 19-tube configuration, that will be considerably lighter, more cost effective and more versatile than their current counterparts, the M-20 and the M-158.

The new launchers, reusable up to 16 times, will be compatible with the new fuzes and rocket motor and will operate under moderate icing conditions. Reduced launcher weight and the new rocket motor will improve helicopter effectiveness and survivability.

MICOM has research, development and configuration management responsibility for the Army's 2.75 program. The command has worked closely with the Troop Support and Aviation Materiel Readiness Command, the Aviation Research and Development Command, other DARCOM activities, Naval Ordnance Station, the Training and Doctrine Command and some 40 countries around the world.

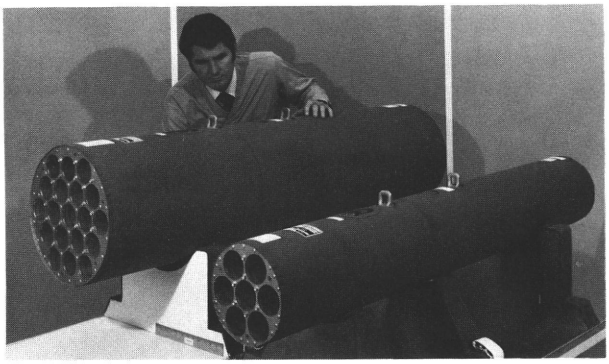


Photo by Hughes Aircraft Company

A Hughes engineer inspects two new lightweight launchers, a 19-tube and a 7-tube configuration (above), and the aft end of a new 2.75 lightweight launcher (below), that Hughes and MICOM have in production for Army helicopters

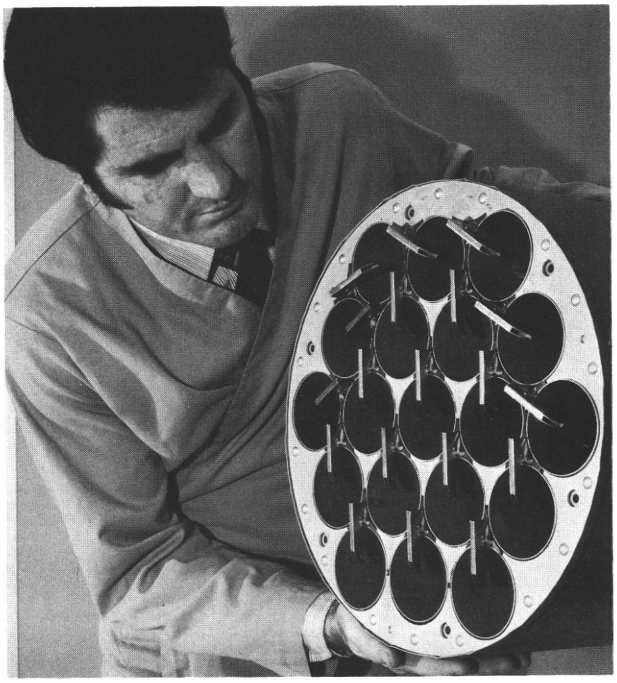


Photo by Hughes Aircraft Company

Future Technology

Seeking accurate, low cost weapons, MICOM is investigating a broad spectrum of homing and guidance techniques for close combat support and airmobility.

Research is particularly heavy with electro-optical, infrared imaging and radio frequency seekers. Since much of the new technology deals with electro-optical devices, there is a need for smokeless, or low-signature propulsion systems. The command is seeking to materially reduce or eliminate signature.

On future sophisticated battlefields, it will be essential for helicopter survivability that pilots be able to take advantage of cover and fire at targets that are over the hill, masked from the helicopter.

One promising new technology at MICOM is fiber optics. The fiber optics link, which would be payed out like TOW wire, has an extremely wide band width, can handle more data and is more secure than wire because it's essentially countermeasure free.

In flight, the imaging seeker—like a low-cost TV—would look at the target and send the picture back to the aviator in the loop who would look at a TV receiver. The aviator could select a target and simply fly the missile into it.

Elsewhere, MICOM is conducting research with new radars and sensors that can operate under all-weather battlefield conditions, including smoke, haze, darkness and adverse weather.

MICOM and the Army Aviation Research and Development Command at St. Louis conducted a test at Redstone in 1980 and are collaborating on a viewing device that does for helicopters what a periscope does for submarines. The test featured a mast-mounted sight (a television and designator system) that was mounted above the helicopter rotor. The additional height allows the chopper to search, acquire and designate targets while remaining concealed behind trees, hills, rocks and other terrain mask.

Meanwhile, research is continuing at Redstone in hypervelocity rockets and multimode fire and forget missiles that might engage both ground and air targets.

MICOM is many things: men and women, Soldiers and civilians, complex facilities and equipment needed to manage the Army's extensive missile and rocket program. But most of all MICOM is know-how—know-how to communicate with Army commands the world over, to find out what Soldiers want and need and to put at their disposal the full scientific and engineering expertise at Redstone to help them fight, survive and win on the modern battlefield—both on the ground and in the air.

MICOM's pledge to the Soldier: "A good weapon today—a better weapon tomorrow."

Perched atop the rotor is the mast-mounted sight for the television and designator system tested at Redstone Arsenal

U.S. ARMY TROOP SUPPORT & AVIATION MA

Illustration by Paul D. Fretts

Major Leslie C. Mingus
Fixed Wing Readiness Project Officer
U.S. Army Troop Support and
Aviation Materiel Readiness Command
St. Louis, MO

Aviation Maintenance in the 1980s

The U.S. Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) provides the American Soldier with the finest logistics support available to any Soldier in the world. It is pledged to continuing that high level of support throughout the 1980s and beyond.

What follows provides a thumbnail sketch of how TSARCOM will support Army Aviation in the 1980s. It will also briefly examine some proposed and programed changes to existing aircraft systems that will enable them to meet and exceed the maintenance demands of the future Army Aviation battlefield.

Army Aviation maintenance in the 1980s will be shaped by three major thrusts. They are:

- The economical considerations that will drive decentralization of maintenance from continental United States to outside continental United States.
- The continuing and developing impact of implementing the reliability centered maintenance (RCM) concept.
- The increasing complexity of systems and heavier reliance on automatic test equipment.

Increased system cost and the resultant belt tightening on inventories plus inflationary transportation costs and the need for closer short term support in mobilization scenarios are forcing an expansion of forward maintenance capability. We can expect to see a strengthening of the trend toward increased theater maintenance capability.

Complementing the increased theater capability, TSARCOM, in cooperation with the Corpus Christi Army Depot (CCAD), currently operates a "hotline" service under the auspices of the RCM program (AUTOVON: 861-2651/2 or Commercial: 512-939-2651/2). This service provides telephonic diagnostic and depot teams to perform infield repair of turbine

engines, thus avoiding costly unnecessary return and overhaul. Also, as a result of RCM failure mode analyses, increases or eliminations of time between overhaul (TBO) are being implemented in order to extend the safe use of equipment.

Advances in technology and subsequent increased sophistication of weapon systems are rapidly exceeding the capability of available field maintenance resources. This trend has brought an increased emphasis on the development and use of large-scale diagnostic systems to the point that it questions the maintainability of our maintenance equipment.

Multi-application Management

Army Aviation units must be able to conduct a variety of missions on very short notice. These organizations rely heavily upon aircraft equipment systems with their variety of subsystems (armament, survivability items and communications) to shoot, move and communicate. This equipment dependence is so strong that Army readiness evaluations define aircraft systems as pacing items, meaning they could significantly impact the mission success or failure of a tactical unit. Further, the operation of subsystems is measured in terms of readiness under the fully mission capable concept. Because of these many integrated readiness requirements and the Army's policy of emphasizing highest readiness in units encompassed by contingency plans, TSARCOM is providing intensive management in this area through the designation of a Multiapplication Items Readiness Project Officer (RPO).

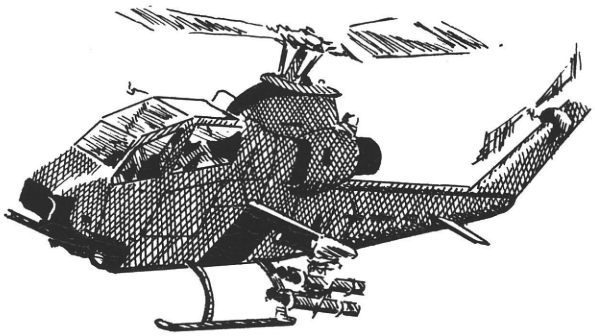
The TSARCOM Multiapplication RPO will have the responsibility of managing aircraft subsystem application on specified aircraft in a minimum time-frame. Efforts will be directed to issuing subsystems to high priority aviation units and then the balance to the rest of the fleet. Consideration for assigning resources to units will be by priorities assigned by Department of the Army. More emphasis will be directed in the future to the planning and execution aspects of management as opposed to correction. Maximum use will be made of the computer and its available data to highlight voids, imbalances and projections.

Utility Helicopter Fleet

The UH-1 Huey helicopter fleet is the largest in the Army. The Huey logs slightly more than half of all the Army aircraft flying hours while performing numerous types of missions at the greatest number of locations throughout the world. The UH-1 helicopter system serves the Army, Navy, Marines, Air Force, nondefense Government agencies and foreign countries in both war and peacetime environments. A continuing need for the UH-1 has been identified through the calendar year 2004.

The UH-1 Service Life Extension Program (SLEP) developed jointly by the Army Infantry School and the Training and Doctrine Command (TRADOC), and approved in concept by the Department of the Army, specifically spells out the modification changes that are necessary to improve the UH-1 and make it capable of serving the Army's needs through the 1980s. The SLEP also envisions a three-fleet concept consisting of a UH-1H tactical TDA fleet, a UH-1 medical evacuation fleet and an EH-1 electronic warfare fleet. The EH-1 and UH-1V models are reconfigured H models and are presently being phased into authorized Army field units. This effort is in conjunction with the current Product Improvement Program. Also, the SLEP proposes, as an option and in addition to the minimum essential product improvements, certain operational enhancements as well as reliability, availability and maintainability (RAM) improvements. This option assumes the application of these improvements when the aircraft is returned to depot level rework for modification. Investment costs are expected to be offset by operating cost savings realized from RAM improvements.

The Huey, like other Army systems, has fallen victim to the austere funding allocations of the past 5 years. Presently, there is no funding for the FY 1980 to 1982 minimum improvements or any indication that funds will be available in the future. The SLEP options previously discussed require research and development leadtime in order to have qualified and tested hardware ready for production and delivery in the 1983-1984 time-frame. There are no approved funding programs for these efforts. It is feasible to delay the phase-out of the UH-1 indefinitely by recycling through depot overhauls, which is the current policy.

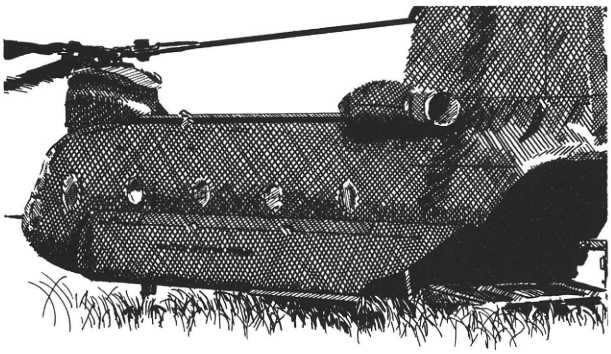


Cobra

The AH-1S Modernized Cobra will meet the challenge of the modern battlefield of the 1980s with enhanced survivability and a greater tank killing capacity. Although the aircraft has maintained the familiar design characteristics of the AH-1G, nearly

every airframe component has been improved. Survivability improvements include the composite rotor blade which can sustain a 23 millimeter (mm) hit, a beefed-up drive train and a third hydraulic system. The Modernized Cobra is now equipped with an infrared jammer and heat suppressing exhaust system and will soon feature either the AN/ALQ-136 radar jammer or the M-130 chaff dispenser.

The addition of the TOW (tube-launched, optically-tracked, wire-guided) missile system (TMS) and the 20 mm cannon represents the most significant improvements to the Cobra. The lethality of the TMS will be increased with the introduction of the improved TOW missile with its greater penetration capability. "FACTS," or forward looking infrared (FLIR) augmented TOW sight, will give the Modernized Cobra a passive night capability as well as an enhanced daylight capability in smoke, fog or other battlefield obscurations. The Modernized Cobra is capable now of fighting and surviving on the modern battlefield, and the 1980s will see continued improvements in reliability and effectiveness.



Cargo Helicopter

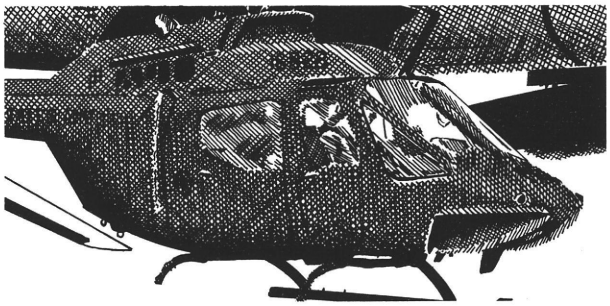
The Army's cargo helicopter fleets are destined to undergo significant changes in the decade ahead. Currently they consist of CH-47A, B and C in the active Army and CH-54A and B helicopters of the Army National Guard and the Army Reserve. These aircraft are spread worldwide throughout the active Army, Army National Guard and Army Reserves. Today, as in the past, these aircraft provide commanders in the field with rapid, dependable aerial logistic support. The capability of these aircraft to move large quantities of supplies, personnel and equipment will soon be enhanced with the fielding of the CH-47D and the planned improvements of CH-47Cs.

During the next 10 years, CH-47A, B and Cs will be inducted into the CH-47D Modernization Program. These aircraft will be output as CH-47Ds. The CH-47D provides users a much more capable and productive medium/heavy lift helicopter (MLH/HLH). With its greater lift and improved RAM, the D model is a force multiplier for commanders in the future. The first Ds will be fielded in FY 1982 with planned initial operational capability in early FY 1984. Current planned production calls for 9, 19 and 24 aircraft to be inducted into the program in FY 1981, 1982 and 1983 respectively, with 36 inputs in FY 1984 and subsequent years until a total of 436 CH-47 As, Bs and Cs are modified to CH-47Ds. Ideally, if the necessary funding is provided, this production rate will be accelerated.

Also, during the decade ahead, the CH-47C's capability will be enhanced through the application of product improvements. These range from the installation of fiber glass rotor blades and T55-L-712 engines to improved aircraft survivability equipment (ASE). With these improvements, the CH-47C will continue to be the MLH workhorse in the early 1980s until significant quantities of CH-47Ds are fielded.

The 1980s also will bring improvements to the CH-54A and B. These aircraft are now assigned to the Army National Guard and they continue providing heavy lift capability to the user in the field. Their capability will be enhanced by the application of product improvements of avionics and RAM.

As they have since the 1960s, the CH-47 and CH-54 systems will provide Soldiers in the field with ready, dependable and effective aerial logistic support.



Observation Helicopter

The October 1980 Aviation Research and Development Command's Army Aviation Research, Development, Test and Evaluation Plan states that the Army Helicopter Improvement Program is initiated as a major effort and replaces the OH-58 improvement effort. This might prompt one to ask, "What's going to happen to the OH-58A or C that we are going to have to fly till these new aircraft become available?

That is a valid question but only from a very near-term perspective, say the next 10 years. While new scout/observation aircraft are being conceptualized and defined, the everyday, real-life missions being demanded of the OH-58 in the field will require that changes, big and little, be applied to the OH-58 fleet.

The OH-58A, the mainstay of the fleet by sheer numbers, will continue to perform scout, observation and administrative missions. To enhance its operational capability, improve safety and provide crew comfort,

many product improvements are in the offing.

Installation of the AN/APR-39 radar warning system Complete Provisions Only (CPO) is ongoing as is the installation of the tail rotor drive shaft cover. There is one active engineering change proposal (ECP) that extends the new two-piece cover to the 90-degree gearbox. The new two-piece cover also has a piano wire hinge on one side to facilitate inspection. The daily inspection of hangar bearings now required may be eliminated with the installation of the cover, as well as allowing the 25-hour servicing of the tail rotor hangar bearings to be extended to 100 hours. Modification of the OH-58A to incorporate an improved airframe defrost system similar to that in the OH-58C will contribute to crew comfort and correct previously identified defog problems.

Crew safety will be enhanced in the nap-of-the-earth (NOE) environment through installation of the wire strike protection system (WSPS) which should begin in July 1981.

Additionally, the installation of an improved fuel supply system inside the fuel cell will replace the hose clamps now used which will eliminate air from entering the fuel supply system.

In respect to the OH-58C, an extensively product-improved OH-58A, the future holds much promise for dramatic improvements in its operable mission package.

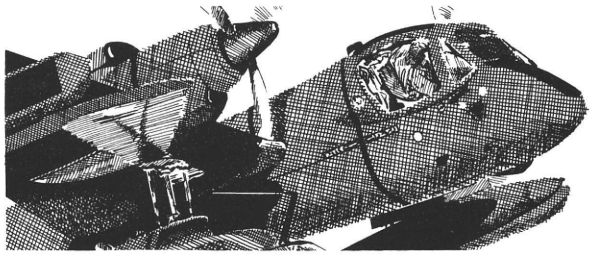
The OH-58C's use as an interim scout in an almost totally NOE environment requires installation of the WSPS. Likewise, its up front use in an area that is target rich lends weight to the installation of a laser detection and warning system to complement the AN/APR-39 radar warning.

Incorporation of the ECP on the greasable main rotor head, while primarily oriented toward the OH-58C, also would be extended to the OH-58A to reduce a major maintenance problem.

The NOE communications program, which looks to the installation of an improved FM (frequency modulated) with a 40-watt power amplifier and a high frequency radio for air-to-ground communications, is another improvement to be realized in the 1980s.

While all the above are representative of the kinds of things that can and should be done, not all of them will be done. Our intent is to furnish the ultimate user, the light observation helicopter and scout pilot, the most efficient and mission effective aircraft that available funds and priorities will provide.

In this effort, we need the users in the field to communicate their concerns to the Army Aviation Center at Ft. Rucker, AL, and the TRADOC community as a whole. An excellent vehicle for expressing your concerns is the OH-58C Systems Assessment/Disciplined Review currently being conducted by the Army Materiel Systems Analysis Activity.



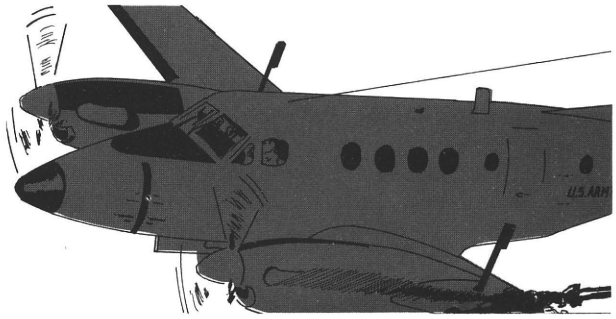
SEMA

The 1980s will involve a number of significant changes in the special electronic mission aircraft (SEMA) fleet to provide a viable airborne electronic combat capability in the field. Among these changes, the current GUARDRAIL V Systems (RU-21H) will be replaced on a phased exchange basis with the Improved GUARDRAIL System (RC-12D). Additionally, the first true division level electronic warfare system, the QUICKFIX IIB (EH-60A), will be fielded.

The conversion of Mohawk aircraft will continue with the objective of reaching an all OV-1D fleet configuration in the mid-1980s.

Historically, SEMA systems experience a 2-year active life prior to major configuration improvements or system replacement. This turnover rate is dictated by rapid changes in operational concept of employment, changing threats and rapid improvements in technology.

The individual improvements on the various SEMA systems are structured to gradually introduce added capability while reducing the proliferation of separate special purpose platforms, leading ultimately to a single multipurpose system identified as SEMA-X in the early 1990s.



Fixed Wing Fleet

The fixed wing fleet of the 1980s will contain much the same type aircraft that are currently found in the inventory. The workhorse of the fleet is, and will continue to be, the C-12 aircraft manufactured by Beech Aircraft Corporation, Wichita, KA. Seventy-four C-12 aircraft have been delivered to the Army, and an additional 139 are programed for delivery in the 1980s. Logistics support of the C-12 fleet should

remain contractor supported through the 1980s; however, alternate means of logistic support are being evaluated in an attempt to conserve resources.

TSARCOM is exploring the possibility of extending the life of the T-42, U-8 and U-21 through a controlled maintenance program which will ensure mission capable aircraft through the 1980s. Recent and forecasted austere resources have precluded the Army from pursuing an active role in the groundwork for development of fixed wing replacement aircraft; however, every opportunity to develop an economical and fuel efficient aircraft system for the 1980s will be explored.

Flight Simulators

The UH-1 flight simulator (FS) subsystem has been fielded with 22 UH-1FSs located worldwide. The availability of these devices is assured by contractor maintenance and has consistently remained above 98 percent. TSARCOM has agreed to accept the maintenance and support of the Navy UH-1FS which will be ready for training in June 1981 at Whiting Field, FL.

There is currently a contract for three CH-47C flight simulators which will be delivered and operational in June, August and November 1982 respectively. The procurement contract award of two CH-47D flight simulators is anticipated for FY 1983.

Negotiations are currently under way for the procurement of five modernized AH-1 flight simulators. These devices will be equipped with the laser scan visual image generator system which will increase the reliability of the visual system as well as reduce the operating energy requirements by 80 to 90 percent.

The UH-60 flight simulator was scheduled to begin Operational Test II in April and scheduled to be completed in September 1981. The results of the Development Test II and the Operational Test II will determine whether the camera model visual system or the digital image generation visual system will be used on the production UH-60 flight simulator.

The AAH flight simulator is in the conceptual stage. It is anticipated that a prototype device may be ready for training at Ft. Rucker by November 1986 provided FY 1982 RDTE funds are approved for the effort.

Aviation Life Support Equipment

There are big changes forecast for aviation life support equipment in the next decade. The threat includes nuclear, biological, and chemical (NBC) warfare on the air land battlefield, which will require a completely new protective uniform for aircrew survival. This will consist of breathing apparatus and complete protective clothing to include NBC detection equipment and decontamination and disposal equipment.

More immediate hardware to reach the user will be the AN/PRC-112 survival radio. This Air Force developed follow-on to the AN/PRC-90 will include homing capability and voice transmission on all emergency frequencies. A family of survival kits is also being designed by Natick Research and Development Laboratories. This concept includes one basic kit for all aircraft with modular supplements for a particular climatic environment. For overwater operations, a new one-man flotation kit will be available. This raft will be worn on the aircrew member's back as thin pack.

Arctic Fuels Dispensing Equipment

The Cold Region Test Center, Ft. Greely, AK, is conducting tests for other aviation equipment to be fielded in the late 1980s. Under development is a system that will provide a simple, lightweight, air-transportable bulk fuel storage and dispensing capability in temperatures down to -60 degrees Fahrenheit.

Equipment now in the inventory performs unsatisfactorily at -25 degrees Fahrenheit because hoses, collapsible tanks, drums, gaskets and seals lose elasticity. Pumps are difficult to start, fuels become viscous and ice and wax particles clog filter/separators. The Arctic fuel dispensing equipment being developed to resolve these problems consists of two major subsystems, an Artic fuel system supply point (AFSSP) and an Arctic forward area refueling equipment (AFARE).

The AFSSP will be a bulk fuels storage and dispensing facility, with a capacity of up to 120,000 gallons of fuel stored in collapsible tanks. Capable of being divided into a complete multiproduct storage and dispensing facility, the system can dispense fuel into 600-gallon pods, 500-gallon nonvented collapsible drums, 55-gallon drums, 5-gallon cans and fuel consuming equipment.

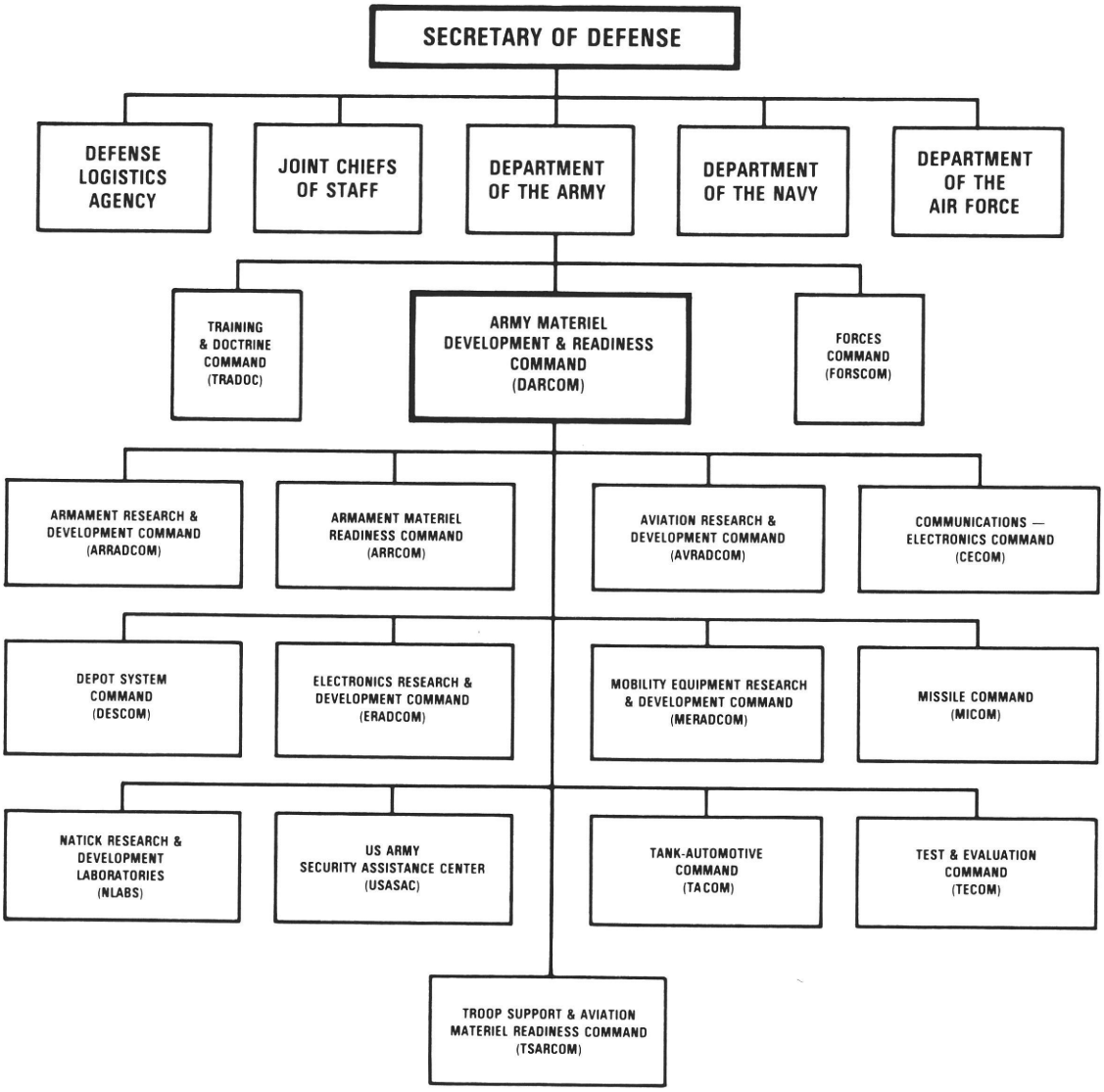
The AFARE, designed to replace the standard forward area refueling equipment (FARE) in cold regions, will be employed by the utility helicopter. The two 500-gallon nonvented collapsible drums, pump, hoseline and filter/separator can be set up by three people, and will be used to refuel helicopters as far forward in the battle area as possible. If resupplied it can be operated independently of an AFSSP.

Team Effort

TSARCOM, faced with austere resources, will continue to initiate innovative methods of ensuring the availability of adequate aviation logistics support in the 1980s. Since the Army mission is a team effort, it is incumbent on field Soldiers to manage their assets in a professional manner which will ensure the Army's ability to accomplish its mission.

A GUIDE* to

UNITED STATES ARMY MATERIEL DEVELOPMENT & READINESS COMMAND ORGANIZATION AND MISSIONS



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Suggested changes, deletions, corrections or additions should be forwarded on DA Form 2028 to HQ, DARCOM, ATTN: DRCIN, 5001 Eisenhower Avenue, Alexandria, VA 22333

MAY 1981

*NOT OFFICIAL ORGANIZATION CHARTS

REPORTING FINAL

Late News From Army Aviation Activities

FROM FORT RUCKER

Egyptian Students. Lieutenant Colonels Mohamed Abdel Fattah Hussin and Mahmoud Hassan Sobhi of the Egyptian Air Force are attending the CH-47 Chinook transistion and instructor pilot courses and are the first aviators from their country to be trained at the Army Aviation Center.

They will complete the 3 months' school 27 May and will return to Egypt to organize a new training squadron to teach other Egyptian Air Force pilots to fly the Chinook. LTC Hussin explained that all military aviators in Egypt are in the Air Force, although they may fly missions for the country's Army, Navy or Marine Corps.

ABC Evaluation. The Sikorsky XH-59A advancing blade concept (ABC) helicopter is scheduled to arrive at the Army Aviation Development Test Activity this month to begin a missions application evaluation. The helicopter, powered by a Pratt and Whitney T400 (twin PT 6 package) gas turbine with auxiliary propulsion from two pod-mounted Pratt and Whitney J60-P-2 jet engines, has achieved 263 knots true airspeed and climbed to an altitude of 25,000 feet. It was developed under a contract administered by the Army Applied Technology Laboratory, Ft. Eustis, VA.

(USAATDA)

UPCOMING MEETINGS

SAFE. The 25th annual Survival and Flight Equipment Symposium will be 6 to 10 December in Las Vegas, NV. SAFE's objective is to stimulate research and development in the fields of safety and survival and disseminate pertinent information to concerned individuals in Government and industry. Relative papers to be submitted at the symposium are being solicited. Abstracts on such can be mailed to Papers Chairman, SAFE Symposium Committee, P.O. Box 631, Canoga Park, CA 91303, in three double-spaced typewritten copies not exceeding 150 words. Include the paper's title; author's name and location; and a statement of the purpose and objective of the study/paper, method of approach, results and conclusions. A resume (100 words or less) of the author's background and experience is also requested. Presentations at the symposium will be limited to 25 minutes.

PAMA. The 10th annual convention of the Professional Aviation Maintenance Association will be held 20 to 22 August in Fort Lauderdale, FL. The business meeting and banquet will be at the Marriott Hotel and Marina, 1881 S.E. 17th St. Causeway. For further information, contact Michael P. Carrabba, 305-887-7314.

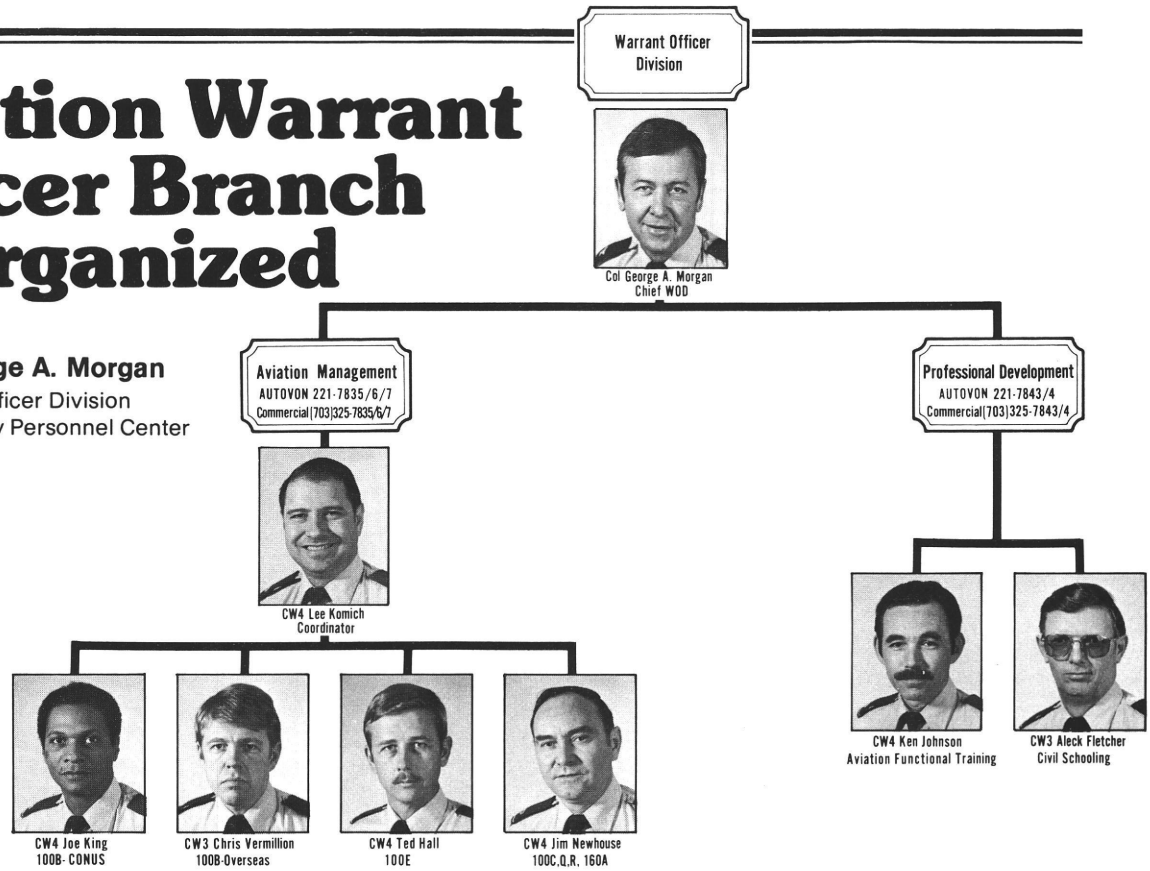
AHPA. The Appalachian Helicopter Pilots Association, Inc., will conduct the AHPA Symposium 1981 in Huntington, WV, 24 to 25 October. Preregistration is $5 and walk-in registration will be $10. For further information, call Herb Castiglia, 606-744-9111, or De Young 304-325-7171.

Author Honored. Lieutenant Colonel (P) E. H. Grayson Jr., right, of the Training Directorate (Aviation), Office of the Deputy Chief of Staff for Operations and Training, HQ, DA, accepts a Certificate of Achievement from Major General James C. Smith (now retired). Presentation of the certificate and an engraved pen recognized LTC Grayson as coauthor of "The Aviation Commander," winner of the *Army Aviation Digest's* monthly writing award in November 1980. Duplicate awards have been made to the other author, LTC J. W. Lloyd, formerly of the Training Directorate and now a student at the National War College, Carlisle Barracks, PA

Writer Award. Major General Howard F. Stone, left, commanding general, 9th Infantry Division, Ft. Lewis, WA, gives a Certificate of Achievement and an engraved pen to Chief Warrant Officer, CW3, Russell D. Capps of the division's C Troop, 3/5 Cavalry. CW3 Capps wrote "Flight in the Twilight Zone," the article selected for the monthly writing award in September's *Army Aviation Digest*.

Aviation Warrant Officer Branch Reorganized

Colonel George A. Morgan
Chief, Warrant Officer Division
U.S. Army Military Personnel Center
Alexandria, VA



NORMALLY I PREFER to communicate with you on an individual and personal basis. However, some changes in the way we do business have been implemented, and it is important that we get the word out to all of you by the most expeditious means available.

Until now you have been managed according to the geographic location of your assignment. Consequently, as you moved from station to station your file was passed from one career manager to another.

Effective February 1981 your career began to be managed differently. We expect the new method to underscore our determination to provide you with more personalized service and continuous effective career management.

Here's how it works. Your primary military occupational specialty (PMOS) will determine who your career manager will be, with one exception. Our population of 100B pilots is large so those of you holding this MOS will have two managers, one to make continental United States (CONUS) assignments and another to handle overseas requirements.

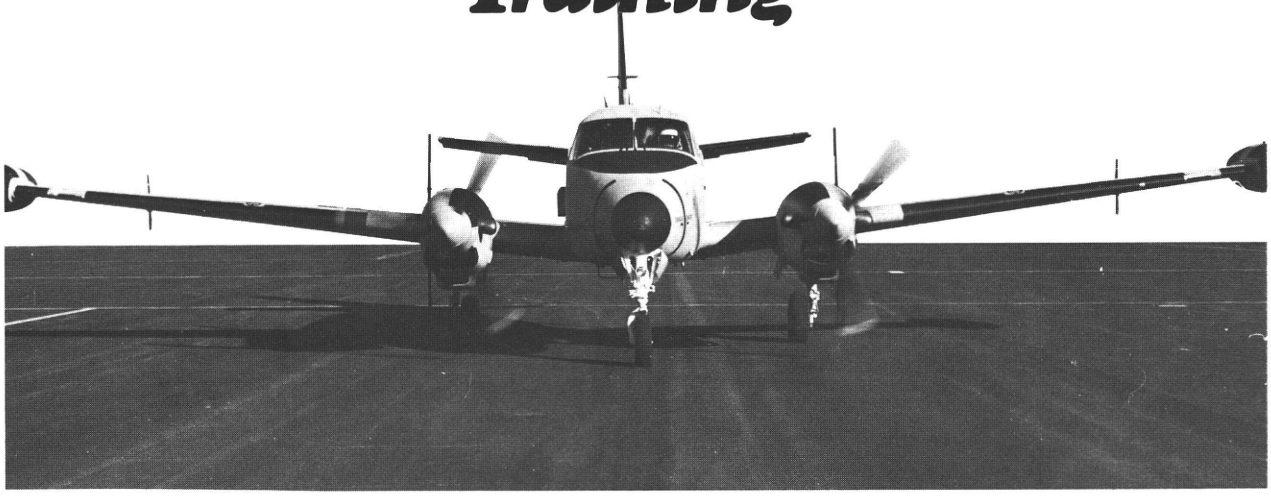
The myriad of details associated with managing 5,600 officers will be handled by Chief Warrant Officer, CW4, Lee Komich, the aviation career management coordinator/branch chief. If your PMOS is 100B and you are stationed in the CONUS, your career manager will be CW4 Joe King, while those stationed overseas will be managed by CW3 Chris Vermillion. The 100E force will be managed by CW4 Ted Hall. CW4 Jim Newhouse will manage those of you who hold a PMOS of 100C, 100Q, 100R or 160A.

As I mentioned previously, our goal is to provide you with better service and more personalized career management. We will all be going through some growing pains, but by exercising patience and working together there is no reason why more efficient practices will not be realized. We solicit your comments on what you think we need to do to improve our service to you.

Please feel free to call your career manager (AUTOVON 221-7835/6/7) any time you have a question, need our help or just want to say hello.

Our mailing address is: CDR, MILPERCEN, ATTN: DAPC-OPW (appropriate career manager), 200 Stovall St., Alexandria, VA 22332.

A Maintenance Simulator for GUARDRAIL V Training



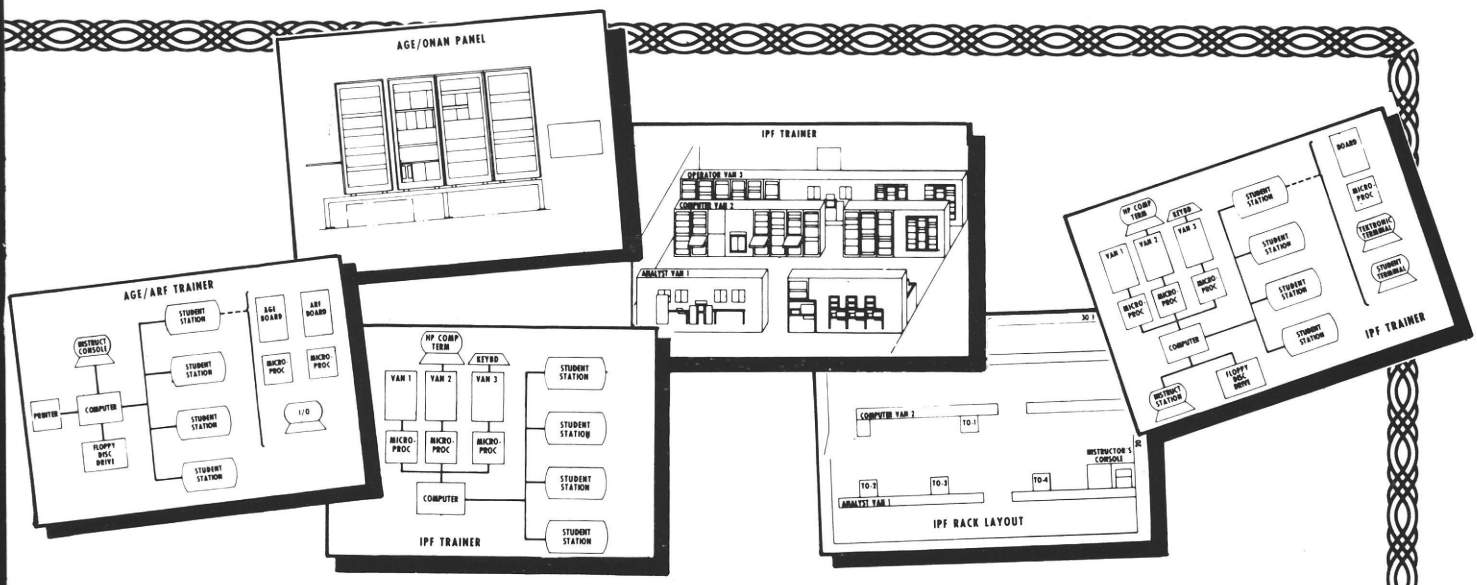
Richard Athanas
Training Program Manager
Directorate of Training Developments
United States Army Intelligence School
Fort Devens, MA

The UNITED STATES Army Intelligence School, Ft. Devens, MA, is pursuing development of programs of instruction for special electronic mission equipment associated with the GUARDRAIL V aircraft. Initial analysis and design information was completed in accordance with Training and Doctrine Command Pamphlet 350-30, "Interservice Procedures for Instructional Systems Development." These courses are being developed for Voice Intercept Operators (MOS 98G) and EW Intercept Systems Repairers (MOS 33S)—the operators and maintenance personnel respectively—and follow two completely different instructional strategies.

The course developers at the Intelligence School determined early on that effective maintenance training for this highly complex mission system would require typical classroom-type instruction. Students would require maximum practical experience to work with the equipment in performing actual system checks and troubleshooting techniques, since each GUARDRAIL V mission requires extensive preflight checks and procedures.

At about $24 million per system the use of the actual GUARDRAIL V system for training obviously was not a cost-effective training method. Added to the initial cost of procuring a system for training, there are hidden costs of maintaining and repairing it. The problem grew as the course developers identified 42 key tasks requiring training, but found no satisfactory way to teach them.

After considerable time researching the problem, it was concluded that these tasks could be taught using a simulator. Besides being less expen-



Engineering renditions of GUARDRAIL V maintenance simulator

sive to procure and maintain than an actual GUARDRAIL V system, simulators are more reliable; easily updated as modifications to existing systems occur; provide for higher student/instructor ratios; provide greater access to equipment with layouts that lend themselves to classroom demonstration; and are capable of programing selected faults without possible damage as would occur when using actual equipment. Therefore, the Intelligence School has started the developmental ball rolling by stating the requirement for a GUARDRAIL V maintenance training simulator.

What will the maintenance simulator do? In effect, it will function exactly as the actual system. With modern microprocessor technology, it can react to control settings, testing and troubleshooting with realism that rivals the real system. Indicators, controls and sounds respond exactly as they would on the system. The simulator will operate on a stimulus response basis providing realistic response to operational procedures, tests and troubleshooting.

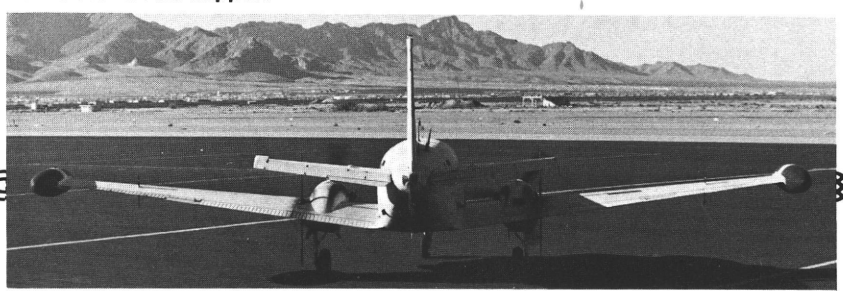
After extensive classroom time on the overall system, the training is divided into major subsystems. The tasks pertaining to a specific subsystem (operate, test and troubleshoot) are then practiced on the simulator. The benefits of this type of training are enormous for students who can go to the field with the knowledge and confidence needed to perform their jobs. They also will have received more hands-on training than would be possible with conventional methods. The trainers also have benefited. They have added flexibility to their training and are not limited by the precautions inherent when using actual equipment. For example, students can make mistakes that would be disastrous and costly if operational equipment were used. But with a simulator, they would merely be informed of errors and the consequences of their actions.

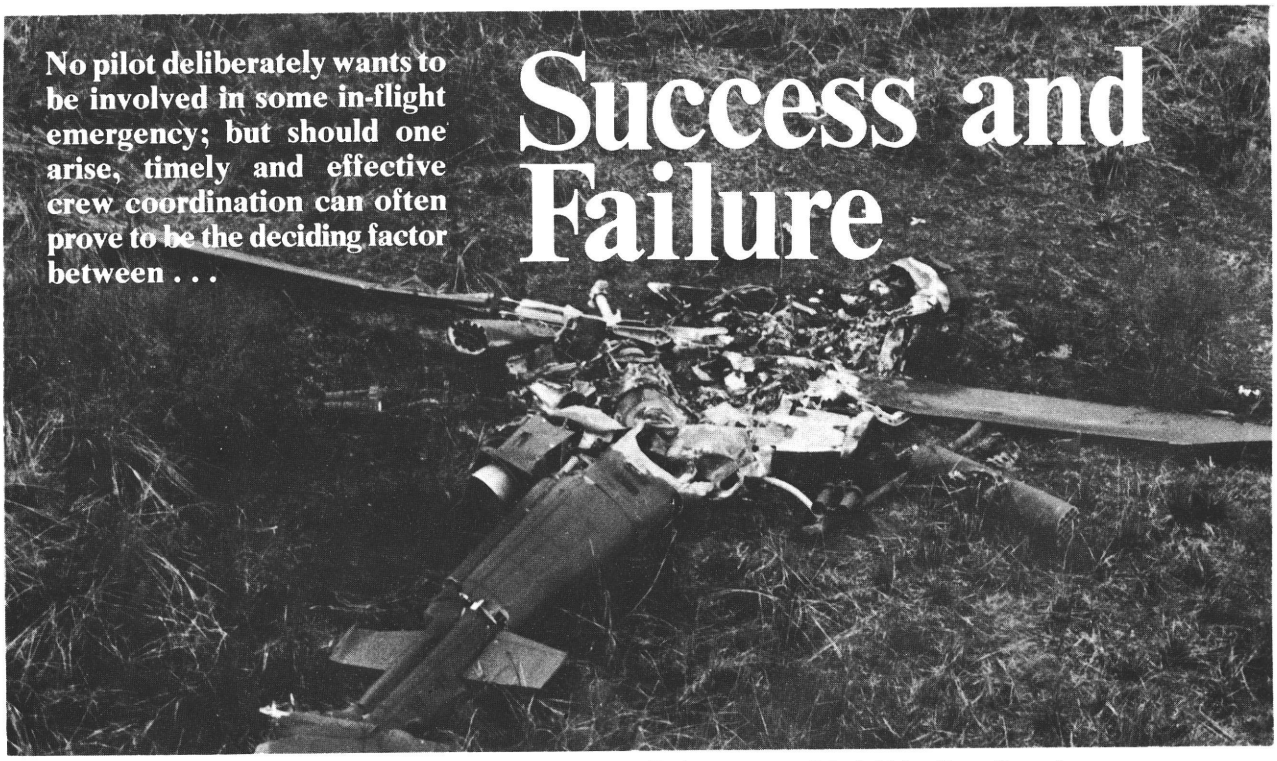
Operator training, on the other hand, does not require the extensive student/instructor training provided for the maintenance course. This can best be performed using a form of extension training materials being developed under a skill performance aids contract. No special classroom facilities are required. The special electronic mission equipment aboard the GUARDRAIL V is all remotely controlled from a special information processing facility on the ground.

This facility easily can double as a learning center, providing excellent opportunities for students to practice basic operator skills during nonmission time and honing those skills during actual mission time without fear of disrupting or jeopardizing live missions.

The unique method of employing two distinctly different instructional strategies on one highly complex, state-of-the-art Army system is not a new or innovative concept. However, it does demonstrate the Army's intention of providing the best possible training in the most efficient, effective and economical way.

OPPOSITE PAGE AND BELOW: RV-21 with GUARDRAIL V System which the simulator would support





Success and Failure

No pilot deliberately wants to be involved in some in-flight emergency; but should one arise, timely and effective crew coordination can often prove to be the deciding factor between . . .

Burned wreckage of AH-1S rests at point of impact following pilot's unsuccessful night landing attempt

FLYING IN A LOOSE trail formation with approximately 1 mile separation, three helicopters threaded their way through the darkness. As participants in a test program, they had just completed a night firing task. Now, with an AH-1S in the lead, they were homeward bound.

As the lead aircraft neared the airfield at an altitude of about 700 feet agl, the pilot made a routine checkpoint report and relaxed in the knowledge that the flight would soon be over. For him, it had been a long day.

There had been personal affairs to attend to, a check ride to complete, and preparations for the night mission to be made. To top it off, he was still suffering from the effects of an auto accident in which he and his passenger had been hurled forward against the windshield of the car. Now, all that remained was a normal landing. But the landing was destined to be anything but normal as the tranquility in the cockpit was soon to be shattered by an unexpected and unscheduled event—engine failure.

Meanwhile, more than 2,000 miles away, a somewhat similar scenario was being enacted. This one also involved an AH-1S as its principal actor. In the front seat of this aircraft sat an IP. Behind him was a pilot undergoing night vision goggle (NVG) training.

After completing NOE flight over an assigned route, the pilot undergoing NVG training made a normal approach to a landing strip, then began a routine takeoff and climb. Turning downwind (180 degrees), he continued his climb, unaware that as the aircraft reached an altitude of about 170 feet agl, tail rotor hanger bearing failure would suddenly cause complete loss of antitorque control.

Both of the instances occurred recently. As pointed out, both happened on the same night and

involved the same type aircraft. However, the significance of these occurrences lies primarily in their differences—not in their similarities. And the principal difference that was instrumental in determining the outcome of each of these emergency situations was crew coordination.

Generally, we tend to think of crew coordination in terms of the timely, interrelated actions that take place between crewmembers during flight—especially during emergency situations. Actually, it is much more than that.

Crew coordination begins long before an aircraft leaves the ground. As a matter of fact, it starts before the crew even boards the aircraft—during the planning stage. It includes preparatory actions to be taken, and it encompasses all normal crew duties and assigned responsibilities. Further, it embodies concrete guidance as to how these crew duties and assigned responsibilities are to be carried out and insures that crewmembers know the specific procedures they are to follow in the event problems arise.

As melodramatic as this may sound, effective crew coordination can often spell the difference not only between the success and failure of any flight but oftentimes between life and death itself—as evidenced by the two in-flight situations being related.

In the first of these, the crew of the No. 2 aircraft noted that they were overtaking the lead aircraft, which was approaching the airfield. As they continued to watch the Cobra, they saw it enter a descending left turn at a rate characteristic of an autorotation. This descent continued without benefit of a searchlight. The lead aircraft then appeared to lose all forward motion and begin a vertical descent—a descent that was not to be checked until the aircraft crashed and burst into flames.

Landing their aircraft near the burning wreckage, the crew of No. 2 tried to aid the pilots of the downed aircraft. But their efforts were in vain. Both crewmembers had been killed on impact.

Within the hour, on the other side of the continent, another drama was unfolding. The Cobra pilot undergoing NVG training had just completed a normal takeoff followed by a turn downwind. Maintaining an airspeed of about 60 knots, the aircraft climbed to approximately 170 feet agl, at which time the crew felt a severe airframe vibration.

The IP immediately made a positive change of aircraft control and advised the tower he was performing a precautionary landing downwind. Simultaneously, he reduced pitch and began decelerating for a landing.

Meanwhile, as he had been previously briefed, the pilot in the aft seat switched on the searchlight which had been deliberately placed in a partially stowed position—a position that permitted effective illumination of the terrain below without "blinding" the pilots who were wearing night vision goggles.

At about 50 feet, the aircraft began turning to the right. The IP applied left pedal with no effect, and the rate of rotation increased until the aircraft had turned approximately 180 degrees. At this time, the IP rolled off throttle. The aircraft continued to rotate throughout the remainder of the approach until it descended vertically from about 15 feet and struck the ground with no forward movement. Rotation practically stopped on impact and the aircraft remained upright. Because of insufficient time for their eyes to readapt to normal vision, neither pilot removed his night vision goggles during the landing.

Damage costs for this mishap were estimated to be approximately $15,000. There were no injuries.

Why? That is the puzzling question. Why did one crew, hampered by night vision goggles, manage to emerge unscathed after the tail rotor failed at a low altitude while another crew was unable to cope with an engine failure that occurred at 700 feet? Both mishaps demand closer scrutiny.

Following the fatal crash, teardown analysis revealed that engine failure precipitated the in-flight emergency. However, because of severe fire damage, the cause of the failure could not be determined.

From the evidence available, investigators arrived at the conclusion that the PIC failed to accurately judge his height above the ground during an autorotational descent. As a result, he applied collective pitch prematurely. This caused the main rotor rpm to bleed off to a

Major Jacob E. Starr
Director for Aviation
Systems Management
U.S. Army Safety Center

U.S. ARMY SAFETY CENTER

low state and resulted in a loss of aerodynamic lift approximately 150 feet above the ground. The aircraft then descended vertically until it struck the ground and was destroyed from the impact and postcrash fire.

It is suspected that the pilot's error in judgment was caused by the lack of natural or artificial illumination and a lack of recent night autorotation proficiency training. In addition, it was concluded that the pilot's social habits, automobile accident, and long duty day could have fatigued him to a point that his ability to cope with the emergency was reduced.

A check of the aircraft's records revealed that on a previous occasion the searchlight switch would not break the circuit, and the pilot had to use the circuit breaker to turn the light off. However, when maintenance inspected the system, the circuit was found to work properly and no corrective action was taken. It is suspected that at some point in the mission, the searchlight failed to turn off by means of the switch, and the pilot pulled the circuit breaker. When the emergency occurred, he was unable to turn the light back on because of the nature of the emergency and the difficulty in reaching the circuit breaker.

Both pilots were low-time pilots. The PIC had logged a total of about 670 hours. Approximately one-third of these were in the AH-1. The copilot's flight experience was about one-half that of the PIC's. The use of low-time pilots for these types of missions caused the unit commander to voice some concern. However, a specific part of the tests being conducted was designed for aircrews of low experience. Consequently, crew selection was made in accordance with test requirements. In this respect, it is significant that the engine failure occurred after the scheduled test was completed—during the return flight to the airfield—and not at some critical point in the mission.

While an error in pilot judgment was listed as the principal cause factor, and a lack of natural or artificial illumination as a contributing one, three important points need to be borne in mind. First, the pilot made no radio call during the emergency; yet he had ample time to do so. Second, he attempted the autorotation without benefit of a searchlight. By performing night operations with the searchlight circuit breaker pulled, he either discounted the possibility that it might be needed, or he felt that he would be able to turn it on should its use be required. As it turned out, he tried to land the aircraft without any external illumination. Third, his deceleration and pitch pull at 150 feet agl strongly suggests that he was having a problem relevant to his airspeed and altitude—a fairly accurate indication of a lack of coordination between the two pilots.

In contrast to the conditions present in this mishap are those associated with the second mishap. In this instance, loss of antitorque control was caused by materiel failure of the No. 2

hanger bearing which seized. However, responding to the emergency was an experienced IP who had logged nearly 4,250 hours of flight. More than 1,600 of these were logged aboard AH-1 aircraft, with approximately 275 flown in the AH-1S.

Before the training mission, both pilots attended a briefing, then went to the airfield where they preflighted their aircraft. Afterwards, they were briefed on the aspects of NVG training to be conducted during the flight period that night.

Approximately 1 hour later, along with the other flight crews, they were briefed on forecast weather and lunar illumination and were assigned the NOE route and area to be used.

The IP then briefed the pilot as to any tasks to be completed before flight and procedures to be followed during flight, including specific emergency procedures. Start and runup were normal and, following a HIT check, takeoff was made.

When severe vibration was transmitted through the airframe, the following crew actions are noteworthy:

First, the IP made a positive change of aircraft control. Next, as he reduced pitch and began decelerating for a landing, he radioed the tower that he was making a precautionary landing downwind. Meanwhile, the pilot in the aft seat actuated the searchlight switch.

Success or failure now depended on pilot skill along with any external factor we might refer to as "luck." In this instance, the outcome was successful—no injuries and approximately $15,000 in damage costs.

At this point, we can logically inject the experience level of the two crews into the picture. Isn't it likely that the experienced IP could have successfully coped with the engine failure had the crews of the two aircraft been switched? The answer can only be a speculative one—probably.

While experience is a definite asset, it is no guarantee that the pilot in question will satisfactorily cope with even a relatively simple emergency. Highly skilled pilots, including qualified IPs, have been involved in serious mishaps—some fatal—when faced with an emergency that a pilot of much less skill could have reasonably been expected to have handled successfully.

A classic example goes back to the days of the O-1 Bird Dog—an unsophisticated, tandem, two-place, fixed wing aircraft. In this instance, the two pilots aboard it were both rated IPs. Their flight was being conducted on a clear, sunny day over flat terrain that was devoid of obstacles.

The first error they committed involved fuel management. They either failed to insure they had ample fuel to complete their flight or they overextended their mission. In either case, the engine failed as a result of fuel exhaustion. During the forced landing attempt, the aircraft crashed, killing both occupants.

Was there confusion as to who had control of the aircraft? Why were two highly skilled IPs unable to make a successful forced landing under what might be termed ideal conditions? The answers to these questions remain a mystery. But one fact is clearly evident: Crew coordination was nonexistent.

A more appropriate question concerns the crew of the ill-fated Cobra. If more effective crew coordination had been employed by the pilots, might the results have been different? Again, the answer can only be made speculatively. Maybe. There is no panacea for the ills associated with flying. Safety is dependent on a number of variables—good maintenance, crew selection, pilot skill, adherence to applicable ARs, proper planning . . . and crew coordination. Alone, none of these elements will insure safety simply by its presence. However, in extreme instances, the absence of just a single one can be more than instrumental in causing a mishap. It can guarantee one.

For example, if poor maintenance practices cause the main rotor to separate from an aircraft in flight, you can rest assured that a mishap will result. In this example, good maintenance proves to be far more important than pilot skill; for the most experienced pilot in the world would find himself utterly helpless in such a situation. So, while effective crew coordination cannot assure safety, it can be the deciding factor between success and failure of a mission.

Curiously, in the two mishaps described, it was the experienced pilot who made sure he would have good crew coordination in the event of an emergency. Yet, the pilot with considerably less experience—who could have used all the help available—neglected this aspect of flight operations.

When asked to define flying, one airline pilot is reputed to have described it as "hours of boredom punctuated by moments of sheer terror." It is such moments of terror when you are tested. And should they arise, the best insurance is effective crew coordination. Make sure you carry such a policy on every flight.

PEARL'S

Personal Equipment And Rescue/survival Lowdown

Bennie Duhaime Photograph by Tom Greene

ALSE Activities

Fifth U.S. Army held its latest "hands-on" aviation life support equipment (ALSE) workshop from 17 to 20 March 1981 at the Sheraton Inn in San Antonio, TX. About 85 Army Reserve, Army National Guard and Active Army personnel (to include representatives from Alaska and Panama) were given instruction in such subject areas as establishment of a unit life support shop; ALSE publications; inspection and maintenance of the life preserver, first aid kit, individual survival kits, flight clothing, flight helmet, survival vest and survival radio; ALSE maintenance forms and records; and the ALSE retrieval program. In addition, the workshop included a practical exercise in water survival. The next Fifth Army ALSE workshop is tentatively scheduled for September 1981. For further information, point of contact (POC) is Mr. Al Cargen, Safety Office, HQ Fifth U.S. Army, AUTOVON 471-4663.

The Army National Guard convened its latest ALSE workshop 9 to 18 March 1981 at the National Guard Professional Education Center, North Little Rock, AR. Thirty-two Army National Guard personnel attended and received instruction in all aspects of the operation, use and maintenance of ALSE. The National Guard Bureau plans no further workshops at this time.

ALSE School Update

The additional skill identifier (ASI) producing course for ALSE maintenance personnel has been approved and details are being finalized. The course, culminating in the award of the "Q2" ASI, will be 5 weeks long and taught exclusively by Army personnel at the U.S. Army Transportation School, Ft. Eustis, VA. The target audience for the course will be personnel with the 67-series military occupational specialties only, in grades E4 and E5.

Personnel already trained in ALSE maintenance via the U.S. Air Force or U.S. Navy life support schools are eligible for award of the "Q2" ASI now, under the provisions of Change 15 to AR 611-201, "Enlisted Career Management Fields and Military Occupational Specialties," dated 15 February 1981.

That "Other" Radio Tester

The U.S. Army Communications-Electronics Command (CECOM) has informed us there are about 1,400 AN/URC-10A and ACR RT-10 survival radios still in use in the field. Although these are not the preferred radios, they are acceptable in lieu of the AN/PRC-90 radio, which has been in short supply. If you have either AN/URC-10A or ACR RT-10 radios, keep in mind that you should perform periodic checks and tests of these radios, just as you would the AN/PRC-90. Paragraphs 5-3 through 5-5 of TM 11-5820-640-15, "Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual, Radio Sets AN/URC-10, AN/URC-10A and ACR RT-10," prescribe in detail the preventive maintenance checks and services required. In short, these checks and ser-

vices are conducted monthly (the same as for the AN/PRC-90) and require the use of the Test Set, Radio Frequency Power, AN/URM-172, in order to performance test the radios. CECOM has informed us that a sufficient quantity of AN/URM-172 Test Sets is still available. They may be obtained from B16, are listed under LIN V89601, national stock number (NSN) 6625-00-832-8551, and are PEMA-funded.

First Aid Kit

The survival kit, individual, vest type, SRU-21/P, NSN 8465-00-177-4819, has among its components the tropical personnel aid kit, NSN 6545-00-782-6412, which contains ingredients classified as controlled substances by the Comprehensive Drug Abuse Prevention and Control Act of 1970, Public Law 95-513. Authorized Army activities, designated to receive controlled substances by The Surgeon General, may submit requisitions for the tropical aid kit directly to RIC S9M: Defense Personnel Support Center, ATTN: Director of Medical Materiel, 2800 South 20th Street, Philadelphia, PA 19101. All other Army elements, including National Guard installations, must contact their post hospital or nearest medical support unit.

The SRU-21/P survival vest is now being shipped *with* the butane lighter and signal flares. This is authorized by the Department of Transportation Exemption DOT-E6232 (fourth revision) which expires 30 September 1981.

POC for further information is Geraldine Johnson at the U.S. Army Support Activity, Philadelphia, AUTOVON 444-2525.

MBU-5/P Oxygen Mask

The MBU-5/P oxygen mask cannot be obtained as a complete assemb
component and a
ordering informati
ponents required t
with the SPH-4 fli

In addition, the
also a required co
the Army Master
ordered "off-line"

Action officer i
693-3307.

Question And Answer

Our facility is experiencing difficulty obtaining the match, nonsafety, NSN 9920-00-985-6891, for stocking and resupplying our survival kits. For some reason, our requisitions for this item are always cancelled. Can you assist us in obtaining this item? (Victor L. Williams, 89th USARCOM Flight Facility, Olathe, KS)

We queried the General Services Administration (GSA) (source of supply G O) to see if we could determine what your problem might be. That agency informed us that all requisitions for the nonsafety match are being returned advising requisitioners to locally procure the item. The reason for this action is that any quantities available in the warehouse are reserved for the initial assembly of survival kits; none are allocated for replacement issue. In light of this, we can only suggest that you immediately process your requisitions for local purchase, rather than even attempt to send them through your supply channels to GSA. This will save you time and frustration, since you ultimately will be required to locally purchase the item anyway.

MBU-5/P Components

NSN	SOS	UI	COST	NOMENCLATURE
1660-00-810-3223	FPZ	EA	$107.36	Mask, Regular Narrow
1660-00-811-5259	FPZ	EA	$ 38.27	Mask, Regular Wide
1660-00-810-3225	FPZ	EA	$ 48.91	Mask, Long Narrow
1660-00-810-3222	FPZ	EA	$ 42.89	Mask, Short Narrow
1660-00-794-0868	FPZ	EA	$ 4.86	Hardshell, Regular Narrow
1660-00-794-0869	FPZ	EA	$ 5.34	Hardshell, Regular Wide
1660-00-794-0870	FPZ	EA	$ 5.20	Hardshell, Long Narrow
1660-00-794-0871	FPZ	EA	$ 5.47	Hardshell, Short Narrow
8475-00-487-0903	FPZ	EA	$ 2.88	Cover, Dust
1660-00-076-9662	FPZ	EA	$ 19.75	Connector, CRU-60/P
1660-00-186-0276	FPZ	EA	$ 5.05	Bayonet, LH
1660-00-186-0277	FPZ	EA	$ 4.46	Bayonet, RH
1660-00-440-5553	FPZ	EA	$ 5.11	Receiver Assy, Bayonet
5965-00-854-0658	S9E	EA	$ 13.02	Microphone, M100 A/C
5995-00-890-8614	S9G	EA	$ 2.55	Cord, Microphone
1660-00-066-2078LS	FPZ	EA	$ 2.91	Harness, Suspension, 4-Point (Available from the Air Force)

Directorate of Evaluation/Standardization

REPORT TO THE FIELD

U.S. ARMY AVIATION STANDARDIZATION

FY 1980 CLASS A MISHAPS

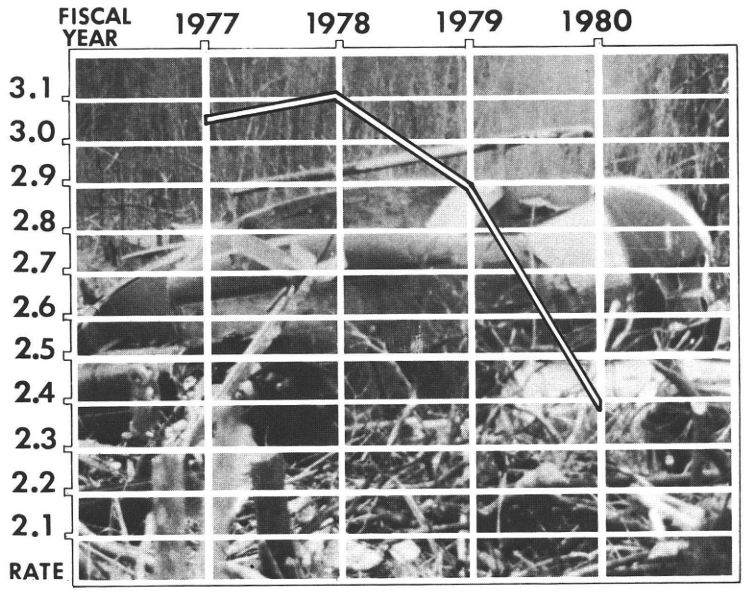


Figure 1: CLASS A MISHAP RATE

THE U.S. ARMY Safety Center (USASC), Ft. Rucker, AL, implemented the Department of Defense aviation mishap classification criteria in fiscal year (FY) 1980. This new system of classification of aviation mishaps aligns Army Aviation reporting and record-keeping procedures with the other major services.

USASC has reviewed all aviation accidents since FY 1977 in order to extract the Class A mishaps that would have been reportable under the current classification criteria. Class A mishaps are defined as a mishap in which the resulting total cost of property damage, injury and occupational illness is $200,000 or greater; or an Army aircraft is missing, abandoned or destroyed; or a fatality occurs as a result of Army operations. This action on the part of the USASC makes it possible to compare FY 1980 mishap data with performance of other years.

There were 37 Army aircraft Class A mishaps and 26 fatalities in FY 1980. The Class A mishap rate was 2.41 per 100,000 flying hours—the lowest in the history of Army Aviation. Figure 1 displays in graphic form the mishap rates for FY 1977 to the present, with FY 1980 showing dramatic improvement over previous years.

The frequency of Class A mishaps and fatalities by aircract type is listed in figure 2.

The UH-1 type aircraft flew more than half of all hours logged by Army Aviation. They were involved in slightly more than one-third of all Class A mishaps. The Class A mishap rate for the UH-1 was a creditable 1.67 considerably below the Armywide average.

The OV-1 type aircraft was responsible for all three fixed wing Class A mishaps. Ejection was not attempted in two mishaps resulting in fatalities. Ejection in the other mishap was successful. The OV-1 had a mishap rate of 12.77 per 100,000 flying hours.

Class A mishaps by rank and experience are listed in figure 3.

Extrapolating data from the above chart indicates that 32 percent of all Class A mishaps involved aviators whose average flight experience was less than 400 hours.

This is not to say that low-time aviators are the main cause of Class A mishaps. On the contrary, chief

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362; or call us at AUTOVON 558-3504 or commercial 205-255-3504. After duty hours call Ft. Rucker Hot Line, AUTOVON 558-6487 or 205-255-6487 and leave a message

warrant officers, CW2s and CW3s, and captains, a group with considerable experience, were involved in 57 percent of all mishaps.

Conclusions. The Army Aviation Class A mishap rate continues to improve. As stated earlier, Army Aviation generated a record low 2.41 mishaps per 100,000 flying hours. Direct comparison of FY 1980 "mishaps" with prior years' "accidents" may generate errors, due to change in the classification criteria. However, a few general comparisons or judgments seem appropriate.

The performance of the Army's instructor pilots (IPs) during FY 1980 has been laudable. They were involved in only two Class A mishaps—5.4 percent of the total. There were no fatalities involving IP error. This appears to be a marked improvement over FY 1979 when IPs were involved in 18 major accidents and two fatalities which represented 24 percent of all major accidents. In that year, there were nine improperly executed autorotations and three decelerations that went awry. There were *no* autorotative or decelerative mishaps in FY 1980.

The Army's younger and less experienced aviators were definite factors in FY 1980's aviation mishap record. There were 18 mishaps involving aviators with less than 1,000 flying hours. They averaged 491.8 flight hours and 25.9 years of age. The Armywide average for all aviators involved in mishaps was 1,870 hours and 30.67 years of age.

Terrain flight training is a necessary part of Army Aviation's doctrinal approach to survival in battle. Pilot performance in this environment continues to be an area of concern in the mishap prevention program. The mishap data for FY 1979 and FY 1980 indicates a more or less constant position. FY 1979 produced four wire strikes, two tree strikes and five fatalities. FY 1980 produced three wire strikes, three tree strikes, one collision with a jeep and four fatalities. Poor air discipline continues to be a factor in some of these statistics.

Flight into instrument meteorological conditions (IMC) also remains an area of concern. During FY 1979, there were three mishaps and three fatalities where IMC was a factor. During FY 1980, there were three mishaps and five fatalities.

The Army aviator's performance when confronted with an engine failure continues to provide gratifying results. During FY 1979, there were 11 mishaps as a result of engine failure and no fatalities. During FY 1980, there were only five mishaps as a result of engine failure and no fatalities.

Other materiel failures declined this fiscal year, but the number of fatalities increased. During FY 1979, there were six materiel failures resulting in six fatalities. During FY 1980, there were only three materiel failures; however, there were nine fatalities.

AIRCRAFT	HOURS FLOWN	PERCENT OF HRS FLOWN	MISHAPS	MISHAP RATE
UH-1	777,356	(50.56)	13	1.67
OH-58	281,732	(18.32)	13	4.25
AH-1	100,433	(06.53)	5	4.97
CH-47	51,793	(03.37)	4	7.72
OV-1	23,483	(01.53)	3	12.77
OTHER	302,711	(19.69)	0	0
TOTALS	1,537,508	(100.00)	37	2.41

Figure 2: CLASS A MISHAPS BY AIRCRAFT

Recommendations. That commanders, aviation safety officers and instructor pilots:

- Monitor and assist the less experienced aviators in their development toward excellence and professionalism.
- Continue to emphasize the importance of premission and performance planning when undertaking terrain flight training, and continue to emphatically discourage indiscriminate, high speed, low level flight.
- Take positive action to eliminate the IMC-related mishaps. Such action is to include emphasis on training, crew selection and definitive standing operating procedures covering operations in marginal weather.
- Continue to emphasize the four conditions at 100 feet above ground level which are necessary for a standardized autorotation.

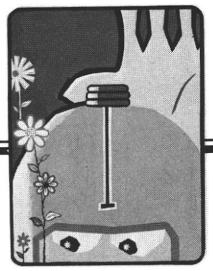
That supervisors remind maintenance personnel of their importance in the prevention of aviation mishaps and the necessity for "by-the-book" maintenance.

Figure 3: CLASS A MISHAPS BY RANK AND EXPERIENCE

RANK OFF	NUMBER OF MISHAPS	PERCENT OF MISHAPS	AVERAGE FLT HOURS
W1	10	(27.03)	393.7
W2	6	(16.22)	2011.8
W3	8	(21.62)	2959.0
W4	3	(08.11)	4690.6
O1	1	(02.70)	312.0
O2	1	(02.70)	358.0
O3	7	(18.92)	1299.2
CC*	1	(02.70)	5271.0
TOTALS	37	(100.00)	1870.0

*Civilian Contractor

VIEWS FROM READERS



We apologize to Lieutenant Colonel Bob Vlasics. In the April issue, page 37, beneath his photo Colonel Vlasics was inadvertently shown as "Lieutenant" rather than his correct rank, Lieutenant Colonel, as it appears in the article.

Editor:

We are in receipt of your articles related to training simulators which appeared in many of your previous magazines; many thanks for this information.

We have recently shown our computer programmable controlled 16 mm film projection system to many personnel at Ft. Rucker.

In the past we have read articles in your magazine concerning visual workload in the helicopter cockpit and target location . . . different training at Ft. Campbell, using video camera in the airborne AH-1G helicopter gunship and replaying the aerial scenes for review and comments. I think that the article appeared in the May or June issue which we misplaced.

To assist us in many visual experiments with our computerized projectors we would like to receive copies of the past visual articles (past 6 or 7 months) and in particular the articles on AH-1G gunship video tapes . . . on various target practice runs.

Your kind attention to this request will be greatly appreciated.

J. J. Milazzo
President
Trainer Corporation of America
Buffalo, NY 14207

• **The articles you requested are in the mail. If anyone else desires copies of the SFTS series or the other articles mentioned above, they can be obtained by writing Editor, *Aviation Digest*, P.O. Drawer P, Ft. Rucker, AL 36362.**

Editor:

CW2 Burgess' article in the October edition titled "AH-1FS: One Step Closer to Reality," provides a valuable update on a serious deficiency that has existed in the area of AH-1 training since the first AH-1 was produced. Why are Cobra pilots without flight simulators and gunnery training aids?

I believe that most people will agree that the UH-1H flight simulator (UH-1FS) has been an outstanding addition to training UH-1H pilots in almost every area of their aircraft responsibility. However, the only good practices an AH-1S pilot can get out of an SFTS period are in the areas of Army and FAA regulations, flight planning, and basic en route and approach procedures. Normal and emergency operations in this type of simulator for Cobra crews are as useful as having C-12 pilots performing the same maneuvers.

With the advent of the AH-1FS trainer, unit commanders and standardization personnel will be able to organize and execute ongoing flight and weapons' training for their units—that is, if they are at one of the facilities fortunate enough to get one. Training Cobra crews to destroy enemy armor is what attack helicopter organizations are all about. Considering the severe shortage of training ammunition available in CONUS for 20 mm and 2.75 inch rockets, and being authorized only one TOW missile per year per pilot, the level of crew/individual proficiency is below standard, in my opinion. Costs are always cited as the reason for shortchanging the AH-1 community. Even the onboard trainers such as the HITMORE and GAZAP have proven not to be worth the investment because of their limitations, in addition to their unavailability.

I cannot overemphasize the seriousness of the existing aerial gunnery shortcomings. Too little ammunition, restricted training areas, unrealistic targets, increased costs, complicated safety regulations, etc., all point to the need for gunnery training aids. This has been a tremendous and frustrating problem which has seriously impaired unit readiness.

Five important areas in which I believe Ft. Rucker should get involved are:

• Initiate a priority project of developing a realistic onboard AH-1S training aid that involves all three types of weapons' systems (TOW, 20 mm and 2.75 inch rockets). The M18, M28 and M35 systems are being phased out, and probably not needed in new simulators.

• Provide an AH-1FS to every installation that has an attack unit with AH-1 aircraft, and include the National Guard units in the planning.

• Increase the ammunition allocations to those units not provided with the AH-1FS.

• Decrease the annual requirement in AR 95-1 for attack pilots to fly the UH-1FS.

• Ensure that the AH-1FS, and any onboard training simulators, have an air-to-air capability.

Attack helicopter units are highly spirited, aggressive and motivated toward their mission; but they need the assets to properly train. Why does it appear that everything centers around the utility aircraft when it comes to training? From gunnery to TEC lessons there are major deficiencies in the training of attack helicopter crews. What is the threat? *Kill Tanks!*

LTC R. Dennis Kerr
USA Concept Analysis Agency
Bethesda, MD 20014

Editor:

This office has proponency for troubleshooting parachute air items and aviation life support equipment worldwide. Request that this office be placed on distribution for the *U.S. Army Aviation Digest.*

If you have copies available, we would also appreciate copies for the past 12 months.

Kenneth E. Lewis, DAC
Chief, TSARCOM Air Delivery
Liaison Office
Ft. Bragg, NC 28307

• **As an official Army agency you can obtain the *Aviation Digest* by submitting DA Form 12-5 in accordance**

with instructions on that form. The back issues you requested are in the mail. Others desiring specific back issues of the *Aviation Digest* can obtain those available by writing Editor, *Aviation Digest*, P.O. Drawer P, Ft. Rucker, AL 36362.

Editor:

An article, "AH-1FS: One Step Closer to Reality," stated that a series of 12 articles pertaining to SFTS had been published since January 1961. I would like two copies of each reprint if possible.

CPT Floyd C. Emery
Commander, SFTS Detachment
Aviation and Standardization Board
APO New York 09165

• **Your copies are in the mail. Anyone else wanting this series of articles can obtain them by writing to Editor, *Aviation Digest*, P.O. Drawer P, Ft. Rucker, AL 36362.**

Editor:

Members of the 12th Aviation Group have voiced an interest in Mr. R. Wicker's article on "Send-A-Message," ***Aviation Digest,*** dated November 1980. In an attempt to gain some insight and possibly incorporate the system into our unit training, I am requesting the additional information offered in the introduction. At your convenience would you send a copy of the article from the July 1978 ***Aviation Digest.*** Your assistance would be greatly appreciated.

CW3 John L. Morgan
12th Avn GP (CBT)
APO New York 09457

• **The article is in the mail. Anyone else interested in obtaining a copy of "Send-A-Message" (July 1978) or "SAM May Become an International Messenger" (November 1980) can do so by writing Editor, *Aviation Digest*, P.O. Drawer P, Ft. Rucker, AL 36362.**

Editor:

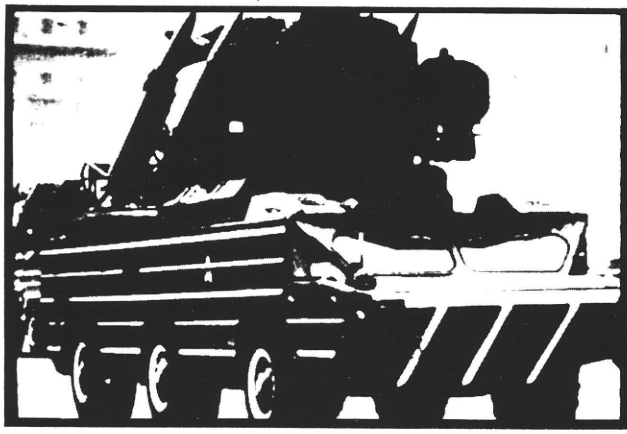
I have just finished reading an article in your publication of October 1980 entitled "Threat SAM/AAA—You Bet Your Life," by MAJ Forrest D. Williams. I found it to be a good informative article on the Soviet air defense systems, however, on page 10 there is an error in the photograph captions. The incorrect captions in question refer to the SA-8 GECKO as the SA-6 GAINFUL and vice versa. I have checked with the above references to ensure that my information is correct prior to writing to you.

We receive your publication through MAJ Tom Johnston, U.S. Army exchange officer, and find them very interesting, informative and widen our horizons as to developments outside our own Army.

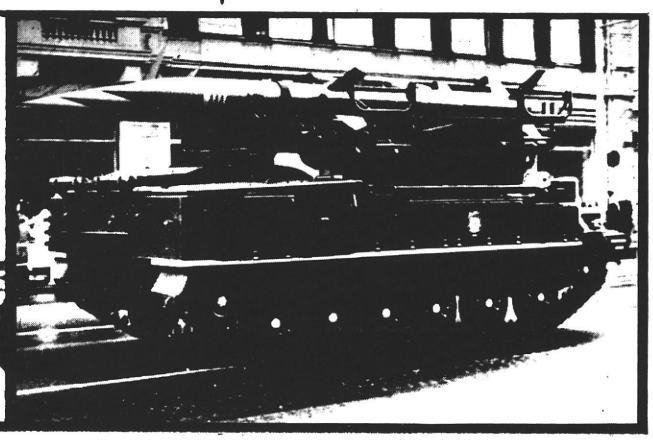
CW2 A. J. Ludington
Army School of Transport
Tobruk Barracks
Puckapunyal Victoria 3226
Australia

• **You are correct. The captions are transposed. The SA-6 GAINFUL is at left and the SA-8 GECKO at the right in the October 1980 issue. They appear correctly here.**

SA-8 GECKO



SA-6 GAINFUL



"Hangar Talk" is a quiz containing questions based on publications applicable to Army Aviation. The answers are at the bottom of the page. If you did not do well, perhaps you should get out the publication and look it over.

FM 1-5

Instrument Flying and Navigation for Army Aviators

CW2 Gary R. Weiland
Directorate of Training Developments
U.S. Army Aviation Center
Fort Rucker, AL

1. What type of turn is your aircraft in according to this turn-and-slip indicator?

A. Balanced
B. Slipping
C. Skidding

2. How long (minutes) will it take your aircraft to make a 360-degree turn if you perform a standard rate turn?

A. 2
B. 3
C. 4

3. How many degrees per second will your aircraft turn in a standard rate turn?

A. 1½
B. 2
C. 3
D. 4

4. In the northern hemisphere, the magnetic compass in an aircraft will lag when making turns in what direction?

A. North
B. East
C. South
D. West

5. What is the usable distance (nautical miles) of a VHF omnidirectional range (VOR) classified as L (low altitude—(L) VOR) below 18,000 feet?

A. 15
B. 25
C. 40

6. What is the total needle sensitivity (degrees) of the course indicator when tuned to an ILS localizer?

A. 2 to 2½
B. 4 to 5
C. 8 to 10

7. What is the normal range (nautical miles) of airport surveillance radar from the antenna site?

A. 10 to 15
B. 15 to 25
C. 30 to 50

8. When available, pilots should use airport surveillance radar to avoid hazardous weather.

A. True
B. False

9. What is the recommended minimum en route altitude (feet above highest obstacle) for a tactical instrument flight?

A. 200
B. 400
C. 600

10. What is the approximate usable range (nautical miles) of very high frequency (VHF) and ultra high frequency (UHF) radios when 1,000 feet above level terrain?

A. 39
B. 59
C. 79

ANSWERS (FM 1-5)

1. C, Fig 3-18
2. A, Para 4-9b
3. C, Para 4-9b
4. A, Fig 4-4
5. C, Para 14-22
6. B, Para 21-3c
7. C, Para 22-3
8. B, Para 22-1
9. B, Para 23-13d
10. A, Para 13-14

THREAT

MONTHLY WRITING AWARD

Major Forrest D. Williams
Chief, Threat Branch
Directorate of Combat Developments
U.S. Army Aviation Center
Fort Rucker, AL

TAC NUKES & THE IRRATIONAL BEAR

IN THIS AGE OF THE AIR LAND BATTLE, IT IS CRITICAL THAT ARMY AVIATION UNDERSTAND ITS ROLE IN THE INTEGRATED BATTLEFIELD. INHERENT IN THIS UNDERSTANDING IS A KNOWLEDGE OF SOVIET NUCLEAR CAPABILITY, INCLUDING POLICY, MEANS AND INTENT. SUCH IS THE PURPOSE OF THIS ARTICLE.

SCUD-B

Staff Sergeant Jones was cold and tired. "Oh, well," he thought, . . . "tomorrow we finish our week up and return to Bad Herzfeld." Pulling duty at Outpost Oscar along the West German border was not his favorite pastime, especially on Sunday morning at 4 o'clock in early March. He thought of his buddies back at the squadron, who must surely be fast asleep at such a dreary time, particularly after the party that had been planned the night before. Then he thought of Julie, his wife, who'd be coming to join him in a week. He had finally managed to find a place to live and had also saved the money for the trip. "At least she's one consolation," he thought. "Why do we have to pull border duty, anyway?" Sometimes he thought it was simply a waste of time.

About 20 miles to SSG Jones' east, First Lieutenant Demitri Olinov could not believe what was happening. "Those insane Americans! Why would they ever want to attempt to take East Germany by force?" The night before, his unit had been briefed by the political officer as to how a drunken American diplomat, while at a cocktail party, had bragged about the upcoming reunification of both Germanies. At first, this had been laughed at and given little

credit. However, as the United States tripled its forces in a 1-month period, as he had been told, it seemed possible, if not probable; and Soviet officials had become increasingly concerned. "So that explains our increased exercise activity over the last month," 1LT Olinov had thought upon hearing what was happening.

The final proof was the interception of a top secret cable from the United States to its allies, outlining both the timetable and the horrid details of the total destruction of the Warsaw Pact forces. "Typical of a great nation," he mused, ". . . we'll stop them before they are able to start." He checked the guidance data on his missile one more time, per the checklist, cleared the area and awaited the command to fire at the supply point in the Giessen area. As a missile firing team leader of its SCUD Brigade, he was sure that the 8th Guards Army, now deployed closer to the border than he had ever seen it, would perform brilliantly in the defense of the motherland.

In the Fuecht area, First Lieutenant Mark Johnson was pouring yet another cup of coffee. As the regimental staff duty officer, he would check the guards at the flight line one more time before his relief came at 0730. A pilot of the AH-1S Cobras his guards were protecting, he had only been in the unit a few months and was still struck by the Cobra's power and performance. "Another year or two, and I'll be in AH-64s," he thought.

In the same 8th Guards SCUD Brigade, three other missiles, the newer SS-23s, had been readied. Also armed with nuclear warheads, one was aimed at 1LT Johnson's aircraft and personnel. The other two were aimed in the same general area—one for the division headquarters at Ansbach and one for the artillery brigade at Herzo Base.

Several hundred miles to the southwest, Airman First Class (A1C) Brown was on ramp patrol at Bitburg Air Base. At this time of the morning, he was regretting having taken the shift for his best friend so he could take the weekend he'd been planning for a couple of months. "How could his number have possibly come up on the duty roster now?"

He stopped at the front of a hangarette and looked admiringly at the aircraft silhouetted therein. Having only a few feet of clearance in all dimensions, the F-15 looked awesome yet sleek in its concrete cocoon, and Airman Brown couldn't help but envy the pilots now asleep in the "ready" shack who might be called on to scramble at a moment's notice and fly these beautiful beasts of technology.

As Airman Brown admired the F-15, Captain Vladimir Rostov, in the Minsk Military District in the western end of the Soviet Union, was preparing his SS-20 intermediate range ballistic missile (IRBM) for firing. For the first time ever, he had just inputted data for each of its three real nuclear warheads! As he and his assistant checked and rechecked the data, he was simply amazed at the stupidity of the Americans. One final check, per the standing operating procedures, and the newly-deployed mobile missile was ready. He had seen from the map that two of his warheads would land on an airbase to take out new fighters stationed there as well as its runway and support facilities. His third warhead was aimed at a key communications switching center. He knew that sister elements also were targeting other airbases, including Ramstein and Frankfurt. He also had heard that they were targeting a major port city in northern Germany through which many nuclear weapons had recently passed in conjunction with the American buildup.

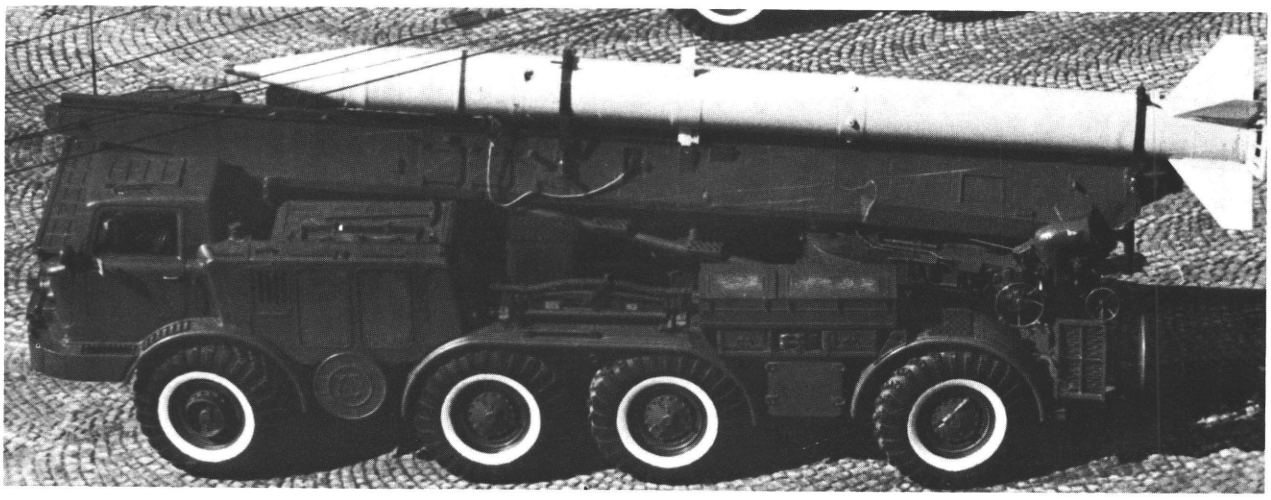
In U.S. Army, Europe (USAREUR) headquarters, Sergeant Kline was on duty. Working in the Indications and Warning Center as a communications type, he often found free time at this particular point of the shift to talk to his fellow "shift-mate," Specialist 4 Pruitt, down at the main switch in Pirmasens. At present, he and SP4 Pruitt were discussing the heightened tensions between the United States and the Soviet Union, and the resultant increase in Soviet exercise activity. SGT Kline poked into his teletype: "We especially don't like the number of Soviet units out of garrison. Communications also were way up, until the last 36 hours . . . now, almost nothing. If it lasts through tomorrow, on Monday we may initiate a higher alert status." SP4 Pruitt typed back, "It's up to you, chum. Tomorrow I'm relieved of duty and have only 10 days to ETS! This is my last shift."

It was the last shift for a lot of people. At 0449, the SS-20 IRBMs were launched from the Soviet Union. Key targets were airfields, special ammunition storage points, prepositioned war reserves, headquarters of divisions and higher echelons, and North Atlantic Treaty Organization (NATO) missile sites, all of which were not within the range of SCUDs. In effect, all targets were NATO's nuclear retaliatory force and the means to command and control them.

The SCUDs were next to be launched. SSG Jones, sitting in his outpost, saw the exhaust plumes looking like large Fourth of July fireworks against the dark sky and looked at his watch—it was 0453. He awakened the other observer and ran to the phone to report the suspected missile firings. Although he couldn't see them at this point, he also could have reported hundreds of T-64 and T-80 tanks now coming his way. The time was 0455.

At 0457, the U.S. European Command (U.S. EUCOM) near Stuttgart issued an initial alert order. Duty officers for USAREUR, U.S. Air Forces, Europe (USAFE), and U.S. Navy, Europe (USNAVEUR) reached for their code books and began to authenticate the message, all to no avail. The time was 0459.

At precisely 0500, the nuclear



FROG-7 View showing detail from above

weapons detonated on or directly over their targets. Most were airbursts, designed for maximum destruction of "soft" targets above the ground. Some were groundbursts, designed for cratering damage on targets such as runways, underground storage sites and command bunkers. All were brilliant in illumination, intense in heat and awesomely destructive in force. 1LT Johnson and A1C Brown, exposed to the elements, saw the brilliant light for only an instant. SGT Kline and SP4 Pruitt didn't even have this indication—they died without knowing what hit them.

SSG Jones saw the dazzling light show to his south and west. In less than a minute, he felt the ground rumble beneath his feet. He packed his track, and he and the other observer began to move southward along Highway 62. As he cleared the town of Bebra, the morning light was beginning to sneak through the dark. Five minutes later, as he was just north of Bad Herzfeld, the FROG-7 missile from the 20th Guards Tank Division's FROG Battalion struck near the squadron area, where sleepy Soldiers were still arriving and confusion reigned. Blinded by the flash, the sergeant slammed on the brakes, cut the engine and ducked into his track. The timing saved his life, and he beat the heat and the shock. Now, blinded and lying in the track, he felt sick. He thought of Julie and wondered if he'd ever see her again . . . and doubted it. The year was 1984, and he felt it was the beginning of the end.

Sound farfetched? I truly hope so. The fact remains, however, that in addition to strategic missiles (11 new missiles or modifications in the 1970s), the Soviets are today improving their tactical surface-to-surface missiles (SSM) at an alarming rate. In addition, they are now deploying the SS-20, the new mobile IRBM whose primary mission also would be European targets.

The decision to use these weapons would be made at the highest level of the Soviet government, namely, the Politboro. Stressed in the Soviets' doctrinal employment are the elements of surprise in the initial attack and the massing of fires through the depths of an enemy defense, primarily along the Soviets' intended main thrusts. Also stressed is minute, detailed planning at division level and higher for deliberate operations.

Principal initial targets for these tactical nuclear weapons include the following (no set priority, with the exception of the first target listed):

—Enemy nuclear weapons delivery means, which include aircraft, artillery, missiles, rockets and nuclear weapons storage points.

—Division and higher headquarters.

—Reserves/troop concentrations.

—Supply installations, including through-put ports and airfields.

—Communications centers.

Most of these initial targets would be struck by the larger, less mobile Soviet missiles launched from presurveyed firing points for better accuracy. The more mobile tactical missiles would be saved for tactical targets of opportunity to supplement conventional weapons.

Organization for the tactical missiles consists of a SCUD brigade at *Front*/Army level and a FROG battalion with each division. The SS-20 IRBM, on the other hand, is part of the Soviet Strategic Rocket Forces (SRF) and would not be controlled by tactical headquarters. However, since its range limits it to theater-level operations, it would probably still be used in conjunction with a surprise attack with SSMs, especially for deeper targets. (It is therefore included on the chart on page 40.)

The next missile, in terms of range, is the SCUD-B. As stated, this missile is found in the SCUD brigade at *Front*/Army level. Within the brigade there are three battalions, with four to six Transporter-Erector-Launchers (TELs) per battalion.

Characteristics	Tactical Surface-to-Surface Missiles				IRBM
General:					
NATO Designation	FROG-7	SCUD-B	—	—	—
Numerical Desig.	—	SS-1C	SS-21	SS-23	SS-20
IOC	1967	1965	Early 80 s	Early 80 s	1977
Total Produced	670	530	10	—	180
Organization:					
Echelon	Division	Front/Army	—	—	Strategic
Total Per Echelon	4	12-36	—	—	—
Technical:					
Number of Stages	Single	Single	—	—	2
Type Propellant	Solid	Liquid	Solid	—	Solid
Stabilization	Spin	Fin/Inertial	—	—	—
Warhead Types	HE/Ch/Nuc	HE/Nuc	Nuc	—	3-Nuc
Nuclear Yield	1 KT	1 KT	1 KT	—	150 KT
Range (nm)	43	83 (Nuc)	75	165	2700
Accuracy (nm)	—	—	—	—	.2
Remarks:		185 nm-HE	FROG Follow-On	SCUD Follow-On	MIRV

Each TEL normally will have one to two missiles, for an average total per brigade of 24 missiles.

This is the longest range SSM in the present Soviet inventory. Carrying a nuclear warhead with a yield of one kiloton (KT), it has a range of about 83 nautical miles. As shown on the accompanying chart, about 530 have been produced.

Its follow-on is the SS-23, and little is known about this surface-to-surface missile. We do know that its range will be about twice the range of the SCUD-B (165 nautical miles) and it will have twice the accuracy. It should appear in the early 1980s in field units.

The next level and lowest echelon where tactical nuclear weapons would be found is at division. Each Soviet division has one FROG (Free Rocket Over Ground) battalion consisting of four TELs. These highly mobile missiles would accompany the division, as already stated, to exploit tactical targets of opportunity.

With its range of about 40 nautical miles, the FROG-7 also carries a 1-KT nuclear warhead. In addition, it could carry a chemical or high explosive (HE) warhead as deemed necessary.

Follow-on to the FROG, the SS-21, will be deployed in the near timeframe. It will have a range of about 75 nautical miles and also will carry a 1-KT warhead. These missiles are summarized on the chart above.

The important question is, "Will, or could, the Soviets use these missiles as described in the scenario?" Although pure conjecture, some strategists feel that Europe could be taken with one quick, decisive blow, without concurrently striking the continental United States; and if there were no modernization by NATO of theater-level nuclear forces to impose mutual retaliatory damage on the Soviet Union, many believe they might be tempted to try such a scheme. If that were so, it would present an enormous threat to USAREUR and its combat aviation forces.

But let us now return to the scenario, where action is continuing. The time is just after 5 o'clock on that same fateful Sunday morning:

As the 20th Guards Tank Division

neared the border as scheduled, its radio-electronic combat/electronic warfare (REC/EW) unit, prepositioned near the border for the attack, began to monitor increasing radio communications between Fulda and Bad Herzfeld. Realizing the element of surprise would be lost shortly, the Soviet division commander was given permission to employ two of his four FROG-7 missiles with nuclear weapons on the two areas. "All is according to plan," he thought. "Within a few hours, victory will be ours."

In Washington, with its 6-hour time difference with Germany, the President was doing some late-night reading when he was given the initial alert. It was but a scant few minutes following the launch of the SS-20s. Following the procedures previously rehearsed, he was in a safe area within a few minutes and was being briefed that the Soviet Union's apparent goal was to take Europe by force and then negotiate for peace while they held the spoils. Following a conference call with appropriate NATO agencies, the go-ahead was given to launch the remainder of NATO's counterstrike, in-theater nuclear forces against primarily Soviet military targets within range. The new ground-launched cruise missiles were ideally suited for this purpose. The United States' strategic nuclear forces, already scrambled and placed on highest alert mode, were held in "hair-trigger" status.

The President reached for the "hotline" and had the new and more radical Soviet President on the phone within seconds. During the conversation, the U.S. Chief Executive pointed out that NATO had already countered with limited nuclear strikes of its own; and if the Soviet Union did not halt the attack and withdraw, the United States stood ready to release its entire nuclear might against the Soviet Union in defense of Europe and the free world.

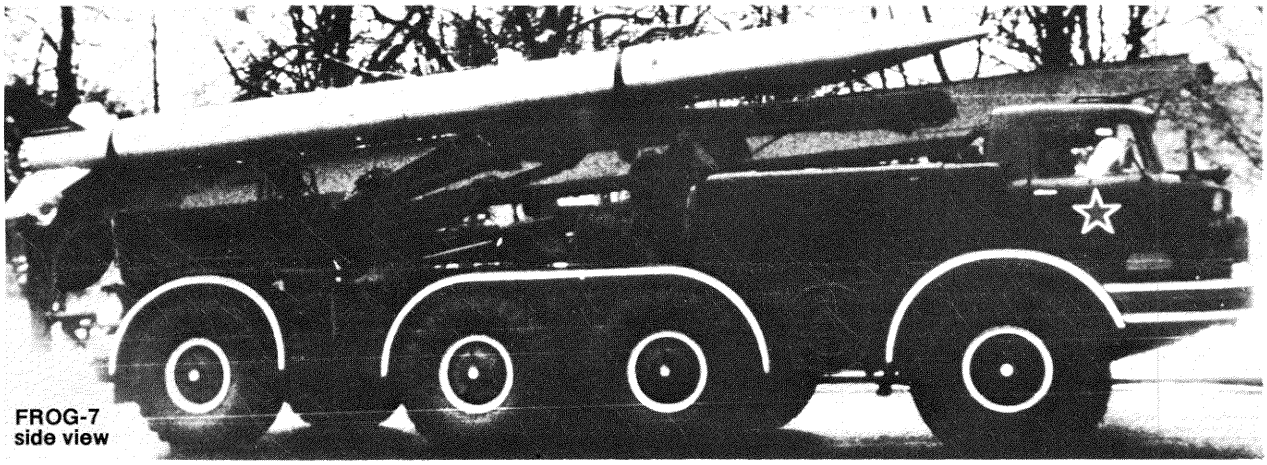
Following a few moments' pause, during which the new Soviet President was assessed of the damage of the NATO nuclear strikes, it was decided among the Politboro members that grave errors had been made as to both the capability and the will of the United States and its NATO allies. As such, the order was given to stand down.

. . . . Finally recovering his vision, SSG Jones and his assistant proceeded on to Bad Herzfeld. As they entered the town, they noticed that the FROG-7 had missed its mark by more than a mile, away from both the city and the military compound. Because of this, there were few injuries and no deaths. The squadron was just departing garrison and SSG Jones found his troop and joined the column.

Almost as soon as they reached their prepared positions, they noticed enemy armor columns, now only a few miles away, advancing rapidly towards them. The Cobras, now on the flanks, prepared themselves for their first missile firings against actual enemy armor targets. While en route, SSG Jones had seen several bright flashes to the east, indicating that the United States and its NATO allies had responded in kind. One of those bursts had seemed to impact at the rear of the advancing unit.

Within less than 5 minutes, and to the amazement of all, the approaching armor columns abruptly halted. As abruptly, they turned around and headed eastward, back from where they came. Over the radio came the command to hold fire but remain in position.

Staff SSG Jones looked at his assistant and smiled . . . during the last 120 minutes much had transpired, but now he knew it was over. "Insanity!" he thought. "It is purely irrational—the thousands of lives and millions of dollars it cost both sides. What could the Soviets have hoped to accomplish?" He knew, too, that the Soviet Union would pay dearly for this attempt and most certainly would be lessened in world power. And way back in his mind, he made a mental note to write Julie that he was all right. She wouldn't be coming in a week now, but as the full morning sun brightened the landscape, he knew that he *would* see her again after all.



FROG-7 side view

WHERE HAVE ALL THE V/STOLS GONE?

Colonel John W. Oswalt (Retired)

GLOSSARY

ARCSA	Aviation Requirements for the Combat Structure of the Army
ASR	Army study requirements
CDO	Combat Developments Office
FAAS-85	Family of Army Aircraft Study (timeframe 1970 through 1985)
GEM	ground effects machine
HOA	heavy observation aircraft
HPH	high performance helicopter
HTT	heavy tactical transport
km	kilometer
LOA	light observation aircraft
LOC	line of communication
LOH	light observation helicopter
MAVS	manned aerial vehicle surveillance
MC	military characteristics
mph	miles per hour
NASA	National Aeronautics and Space Administration
R&D	research and development
SEMA	special electronic mission aircraft
shp	shaft horsepower
Vmax	maximum velocity
V/STOL	vertical/short takeoff and landing

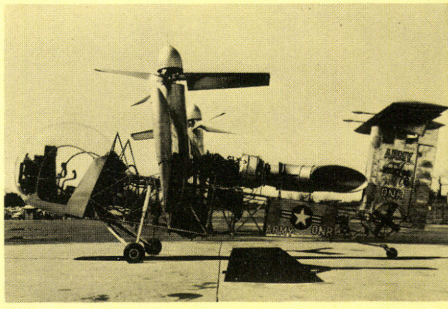
FROM 1949 TO 1950, I was stationed at Wright Patterson Air Force Base, OH, as a young major being educated in aviation research and development by the old hands there, that included Bernie Lindenbaum, Hank Velkoff and many others. This was at the time when the Air Force was creating its own separate structure from the U.S. Army. Many Ordnance, Signal Corps, Quartermaster and other technical service officers were moving over to the Air Force to help them create their own support capability organic to the Air Force. The Air Force on the other hand was supporting the Army in development and procurement of airborne and Army Aviation equipment. Of course, later in the 1950s, the Army developed its own capability in this regard.

During this period, the Air Force R&D people hammered into me that our big step forward in helicopter performance would be tied to the development of the small turbine engine. The Army was encouraged to develop a turbine engine of its own, which it did with what became the Lycoming T-53. Also, we got involved with other engines such as the T-55, the Artouste family, and what became the Allison T-63 — but that's another story.

Convertiplane Program

Our Air Force counterparts also said that, "Unless you guys want to fly whirly-birds all your life, you ought to get into the convertiplane program!" I was transferred to Army Field Forces R&D, 1950 to 1953; we wrote the first money into the R&D budget to initiate the convertiplane design competition. The Air Force conducted this for us as our aviation technical advisor based upon military characteristics which we had prepared at Army Field Forces Board No. 1 at Ft. Bragg, NC. Since Army Aviation missions were somewhat restricted by the Key West and other gross weight agreements with the Air Force, we had to aim these MCs at our four-place medevac mission much as we also had done with the MCs which finally evolved into the Huey helicopter series during the late 1950s.

LEFT: XV-1 McDonnell compound



RIGHT: XV-2 (VZ-2, Vertol 76)

At any rate, we received 22 responses for our convertiplane design competition that were evaluated by an Army/Air Force team of experts at Wright Field in 1952. These designs, primarily powered with reciprocating gasoline engines, included almost any V/STOL design thought up — from then until now— of course in "then" technology. Included were tilt ducts, tilt wings, channel wing, tailsitters (Ryan and Convair), tilt rotor, stopped/stowed rotors, compound helicopters, etc. Selected for Phase I engineering design were what became the XV-1 McDonnell compound, the XV-2 Sikorsky delta wing with retractable rotor and the XV-3 Bell tilt rotor. The XV-2 was dropped after Phase I, but the other two designs produced flying test beds. The XV-1 had ram jets on the rotor tips for takeoff and a 600 shp Continental with pusher propellor for forward flight on the wing. The forward bubble would open on one side to permit loading of two litter patients (in an experimental aircraft, yet). It attained speeds of up to 160 mph— a considerable achievement then, considering that helicopters were in the 85 to 135 mph speed range.

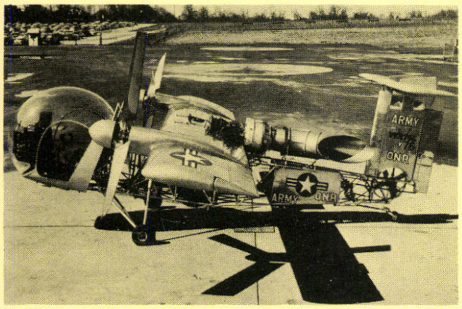
The two tail sitter proposals brought considerable comments from the safety people. The aircraft took off and landed vertically depending on thrust provided by counterrotating propellers concentrically mounted. As they gained altitude and speed, the aircraft rotated 90 degrees to fly on a wing. The safety people were concerned that, should there be a power failure during this transition, the aircraft would certainly crash. To keep the pilot from being apprehensive about this situation, the engineers designed a new instrument for the instrument panel. From the front, it merely looked like a black hole. However, behind the panel was mounted a 38-caliber revolver which, when the engine failed would shoot the pilot in the head, thus removing all apprehension.

These early "convertiplane" designs spawned a whole variety of test V/STOL aircraft through the late 1950s and into the 1960s including the VZ-4 Doak (civilian model 16) tilt duct, the Canadair and Vertol 76 tilt wings, Ryan VZ-3 Vertiplane deflected slipstream, XV-4 Lockheed Hummingbird, the GE/Ryan XV-5 fan-in-wing, Curtiss-Wright X-19 tilt prop, Bell Aerosystem's X-22 tilt duct, LTV XC-142 tilt wing, and others. Of these designs, only two types currently survive—the Hawker P1127 Direct Jet Lift (XV-6) as the "Harrier" and the tilt rotor as the Bell "XV-15." All the others were found impractical for a variety of reasons including complexity, poor hovering efficiency, high fuel consumption, high horsepower requirements, high downwash, control difficulties in hover and low speed flight, complexity in transition from hover to forward flight and back, etc. Operational testing by the military and NASA of a variety of high disc loading prototypes in the 1960s raised serious questions about the ability of such aircraft to habitually operate in a primitive, forward area environment.

Rogers Board

In May 1959, at Ft. Rucker, AL, the Army Aviation School's Combat Developments Office, of which I was director, completed a study called the Development Objectives for Army Aviation 1959 to 1970. It forecast future growth in the organization of Army Aviation, proposed new airmobility concepts and doctrine, and outlined a family of seven manned aircraft plus two drones. Three areas of development of these new aircraft were selected as more urgently needed. These areas developed into what became Army Study Requirements—a new light observation aircraft to replace the L-19, H13/23 fleet (ASR 60-1), a new heavy observation aircraft to carry a multisensor package for SEMA-type missions (ASR 60-2), and a heavy tactical transport for intra-Army mobility, hauling from the rear of a field army as far forward as possible without a forward area complex or signature runway (ASR 60-3). The latter was to replace the CH-47/CV-2 Chinook/Caribou combination.

The aviation industry was invited to submit design studies on any or all of these ASRs. By reviewing these submittals, the Army would then have an excellent picture of what the *state-of-the-art* was capable of producing in each of the three requirement areas. Out of 117 design study responses, 45 were for the LOA, 31 for the HOA and 41 for the HTT. These



RIGHT: XV-3 Bell tilt rotor

included fixed wing, fixed wing/STOL, pure and compound helicopters, tilt wings, tilt rotors, ducted fans, tilt ducts, autogyros, lift fans and a number merely categorized as "unique." Designs were costed-out by airframe weight, horsepower, likely development cost and total program cost. I was head of the operational analysis team which performed the initial evaluation and sorting of these design studies. Summaries were prepared and put on the covers of each, listing strong or weak points, etc. and segregating them into three categories: "Good, Average, or Unresponsive/Unsuitable."

Subsequent evaluations and judgments by three groups and a board of 10 general officers was formally named the Army Requirements Review Board, or more simply, "The Rogers Board" after its three-star chairman. The LOA studies resulted in the LOH program that began in 1964 and ended in 1966 with selection of the OH-6 Cayuse and the OH-58 Kiowa. The whole operation gave the Army an excellent opportunity to review the state-of-the-art in V/STOL possibilities. All of the designs were there in one form or another from the earlier convertiplane program, brought up-to-date with turbine power and other state-of-the-art advancements.

Howze Board

Technically, the Army was well oriented on V/STOL possibilities when in 1962 Secretary of Defense Robert McNamara directed that the Army take a "bold new look at land warfare mobility with a view of substituting airmobility systems employing the Army helicopter and the Army light fixed wing aircraft to replace in part and augment the traditional ground systems." Lieutenant General Hamilton H. Howze began assembling his board (The Army Tactical Mobility Requirements Board) in late April 1962 at Ft. Bragg. In May, I reported in again to help evaluate some 240 submittals from industry on advanced design concepts. Later I became part of Brigadier General Beverly Powell's Fire Power Subcommittee at Ft. Sill, OK and still later, part of Brigadier General Robert R. Williams' Aerial Equipment Subcommittee at Ft. Rucker. The results of this latter subcommittee were later incorporated into the Aerial Equipment Annex appended to the basic study to provide backup technological verification.

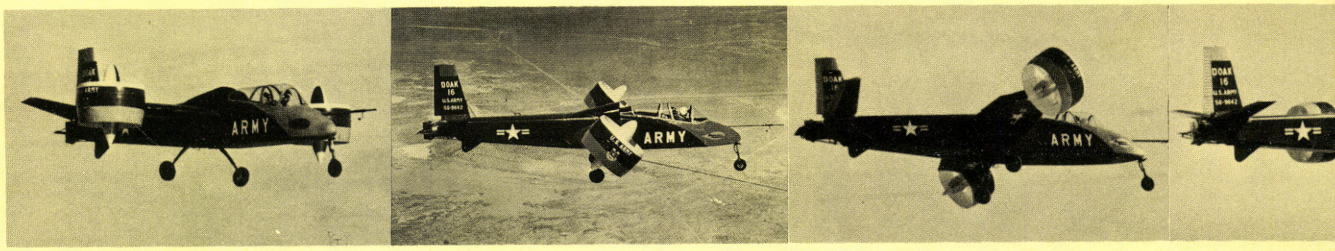
It's really quite interesting to go back and look at your old notes on such things as the aerial jeeps, wing-mounted turbo fans, etc.— notes like "post hole digger" or "yaw and pitch weak, nervous," or "roll control marginal," "poor in crosswind," "time lag in controls," and others. At one point the Rogers Board compared some eight autogyro design studies to comparable helicopters for cost, complexity and capability. The results put to bed forever any fleeting idea that the Army would ever return to the autogyro (almost as expensive and complex, and still no hover).

At one point, we looked at a mixed LOA fleet— LOHs for forward area units which could tolerate no fixed wing strip limitations, and small STOL fixed wing aircraft for the longer range artillery, corps and Army administrative units, i.e., longer range, endurance, lower cost, lower maintenance, etc. It still makes a lot of sense.

Subsequent Army Aviation studies have looked at missions, organizations, tactical concepts, etc. These include ARCSA I, II and III; FAAS-85; and a number of others. They differ from these earlier attempts to match mission with aircraft capabilities by having very little technical input from industry.

Mission Development/Evolution

In Combat Developments, we used to speculate as to whether equipment capability led to new tactical concepts and eventually new organization — or whether a new tactical concept led to a new organization and then to the equipment with which to fight. Actually, it can work a variety of ways. The tank was invented to get the Soldier out of the trenches to which he'd been driven by firepower in the form of machineguns and artillery. The tank put mobility back in the combat equation. From the tank sprang new concepts of how to fight using this new equipment — how best to



organize and what new, better guns, sighting systems, etc., were required.

In 1947 to 1948, the Army's organic aviation consisted of small two- and four-place fixed wing aircraft (down to about 800 aircraft after some 4,500 in World War II). From Bell Helicopter (then at Buffalo, NY) the Army received 10 YH-13 Sioux helicopter for what we'd now call "operation evaluation." They were assigned first to the 2d Infantry Division at Ft. Lewis, WA, for about 6 months and then to the 2d Armored Division, Ft. Hood, TX, for about the same period. The questions asked were: "If we had helicopters in the Army, how would we use them? Can they do missions which we don't even try now, or haven't thought of since we didn't have the capability anyhow?" From this testing, the Army determined, "Yes, we ought to get into the helicopter business. We can do medevac much better with a helicopter than with small fixed wing aircraft. We can use it in aerial survey to great advantage—excellent for command and control, etc." From this start of 10 "Y" Model H-13s (178 shp) grew the Army's helicopter program. The Army now operates more than 7,900 helicopters (about 83 percent of the total in U.S. military services) in a wide variety of missions. In 1948, as a result of the Y model testing, the Army negotiated for the purchase of 65 H-13Bs, the first quantity production of helicopters ever purchased by any activity up to that time. This contract provided the Army's first true aerial medevac capability in the early days in Korea. Colonel Jack Marinelli (Ret) will remember the YH-13 testing when he was at AFF Test Board No. 1 at Ft. Bragg in 1947 to 1948. So would ol' Don Muttoni. He was one of the test pilots at Ft. Lewis and gave me my first helicopter ride there at Yakima. I later got transitioned into helicopters in a YH-13 at Connally AFB with a 30-hour check-out.

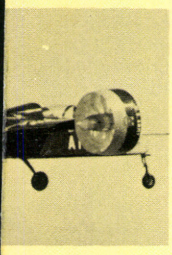
Sometimes things evolve where no mission originally existed at all, for example with the armed helicopter mission. In 1956 to 1960 at CDO, Ft. Rucker, we experimented with raising infantry weapons just above the tree tops on helicopters to give more tactical mobility to this firepower. It was felt that much could be done by creating an airmobile combined arms unit which could operate as a semi-independent maneuver element. The helicopters used were far from optimum. We cut and drilled holes and stuck existing weapons and sights on and tried them out. St. Louis and company engineers screamed and hollered about air safety — and well they should have! However, we created and demonstrated an air cavalry unit which caught the attention of higher ranking people who could then envision mission possibilities far beyond what was rather primitively demonstrated. During Project Man at Ft. Benning in 1960, two SS-11s were fired at a tank from a UH-1A Huey at 2,200 meters. President Eisenhower exclaimed, "Holy Cow!" when he saw both hit the target. Such demonstrations, stuck together with existing nonoptimum, but available equipment, helped inspire ideas in a variety of directions.

From these early days of Army airmobility with the impetus given by the Howze Board, plus a major war in Vietnam, grew the Army Aviation battlefield missions of today. Each new air mission was derived from an Army mission previously and traditionally performed by ground means. The aircraft only supplemented those other traditional means organic to the Army.

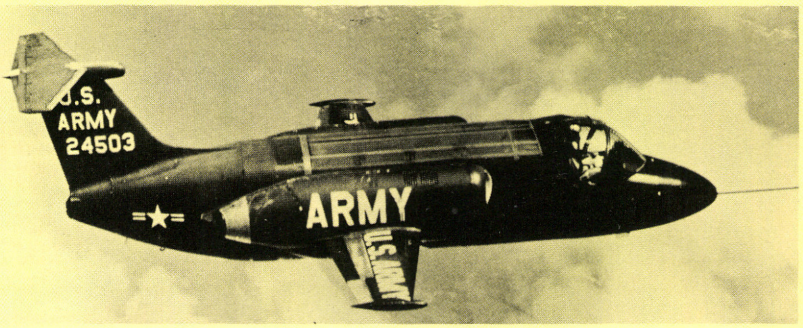
XV-15 Mission Potential

I believe we are on the threshold of another mission area breakthrough with the XV-15 tilt rotor concept. It may not have as great an impact as armed airmobility or the introduction of the helicopter into the Army, but the military is about ready to receive a new tool which can do things no other present implement can do.

If you have an aviation mission that requires an efficient hover, limited range and speeds below 180 knots, the simplest, cheapest, most efficient and practical way to do it is still by pure helicopter. However, if there is a requirement for longer range or higher speeds than those within the capability of a helicopter and still the added requirement for an efficient and protracted hover during the mission, the answer may well be the tilt rotor concept. Bell, on contract with AvLabs at Ft. Eustis, VA, in 1965, proved that when enough



LEFT: VZ-4 Doak (civilian Model 16)



RIGHT: XV-4 Hummingbird jet thrust diverter

horsepower was installed on the old HPH it could move along — well enough to attain an unofficial rotorcraft world's speed record of 300 mph. The aircraft, a modified Huey, took off employing its main rotor and powerplant. It had stub wings with two Fire Bee target drone engines on the tips. At 140 mph, the helicopter controls locked-out with the main rotor in a minimum drag position still rotating. (If we could have gotten rid of it, we would have.) From here on, the aircraft flew using fixed wing type controls. Guzzling fuel, it only had about ½-hour endurance with fuel reserve. It had multiple and expensive power sources; but a lot was learned about rotor/aircraft controls at high speeds with small stiff wings. This, plus many other technologies carried over to the XV-15. It did prove that old adage that, "You can even fly a barn door if you put enough horsepower on it."

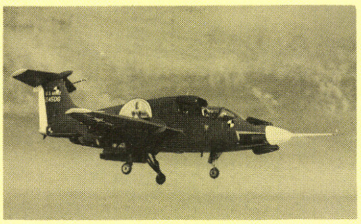
SEMA — Long Range Medevac

Looking at the Army's aviation mission requirements today, I would say that the XV-15 concept aircraft would likely have its biggest payoff in the SEMA mission. This was the HOA mission of the Rogers and Howze Boards and later MAVS. The Army has about 250 to 300 aircraft involved with these missions. Some are helicopters located fairly well forward tactically; some are fixed wing located 30 to 50 km deep. Coordination and command and control between such units would be difficult. So would logistical support. What about one new XV-15 type machine to do all these missions, plus others, and do them better? Well what do you know!? Looking back at study submittals for the Rogers and Howze Boards and FAAS-85, there were tilt rotor aircraft looking very much like the XV-15. Design studies show that a machine not too different from the XV-15 proof-of-concept vehicle could be manufactured using advanced technology engines of lower weight and better fuel specifics. An old rule of thumb in preliminary design is that for every 1 pound of weight you take off the design, you really save more than 2 pounds in gross weight (i.e., weights are cumulative. A more efficient engine burns less fuel; because you don't need so much fuel onboard, you cut down the size of the aircraft; because you reduce the size of the aircraft, the engine can be smaller, etc.). An XV-15 derivative aircraft could replace the OV-1 Mohawk, U-21 Ute or C-12 Huron and have higher speed and still land like a helicopter without benefit of a prepared runway complex. It would be smaller with less weight and be capable of a protracted, efficient hover if need be. We're talking of a 360- to 400-knot top speed, a 280-knot cruise and a 900-mile endurance with fuel reserve.

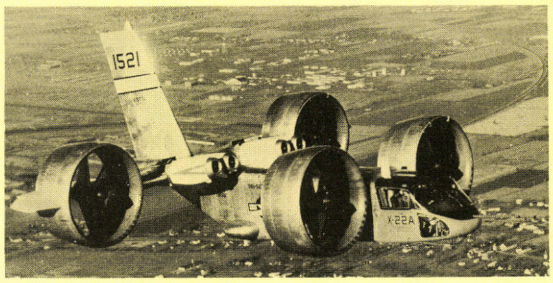
The size, low disc-loading and efficient hover regime of the tilt rotor design require minimum site preparation. Such aircraft could be based forward at impromptu sites to reduce mission turnaround and threat exposure time. Because of forward basing, there is less fuel, a smaller engine, a smaller aircraft, less cost, a shorter reaction time, a reduced vulnerable flight time and reduced losses. The ability of the aircraft to accelerate and decelerate rapidly and to fly in a variety of speed and altitude regimes from 0 to Vmax without restrictions should also aid in its survivability.

Airstrips or other forward area complexes such as those associated with current generation fixed wing SEMA aircraft will be precisely known by enemy forces and extremely vulnerable to surprise attack. Such facilities are difficult to build or move and impossible to hide.

If the Army developed an XV-15 derivative for the SEMA mission, it would likely also buy follow-on aircraft for longer range medevac, command and control, staff transport and for use with special forces. High speed rescue pick-up, in rough terrain, might be most important in returning the critically injured to a point of first definitive treatment. I can well remember when I was 8th Army Aviation Officer for General Maxwell D. Taylor, sending H-19 Chickasaws out 110 miles to islands off North Korea northwest of Inchon to bring burn victims from air-sea rescue radar stations back to the 110th Hospital at Yangdangpo. Similar medevacs were flown from X Corps units on the far northeastern end of South Korea. Those were long



LEFT: XV-5 Ryan lift fan propulsion



LEFT: X-22A Bell Aerosystem tilt duct

flights at 85 knots, but our alternate choice was an L-20 (U-6) Beaver at 107 knots with litters installed.

Heavy Tactical Transport

The world of armed combat is full of variables of every conceivable variety. You can never guess them all correctly in your planning. Therefore, flexibility is the keynote. The Army has traditionally depended upon the Air Force for intertheater, troop carrier and long haul intratheater airlift. Their aircraft are to come as far forward as the tactical situation and geography will permit. The old Caribou/Chinook combination in air LOC type operation was to pick up cargo by Caribou at the Air Force forward base and fly as far forward as we might have roughed-out primitive landing strips. From here, the Chinooks hauled forward into the division, brigade or even maneuver battalion area if need be. At Rogers and Howze Board times, this replacement aircraft was called the heavy tactical transport. The concept was for an aircraft which could take off VTOL or STOL at full gross load in the Army rear area and, after burning off fuel, land vertically close to the ultimate destination without benefit of landing strip or forward area complex. At reduced load, the aircraft could take off vertically for any lateral movement of troops, equipment or supplies. Its cruising speed and range would exceed that of the Caribou.

Now wouldn't it be something to find an XV-15 type V/STOL design proposed for the HTT mission in the Rogers and Howze Board submissions? Well they're there, and they rated as potentially good.

In this forward area air LOC operation enemy sophisticated air defense systems may dictate gradually lower altitude operation as the aircraft approach the forward area to avoid radar controller and seeker weapons. Operation at lower altitudes, particularly in rough terrain, may require a considerable reduction from cruise speed and maximum agility at low altitude, low speed maneuver prior to touchdown in forward area landing zones. Flexibility again is the keynote in speed regime, in low speed maneuver and control in approach to landing.

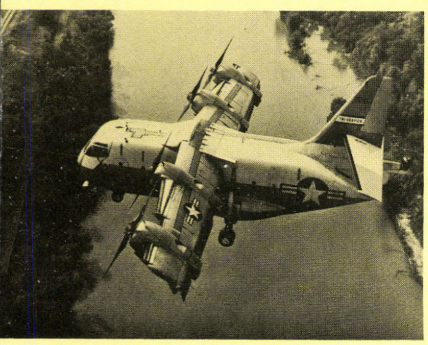
In combat, there never seems to be enough engineer support. Hopefully, engineer support will be sufficient to rough out primitive strips as far forward as corps rear in fast moving tactical situations. In fairly static situations, they may be even further forward, but we can always depend on it that there will never be quite enough engineer support. So a VTOL capability adds immeasurably.

In this regard, I would like to quote Major General Burl W. McLaughlin, commander of the 834th Air Division in Vietnam. Regarding the Khe Sanh aerial resupply, he said, "The most vulnerable aspect of the fixed-wing aircraft's operation is that its approach and departure patterns are necessarily restricted to runway headings. If tactical airlift had been V/STOL aircraft, attempts by the enemy to "zero-in" the approach and departure courses at Khe Sanh would have been easily thwarted and aircraft damage reduced . . . V/STOL aircraft . . . would allow for deliveries at various locations on Khe Sanh closer to the various supply points." Again, flexibility.

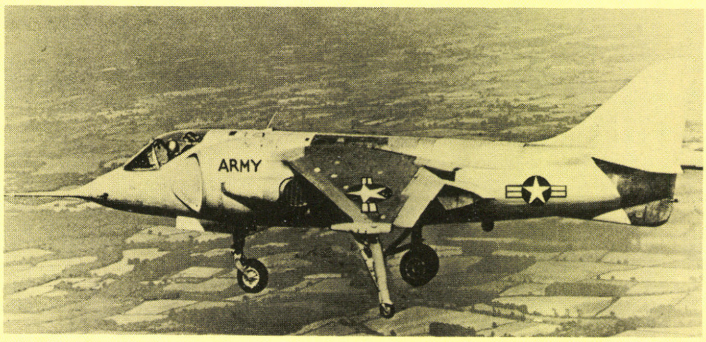
One more mission bears comment. The Soviets have substantial quantities of helicopters. It is inevitable therefore that there will be an occasional confrontation between hostile helicopters. So far, we have accomplished no deliberate development of weapons for this purpose. Tests using Red Eye, Stinger, 20 mm, 30 mm, etc., have been run for almost 20 years. Army tests have repeatedly proven that if high performance fighters slow down in order to even locate and track the helicopters, ground fire and the helicopter counterfire are considerably more of a threat to the fighters than vice versa.

I submit that an XV-15 type VTOL would make an excellent helicopter killer. It would provide an excellent speed and maneuver advantage over Soviet helicopters. There is one theme that has run historically through Army Aviation missions for organic assignment of aircraft:

- Full-time use is required
- Aircraft should be suitable, performancewise, for inclusion in Army units and compatible with



LEFT: XC-142 Ling-Temco-Vought tilt wing



RIGHT: XV-6 Harrier (civilian Hawker P1127) direct jet lift

Army support capabilities in the field.

- The mission the aircraft performs must require close coordination with Army unit activities.

Just as the Navy has attack submarines to fight enemy submarines, so should the Army have a machine to fight enemy helicopters. It must be capable of operating in the same combat envelope as the enemy machine. In this regard, I am reminded of "Bed Check Charlie" of Korean days. An old PO-2 biplane would come over at night to harass and keep friendly troops awake. The Air Force and Navy tried to track him with radar, vector fighters to shoot him down — with no success. One night, a Navy fighter with flaps and gear lowered to slow down to near his speed, had him on radar and was shooting at him. He claimed a victory when the aircraft disappeared off the radar screen and crashed. The following morning, they located the crashed PO-2. He had run out of gas while trying to evade his pursuer.

Closing Comments

So, "Where have all the V/STOL's gone?" Many are in aviation museums or on pedestals at the gates of military posts or R&D activities. The Bell X-14 is still flying at Moffett Field, but couldn't be put into practical field use. Oh, the romance of brochures on zero ground pressure vehicles, GEMs, aerial jeeps and flying saucers! Many have been the basis for long-range studies complete with units to operate and fight them.

With the XV-15 the Army has two flying proof-of-concept vehicles that you can smell, feel and taste. Performance capabilities can be tested and measured. It's not a stack of engineering data and proposals promising the moon at very little cost 6 to 10 years from now. Pilots can get in and fly the aircraft to find out for themselves what it can do and engineers can measure. One of the XV-15's is at NASA Ames for continued testing. Part of this may include some operational evaluation at Ft. Hunter-Liggett military reservation against a Soviet air defense threat array. The second XV-15 is in test at Edwards Air Force Base, CA.

We are at a point now where we can predict with considerable assurance what can be done with the tilt rotor design. None of this will require big money now. What is needed now is for whoever writes the Army's long-range plans and concepts to indicate where XV-15 derivatives of certain sizes and performance could help Army Aviation better accomplish its missions on some future battlefields. Costwise, the Army is up to its ears with the UH-60 Black Hawk, AH-64 attack helicopter and CH-47 Chinook modernization programs —also the aerial scout is going through one more iteration. Money is not available except for the current generation of aircraft—but what are you going to do for an encore in 1986-1995? Are we going to be forever stuck with the French 75 and the Enfield Rifle!

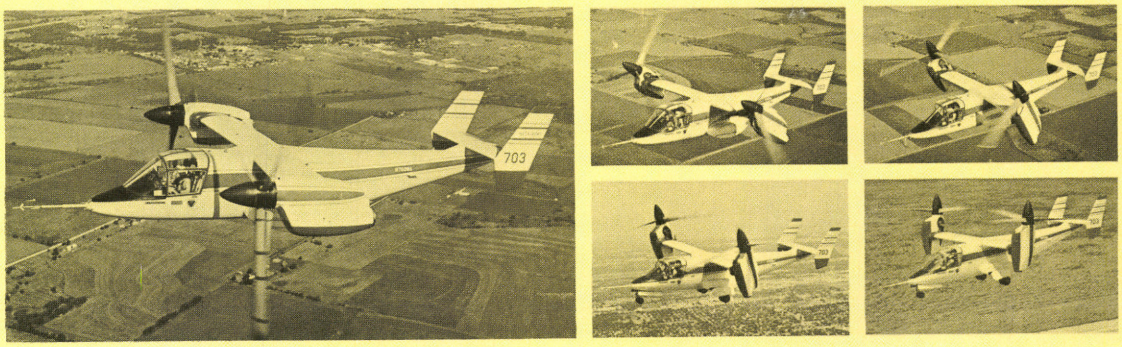
We are on the threshold of obtaining an operational capability which will grow just as the helicopter did when we introduced it to the Army in 1947. Many missions subsequent to 1947 didn't even exist in the Army until we got the aircraft in our hands and found out what its capabilities really were. Then look where it went.

The Middle East is apt to be the locale of the next confrontation between East and West. It might conceivably pit the United States against the USSR in a local limited war — not an unsophisticated war, but yet a limited one, particularly with respect to geography. In such vast, open terrain, wouldn't greatly increased range and speed coupled with vertical takeoff and landing provide a conclusive advantage for many missions?

Also, the aircraft could be self-deployed there with some useful payload. Considering a Soviet submarine fleet numbering nearly 380 vessels, this bears major consideration.

So, where have all the V/STOL's gone? One is off and flying — the XV-15!! I predict a great future for it in military and civilian application.

RIGHT: XV-15 Bell tilt rotor



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U.S. Army Communications Command
ATC ACTION LINE

COPCOM

DOES COPCOM MEAN anything to you? The Federal Aviation Administration (FAA) chartered Controllers Operations and Procedures Committee was established to encourage controller participation in the development of air traffic control (ATC) procedures through the views and recommendations obtained directly from working level controllers. However, any aviator worth his or her salt would realize that this channel offers a great opportunity to get a person's ATC ideas considered by FAA. In other words, *talk to your controllers.*

Example of a recent COPCOM action: An Army ATC facility requested COPCOM to initiate action to delete paragraph 1220.b from FAA Handbook 7110.65B which required precision approach radar (PAR) monitoring of all precision and nonprecision approaches conducted *at night*. The facility was of the opinion that paragraph c, which provided for PAR monitoring upon pilot request, was sufficient without any compromise of safety. The proposal was forwarded to the National COPCOM at FAA headquarters for circulation to all users. They did not elect to cancel the paragraph; therefore, the Army, insisting that the suggestion had merit, took exception and the individual saw his proposal published effective 1 January 1981.

For your ideas or proposals to become a reality, contact your regional representative listed below for submission and information about the committee:

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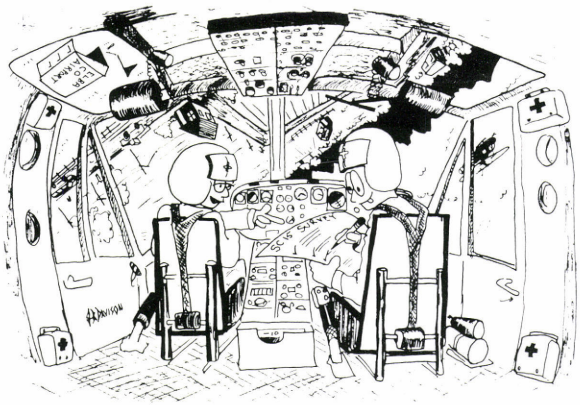

Illustration by CPT J. B. Davison

Thats Just Great, Another Survey!

Major Victor M. Sathre
Directorate of Training Developments
U.S. Army Aviation Center
Fort Rucker, AL

WHAT DO THOSE people at Military Personnel Center (MILPERCEN) think? That I don't have enough to do? Why don't they solve some real problems instead of surveying everything?

Sound familiar?

I've said these words (or thought them), and I'm sure you have too. But wait! This *is* different. This is your opportunity, as an Army aviator, to let the people who control aviation education and training know exactly what's wrong or right about it.

Hey! I heard that they're going to get rid of the officer advanced course.

Hey! I heard the officer basic course is going to be 12 months long.

Hey! I heard we're all going to Ft. Leavenworth, KS, for some school.

By now, you're probably wondering what this article is all about. It's about *your* future! The Review of Education and Training for Officers (RETO) is a Department of the Army directed, long-range program which has, as its ultimate goal, the total improvement of the training and education of Army officers. Naturally, the Specialty Code 15 (SC 15) and the 100-series military occupational specialty (MOS) for aviation warrant officers are a large part of this program.

Some time ago it was recognized that the Army training development process being used was inadequate. Lately, a new process has emerged. This sytem basically helps us determine what tasks, skills, knowledges or responsibilities are inherently necessary to perform a certain job to a certain standard. Then, and only then, is training developed to teach the required tasks that will be performed on the job. This process, of course, requires extensive analysis of various duty positions to enable the developers to see clearly what *is* done on the job. Primarily, we are searching for those tasks which are trained extensively but are never used and those tasks which *are* used but never adequately trained.

The rumors and questions you have heard regarding the officer advanced and basic courses, the new Combined Arms and Services Staff School (CAS^3) at Ft. Leavenworth, TDY functional courses and various exportable training packages are fallouts from the ongoing RETO analysis. The only ones that officially have been approved are the extension of officer basic courses an average of 4 weeks and the CAS^3 at Ft. Leavenworth. CAS^3 is designed primarily to teach division level staff work to relatively senior captains. Eventually, all captains will attend between their seventh and ninth years of service.

On 19 September 1980, the Chief of Staff of the Army was briefed on various officer training strategies for many specialties. Naturally, the officer basic and advanced courses, CAS^3, TDY functional courses and exportable training were part of that briefing. Although decisions were made regarding certain individual courses, possibly the most important fallout was the reaffirmation that the RETO Officer Job/Task Analysis Program will continue and be the vehicle for changes to our overall education system. This brings us back to ***the survey.***

The Army Occupational Survey Program is set up and operating under the Army Training Support Center from MILPERCEN; however, the actual development of the survey questionnaires is done by the various centers that have proponency for the officer specialties. In the case of SC 15 and the 100-series MOS, the U.S. Army Aviation Center, Ft. Rucker, AL, in coordination with the other aviation systems proponent schools, is the responsible agency. The SC 15 survey for company grade aviators is complete and should be in your hands now or very shortly. Let me assure you that your response to this survey will be read, analyzed and used in the development of a new aviation training and education strategy for the 1980s and 1990s. This is our base document. This is your opportunity as an Army aviator to have a significant impact on your future education and training. As you fill out *your* survey, remember you are the critical part of the solution to a problem that is vital to us all.

We are in a new era of tactics, doctrine and technical complexity. We are a new combat arm. Our training and education system must keep pace to enable us to fight and win the air land battle of tomorrow. It's up to *you!*

NOTE—Aviation Warrant Officers: We haven't forgotten you. Your training and education system is now being analyzed, and your survey is being prepared at the Aviation Center.