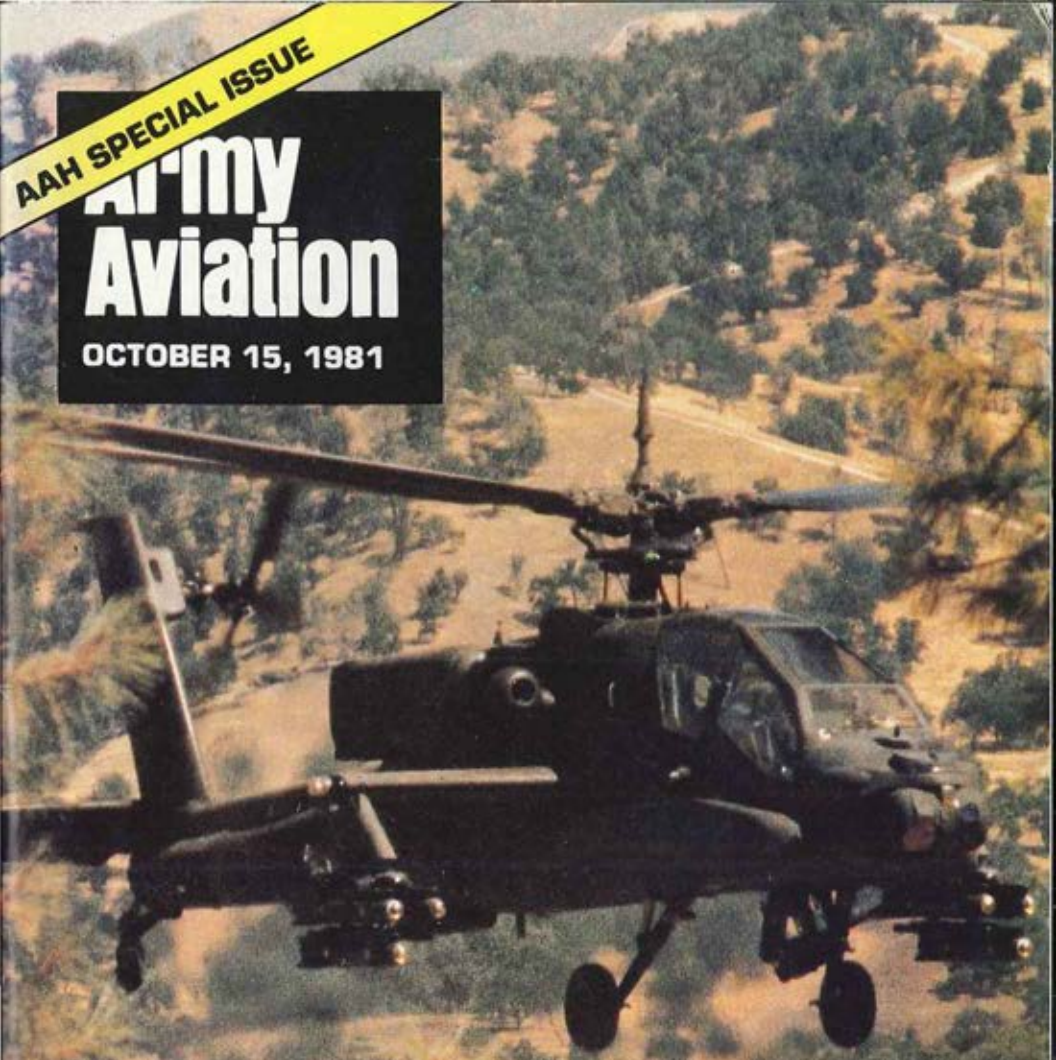
AAH SPECIAL ISSUE

Army Aviation

OCTOBER 15, 1981



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RCA's automatic test equipment provides total system support to the AH-64. The test system will reduce maintenance training requirements while improving the AH-64's combat availability and missile effectiveness. Scheduled for intermediate and depot level maintenance, the AH-64 ATE is now ready for production.

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The AH-64 ATE is one configuration of the RCA-developed AN/USM-410. The test system can be configured to meet your specific ATE requirements.

RCA Government Systems Division

The CH-47D. Meeting schedules to meet the need.

From the beginning, the Army's new CH-47D Chinook helicopter has met or beaten every developmental schedule... cost, time, performance. First flight was under budget and ahead of schedule. Developmental program completion continued the pattern. And prototypes met or exceeded every design goal.

Now, production is underway, upgrading Chinook As into new, high performance, high reliability models. It will continue until the entire fleet of 436 A, B, and C models is remanufactured with more reliable engines, new transmissions, fiberglass rotor blades, and modern electrical, hydraulic, and avionic systems.

Not only will the Army be getting the increased performance it needs at lower operating costs, but American taxpayers will be saved millions of dollars in investment cost. Upgrading this well-conceived and thoroughly proven design means the Army's workhorse helicopter will continue to serve with distinction into the next century. Most importantly, it means the ground commander will be getting modern, effective, logistical support. It's the result of teamwork... Boeing and Army commitment to meeting tomorrow's needs with the right equipment at the right time. The Chinook CH-47D. Meeting schedules to meet the need.

BOEING VERTOL HELICOPTERS
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ARMY AVIATION

ARMY AVIATION
A professional journal endorsed by the Army Aviation Ass'n (AAAA)

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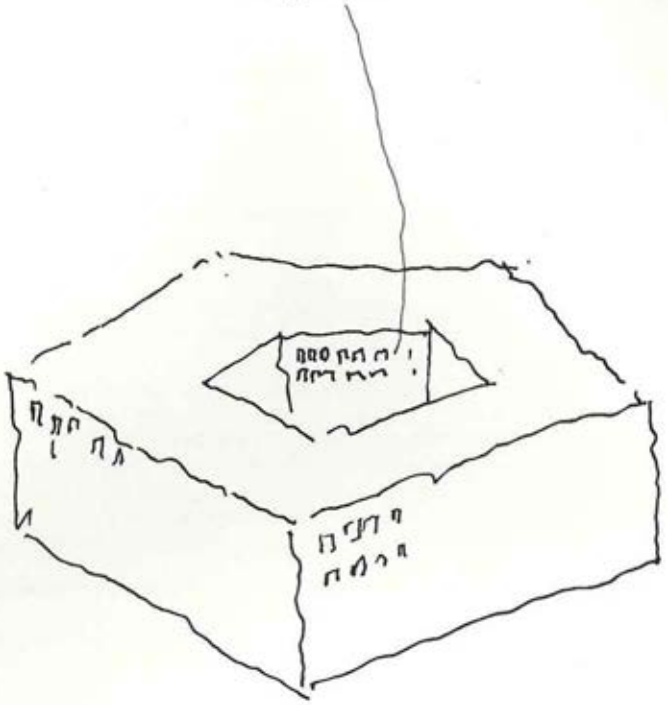
VOLUME 30 — OCTOBER 19, 1981 — NUMBER 10

FEATURES

THE ADVANCED ATTACK HELICOPTER — AAH

DEPARTMENTS

King who?



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19 October 1981

AT THE GRASS ROOTS!

Buried in each issue of this magazine — usually on one of the rear pages — is a pretty cut and dry account of the recent and future activities of our far-flung AAAA Chapters . . . This editorial copy appears monthly under the headline, **"Calendar,"** and gives a capsulized account of the **When, What, When,** and **Where** of the more than 225 Chapter professional, business, and social gatherings held throughout the year.

The title, **"Calendar,"** is a misnomer; most of the listings are published **after** the fact . . . no fault of the Editor's for most Chapter notice drafts are submitted to the AAAA National Office less than three weeks in advance of the meeting date, and the monthly magazine cannot turn late material into early news.

That's not my point . . What is my point is that the listings simply do **not** do justice to the overall ingenuity of our widespead members in the conduct of their local area meetings. Many Chapters simply do not pursue a **"Ho Hum"** type of existence, and it is not a small coincidence that they are the very same Chapters that continue to thrive while others, not so ingenious or so receptive to innovative ideas from their membership, ask, "What do we do now?"

For example, there's the **Morning Calm Chapter's** Pig Roast . . the **Southern California Chapter's** viewing a Space Shuttle Landing front row . . the **Franconia-Marne Chapter's** Helicup Competition, and Western Night, and Afternoon Delight (A 12 kilometer cross-country run). You want more? . . What about the **Jack H. Dibrell (Alamo) Chapter's** Father's Day Family Bar-B-Q (We all take Mother out on Mother's Day but it took the **Dibrell Chapter** to put the bib on Dad). The **Lindbergh (St. Louis)** and **Monmouth Chapters** both hold Annual Golf Tournaments; the **David E. Condon (Ft. Eustis) Chapter** is pursuing a Bowling League.

Then again, there are numerous facility tours (**Bueckeburg, Edwards AFB, etc.**), plant tours (**Sikorsky, Boeing Vertol, Hughes, etc.**), and sightseeing tours (**Paris, West Berlin, Pearl Brewery, etc.**) that educate (and entertain) the members outside the local area.

What I'm trying to do here is convey the thought to you that AAAA meeting activity isn't (and doesn't have to be) rigid, or hum drum, or ritualized. It helps, of course, to have an enthusiastic **Chapter VP—Programming** as well as a supportive Chapter Executive Board. If you've got both, we know that AAAA can be alive and well in your area.

JOHN W. MARR
Colonel, USA (Retired)
President, AAAA

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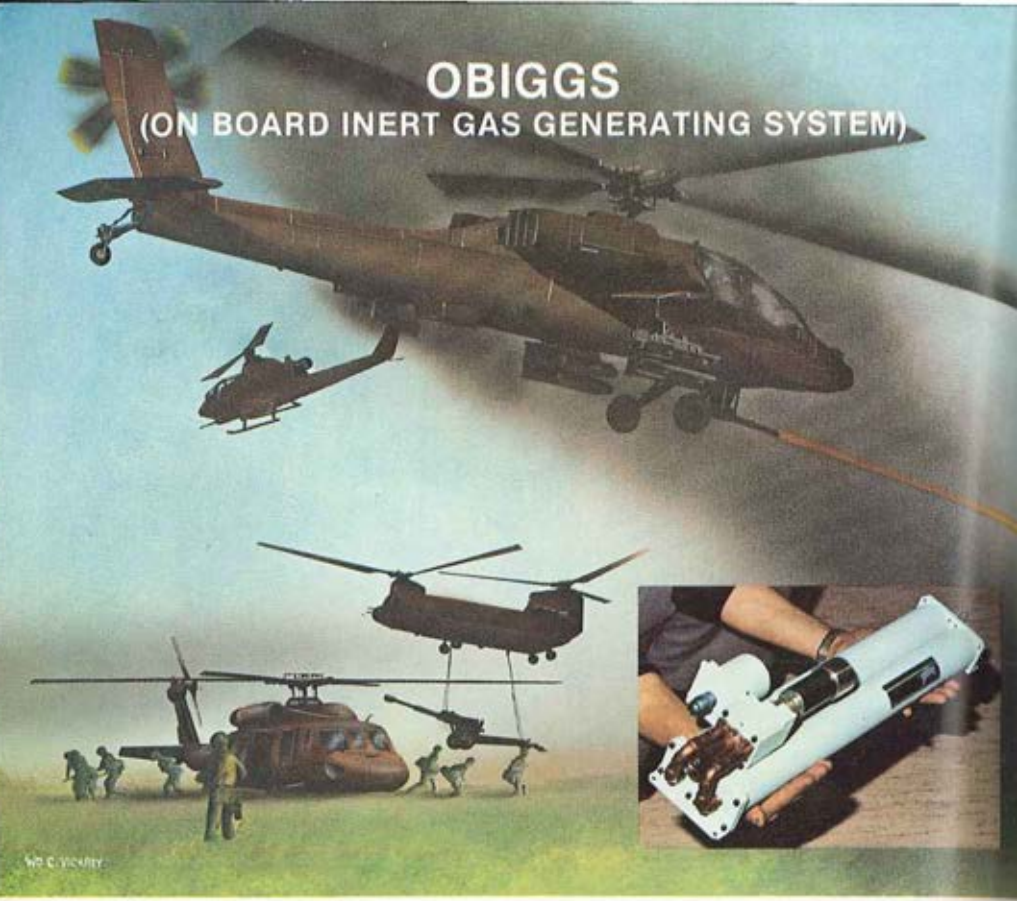

TODAY'S TECHNOLOGY FOR BATTLEFIELD SURVIVABILITY

An inert gas unit program for U.S. Army helicopters has been jointly initiated by the Aircraft Survivability Equipment Project Office, Advanced Attack Helicopter Project Office, with the Applied Technology Laboratory as the lead agency.

The Army awarded Bendix Instruments & Life Support Division a contract for system design and fabrication of three prototype generic fuel tank inert gas units.

Over the past 15 years, Bendix I&LSD has carried out a continuous series of development programs relating to aircraft on board gas generating systems. This effort has resulted in contracts for on board oxygen and inert gas generating systems programs for the Army, Navy and Air Force. For information concerning inert gas generation contact:

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We speak survivability

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Apache Power

The T700: More power for the AAH

The rugged, remote Army flight environment has earned the T700 its reputation for toughness and reliability. The field statistics prove it. Now a higher-power derivative is being readied to power the Hughes AH-64A Apache Advanced Attack Helicopter. Designated the T700-GE-701, the engine produces 10% more power for extended NOE, and hot and high missions. In addition, the -701 offers outstanding fuel efficiency, simple maintenance and low life-cycle cost.

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Bell Helicopter Textron...helping keep the free world free.

AHIP is finally here!

by
BRIGADIER GENERAL ELLIS D. PARKER, Army Aviation Officer—DA and Deputy Director of Requirements, ODCSOPS

AFTER what seems an excruciating time, the long-awaited decision on the selection of the **Army Helicopter Improvement Program (AHIP)/ Near Term Scout Helicopter (NTSH)** has been announced.

On 21 September 1981, the Army announced award of a development contract to Bell Helicopter Textron. The contract will provide improvements to the OH-58 helicopters currently in the Army's inventory.

Many improvements

Numerous improvements are planned to enhance the operational and mission effectiveness of the Scout Helicopter to enable it to interface more effectively with the new developmental weapon systems. Mission equipment to be installed includes a mast mounted sight for day and night target acquisition to support the attack helicopters.

This sight will also have a laser range finder/designator to enable the AHIP/ NTSH to designate targets for the HELLFIRE missile and COPPERHEAD artillery munitions while hiding at defilade from the enemy. It will also be capable of designating targets for Air Force "Smart Bombs".

The new aircraft will be equipped with a Doppler navigation system. In addition, hover performance will be improved to enable the aircraft to better meet worldwide employment requirements.

This program will significantly improve the capability of Army Aviators to conduct the Air Land Battle and enhance the flexibility of some of the battlefield's most potent future tank killers.

Welcome, new Scout!

Calendar

SEPT.-Oct. 1981 AAAA MEETINGS

★★SEPT. 16. Coastal Empire Chapter. General membership meeting. Representatives from Bell Helicopter Textron, McDonnell Douglas Corporation, and Sperry, guest speakers. Hunter Army Airfield Officers' Club.

★★SEPT. 28. Franconia-Marne Chapter. Professional luncheon meeting. Topics will be preparations for October 1981 "Western Night" and "1981 AAAA-USAREUR Helicup". Giebel-People Inn, Giebelstadt AAF.

★★SEPT. 29. Taunus Chapter. Professional Meeting. CW4 Cochran, USAREUR Aviation Assignment Office, guest speaker. Frankfurt Officers' Club (Terrace Club).

★★OCT. 5. Fort Hood Chapter. Welcome the new 6th Cavalry Brigade (AC) Commander. BG John C. Bahnsen, Jr. will host. Main Ballroom of the Fort Hood Officers' Club.

★★OCT. 8. Suncoast Chapter. Professional-Social Luncheon. Presentation by MG James C. Smith, Ret. Bradford's Coach House, St. Petersburg, FL.

★★ OCT. 10. Fort Indiantown Gap Chapter. Activation Meeting/Election of Chapter Executive Board. Classroom Building 19-101 at MUI Army Airfield.

★★OCT. 29. Connecticut Chapter. Professional Dinner Meeting in conjunction with the Stratford Chapter of the AHS. Frank N. Piasecki, Engineer-Designer, guest speaker. Valle's Restaurant. Stratford, CT.

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I wish to join the Army Aviation Ass'n of America [AAAA]. My past or current duties affiliate me with U.S. Army Aviation and I wish to further the aims and the purposes of AAAA. I understand that the annual membership includes a subscription to the AAAA-endorsed magazine, ARMY AVIATION, and that my membership starts on the subsequent 1st of the month.

Note: A home address is suggested, if one's military or firm address exceeds 25 characters.

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[ ] Army Retired*	[ ] Professional*
[ ] Other Services	[ ] Other*

*Nat'l Office will request add'l information.

AAAA ANNUAL DUES

New & Renewal Dues for other than below:
[ ]1 Yr,$15-[ ]2 Yr,$29-[ ]3 Yr, $43

New & Renewal Dues for Enlisted; GS-6 & below; and Wage Board 12 DACs & below:
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This is the only application form accepted by the AAAA. It may be reproduced locally.

Elastomeric Design Decisions

Safeguarding the flight stability of the world's most survivable attack helicopter

The Hughes YAH-64 Attack Helicopter was designed to fight and survive under the toughest combat conditions. Inflight stability, reliability, ease of maintenance, and the capability to withstand abuse were critical criteria in the decision to use elastomeric lead/lag rotor dampers from Lord Kinematics.

The results speak for themselves. After endurance tests equivalent to 4,500 flight hours, the damper system displays ample capability to damp small or large amplitude vibrations and maintain maximum flight stability in the face of potentially destructive ground resonance. Equally important, it has no fluid to leak, no sliding surfaces to wear, and no need for maintenance, adjustment, or lubrication. And, it is not affected by dirt, grit, or other environmental hazards. Even ballistic damage produces only a proportional loss of damping efficiency.

The future looks bright. The YAH-64 Rotor Damper System is a refinement of the elastomeric dampers proven on the Hughes Model 500D helicopter. It now becomes a foundation for research into new elastomers and lightweight composite substrate materials to meet future needs.

For more information on this system or assistance with your next elastomeric design decision, contact Lord Kinematics, 1635 West 12th Street, P. O. Box 10039, Erie, Pennsylvania 16514. Telephone: 814:456-8511. Telex: 914-438.

LORD Lord Kinematics

Applicants for 1982 Scholarship Aid Sought by AAAA

The AAAA Scholarship Foundation, a separate non-profit educational activity created to provide scholarship aid to the sons and daughters of AAAA members and deceased members, announces the availability of assistance funds for the 1982 college-entry year. Program participation is limited to the children of members with an effective date of membership on or before March 31, 1981.

APPLICATION PROCEDURE

Student-applicants are asked to request the appropriate application forms by writing to the AAAA Scholarship Foundation at 1 Crestwood Road, Westport, CT 06880. Requests for applications must be received on or before January 1, 1982. Grades and individual test scores are to be submitted by February 8, 1982. All forms, together with other supporting data, must be returned to the Foundation on or before February 1, 1982 to receive Awards Committee consideration. The student-prepared application should state the full name of the applicant's father-member and address of student if different.

ELIGIBILITY CRITERIA

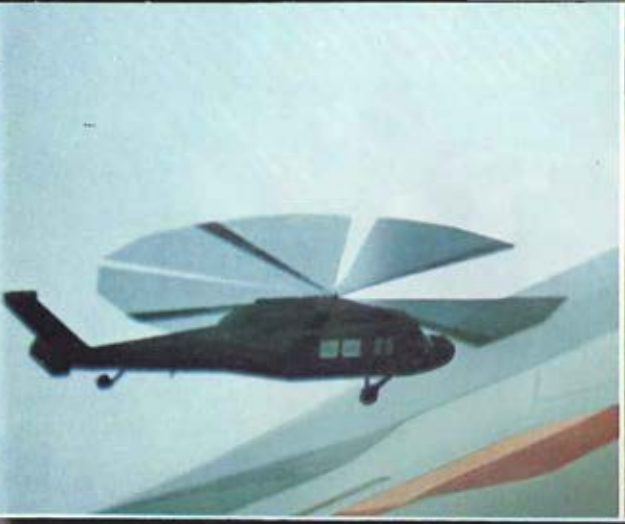
The AAAA applicant must also be: (1) a high school senior who has applied to an accredited college or university for Fall, 1982 entry as a freshman.

SELECTION & NOTIFICATION

Selection of winners will be made during the month of March 1982 with each applicant to receive a list of the winners not later than 1 April 1982.

BACKGROUND DATA

Incorporated in December 1963, the AAAA Scholarship Foundation provided 14 scholarships in 1981, and has furnished more than $71,700 in direct aid.



AH-64A & LINK: A NATURAL

When it comes to helicopter training, think Link.

That's what the U.S. Army has been doing since 1971 when it launched the Synthetic Flight Training System (SFTS).

Link began its decade of dedication to the Army's training needs by providing simulators for UH-1H (Huey) pilots. This training proved so successful that the Army chose Link to support other SFTS programs: CH-47C (Chinook), AH-1Q (Cobra) and UH-60A (Black Hawk).

Simulation realism was enhanced by visual systems, providing digitally-generated images, like that of the Black Hawk (left above), and camera model views such as the scene from a Cobra trainer (right above). Now the Army is involved in a challenging new program: the Advanced Attack Helicopter (AH-64A).

Binghamton, N.Y. 13902

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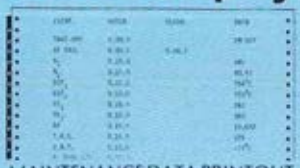

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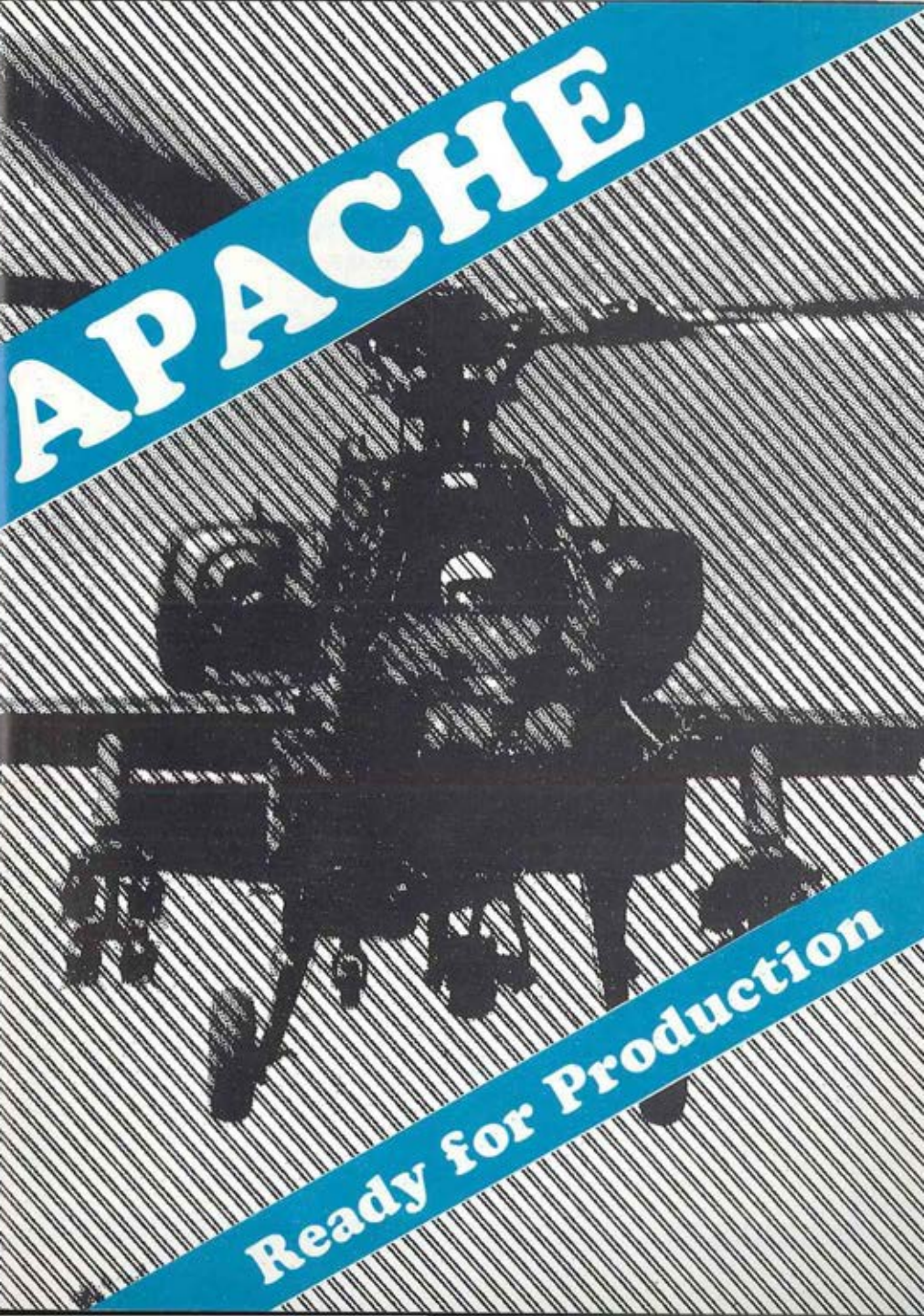

APACHE
Ready for Production

UNITED STATES ARMY

THE CHIEF OF STAFF

The most potent conventional threat facing our combined arms team on the integrated battlefield is the offensive capability inherent in the modern armored formations of the Warsaw Pact. The Army's continuing goal is to ensure that the American Soldier, in concert with the capabilities of the other services and those of our allies, is trained and equipped to defeat this threat decisively. Our program to attain this goal involves toughened training, innovative tactics and the infusion of technically advanced weaponry of many varieties; like the Abrams tank, the Bradley infantry fighting vehicle, and our new attack helicopter, the Apache.

The American Soldier pioneered the application of the helicopter to land warfare. He appreciates the fact that its maneuverability can greatly improve the ground commander's means to rapidly mass firepower at the decisive point. The AH-64 Apache is designed to kill tanks in the forward battle area, at night or in adverse weather. When coupled with the means to rapidly recycle its firepower it provides one of the critical ingredients to the challenge of fighting and winning, even though initially outnumbered.

The Army looks forward with great expectation to the Apache joining the force. In the hands of skilled crews, it is potent justification for enemy tanks to remain in their parks, at peace.

E. C. MEYER
General, United States Army
Chief of Staff

The Apache Attack Helicopter . . . Ready for Production!

By Major General Edward M. Browne Program Manager — AAH

ON future battlefields the AH-64 APACHE Attack Helicopter will be a valuable asset and provide an added lethal dimension to the U.S. Army's combined arms team. The APACHE will be immediately available and responsive to the needs of the ground commander.

This makes the fourth issue of **Army Aviation Magazine** devoted to the APACHE Attack Helicopter and at the onset, I would like to once again express my sincere thanks to editor **Art Kesten** for the opportunity to provide all interested individuals with this annual report on the Army's Number One aviation program.

The force modernization of the Army's land and air assets is progressing rapidly. Land force fieldings include the M1 Abrams tank and the M2/3 Infantry/Cavalry Fighting Vehicles. In the air, we are fielding the UH-60A BLACK HAWK and will soon commence production of the AH-64A APACHE.

Although the background information and other data on the APACHE has not changed significantly, I've repeated certain parts of this information for newcomers, for those who did not save the previous issues, or for those who haven't a file copy to put all things in their proper perspective.

Background

In June 1973, the Deputy Secretary of Defense authorized the Army to initiate a two phase development of the Advanced Attack Helicopter. Phase I was a competitive development for selecting the best helicopter airframe to enter the Phase II full scale engineering development.

In July 1973, Bell Helicopter and Hughes Helicopters were awarded contracts to design and fabricate a **Ground Test Vehicle (GTV)** and two flying prototypes to be evaluated in the competitive fly-off.

The Bell Helicopter candidate, a two-bladed tricycle-gear aircraft with the pilot located in the front seat, was designated the YAH-63 (See **Figure 1**) and the Hughes Helicopters candidate, a four-bladed, three point gear system with the pilot in the rear seat, was designated the YAH-64 (See **Figure 2**). Both aircraft utilized twin T-700 General Electric turbine engines rate at 1,560 SHP each.

Following the first flight of the prototypes in September 1975 both companies conducted extensive developer tests of their aircraft before delivering them to the Army for Government competitive tests at Edwards AFB, CA.

FIGURE 1—THE BELL YAH-63 CANDIDATE

FIGURE 2—THE HUGHES YAH-64 CANDIDATE

Military developmental test pilots and operational pilots from user commands participated in the evaluation of the helicopters. The Source Selection results were presented to the Secretary of the Army on 10 December 1976, and he selected the Hughes YAH-64 as the clear winner.

Upon winning the competition, Hughes was awarded the Phase II full scale engineering development contract, which included the fabrication of three additional flying prototypes, and the development and integration of a target acquisition designation system, a pilot's night vision system, and the fire control essential to the integration of the HELLFIRE anti-tank missile, the 2.75 inch rocket and the 30mm cannon (area weapon) subsystems.

System Description

The AAH is a two-man, twin-engine helicopter with two T-700-GE-701 (1,690 SHP each) engines, a four-bladed fully articulated main rotor, and a four-bladed tail rotor. It utilizes a three-point landing gear.

The pilot is located in the rear of the tandem cockpit arrangement, with the **copilot-gunner (CPG)** in the front crew station. A variety of armament and fuel options are available on the four stores stations mounted under the wings thus providing extraordinary combat mission flexibility.

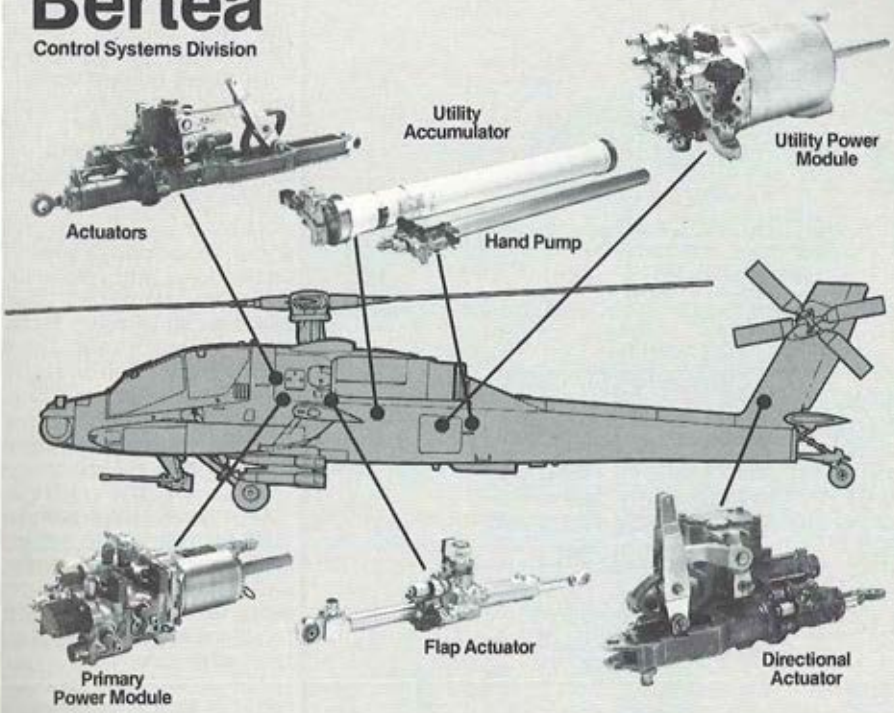
The AH-64A APACHE is the first Army attack helicoper developed to live with the troops in the forward battlefield environment specifically for the day, night, adverse weather,and anti-armor mission with emphasis on the ability to fight, survive, and return to fight again.

In order to achieve a high availability rate, emphasis has been placed on developing the APACHE with superior flight performance and ease of maintenance. The best measurement of helicopter performance under certain atmospheric conditions, at mission weight, for a specific period of time is **vertical rate of climb (VROC)**, cruise speed, and maneuverability (the ability to avoid obstacles at high speeds). The charts at **Figure 3** present the flight performance of the production APACHE AH-64.

The armament system consists of the HELLFIRE

Bertea

Control Systems Division



Flight Control Systems for the AAH

PARKER BERTEA, a world leader in flight control systems, is a member of the Hughes AAH team—designing, developing and producing the complete Hydraulic Flight Control System for this advanced attack helicopter. Total project response and proven system dependability from PARKER BERTEA—putting tomorrow's technology to work today.

Parker

18001 Von Karman Ave., Irvine, CA 92715
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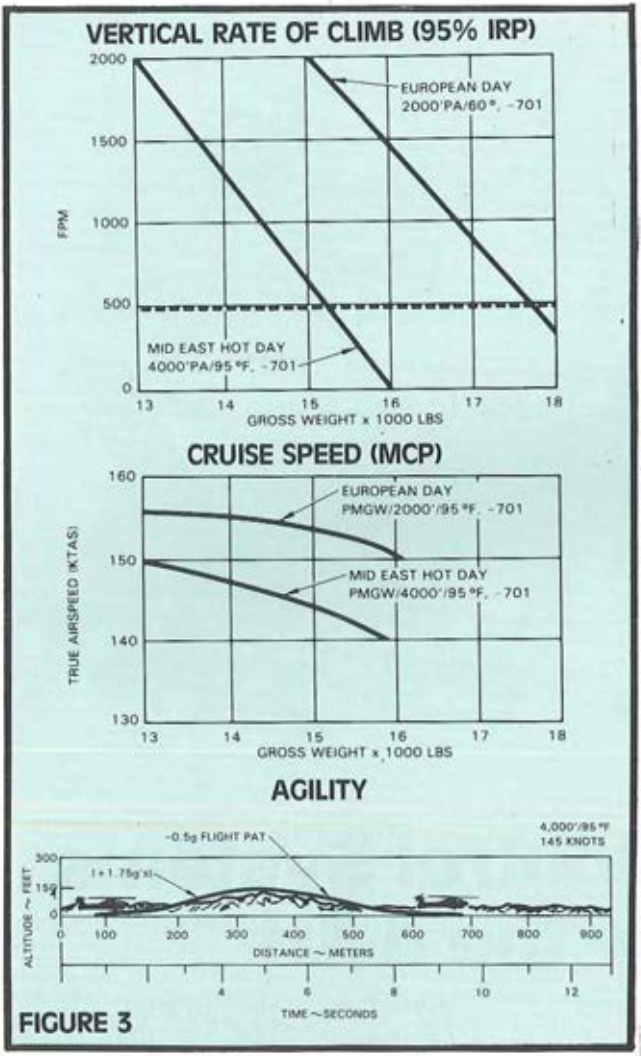


FIGURE 3

anti-tank missile, a 30mm cannon, which provides highly responsive area weapon capability for defeating personnel and lightly armored vehicles, and 2.75 inch rockets which are capabale of delivering a wide variety of payloads.

HELLFIRE

The HELLFIRE terminally-guided missile provides the primary anti-tank armament for AAH. The missile (as shown on **Page 62**), is based on a modular design to facilitate a variety of homing seeker heads. The first missiles to be fielded will be equipped with a laser-guided seeker. Potential future follow-on seekers may include a true fire-and-forget seeker that will independently guide on the target.

The missile weighs about 100 pounds and is 64 inches long and seven inches in diameter. The APACHE can carry up to 16 missiles which are fired from new lightweight four-rail launchers. The missile offers higher rates of fire, shorter flight times, and increased range relative to the current TOW missile. Firing techniques include single, rapid, and ripple fire. In the ripple fire mode, two or more tank platoons could be "blown away" in less than a minute.

The guidance scheme requires that a laser beam be positioned accurately on the target during the terminal phase of the flight path of the missile. The laser designation can be accomplished autonomously by the AAH gunner using his **Target Acquisition Designation Sight (TADS)** or remotely by a ground or another airborne laser designation system. The principle virtue of laser guidance is the versatility provided by a multiplicity of firing modes which permit engagements by direct, indirect, and pseudo-direct fire.

Direct fire is similar to command line-of-sight guidance modes. The gunner requires line of sight to the target. The seeker can be locked onto the target before launch which provides the greatest latitude in the helicopter launch envelope.

Alternately, the seeker can be locked on after launching which provides extended stand-off range in degraded weather and improved performance under certain types of countermeasure environments.

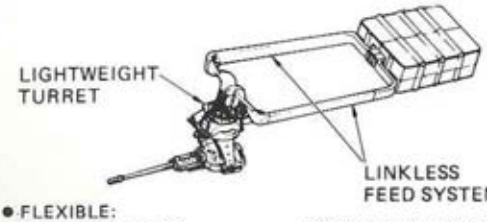
Indirect fire

Indirect fire does not require line of sight, enabling the helicopter to fire from concealed, defiladed positions. The target information required to launch the missile is handed off to the helicopter from the remotely located designator. Shortly after launching, as the missile proceeds down range, it picks up the laser signal reflected by the target and enters a guided flight mode.

Psuedo-direct fire is a hybrid of the direct and indirect fire modes. The missile is launched on a ballistic flight path prior to exposing the aircraft. Shortly after launch, the pilot maneuvers the aircraft to establish line-of-sight to the target.

The gunner, whose TADS is precisely directed at the known target coordinates (by the AH-64A navigation system), rapidly acquires and designates the target.

FIGURE 4—30MM AREA WEAPON SUBSYSTEM



- FLEXIBLE:
  - AZIMUTH LEFT OR RIGHT 110°
  - ELEVATION +11° TO -60°
- SAFETY INTERLOCKS
- SPRING AUTO ELEVATE
- CRASH ACCOMMODATING

XM230E1 CHAIN GUN

- 1200 ROUND MAGAZINE
- RELOAD 1200 RDS - 10 MINUTES
- POWER DOWN LOADER REPACKAGES AMMUNITION

The missile then acquires and locks into the guided mode. The pseudo-direct mode reduces aircraft exposure time, but requires timely, accurate target hand-off and close coordination between the pilot and gunner.

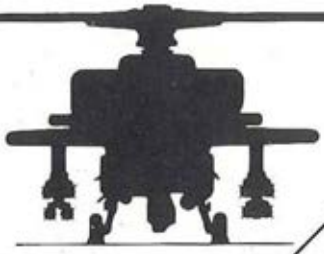
The lethality of the HELLFIRE against tanks at long stand-off ranges has been demonstrated throughout the separate missile development program, as well as during the over 50 APACHE firings for integration of the system. The article of **Colonel Stanley Cass,** the PM HELLFIRE, clearly points to the dramatic increase in firepower that the APACHE-HELLFIRE will bring to the combined Arms Team.

Area Suppression Weapons

Secondary armament consists of the XM-230 30mm chain gun® and the 2.75 inch rocket system.

FIGURE 5—2.75 INCH ROCKET SUBSYSTEM

FIGURE 6
AAH OPTIONS



Mission				Performance			
				VROC (IRP)	V Cruise (MCP)	V MAX Level Flight (IRP)	Mission Duration
Anti-Armor Mid-East Primary Mission 4000/95°F	4 HF	320 RDS	4 HF	1300 FPM	145 KTS	157 KTS	1.83 HRS
Europe Alternate 2000/70°F	8 HF	1200 RDS	8 HF	770 FPM	147 KTS	151 KTS	2.5 HRS
Covering Force Mid-East Alternate 4000/95°F	4 HF	1200 RDS	4 HF	715 FPM	143 KTS	154 KTS	1.83 HRS
Europe Alternate 2000/70°F	4 HF 19 RKTS	1200 RDS	4 HF 19 RKTS	1330 FPM	150 KTS	153 KTS	2.6 HRS
Airmobile Escort Mid-East Alternate 4000/95°F	19 RKTS	953 RDS	19 RKTS	695 FPM	144 KTS	155 KTS	1.83 HRS
Europe Alternate 2000/70°F	38 RKTS	1200 RDS	38 RKTS	445 FPM	148 KTS	151 KTS	2.5 HRS

The XM-230, which was developed by Hughes Helicopters especially for the APACHE, is a lightweight, externally powered, single-barrel gun that emphasizes firepower, simplicity, and reliability. The chain-operated bolt simplifies the design by eliminating declutching feeders, chargers, or other special devices to insure firing of all rounds.

The gun is mounted in a flexible turret underneath the aircraft providing a field of fire at 110° azimuth and +10° to -60° elevation. Total weight of the gun, turret, drive motors, and control electronics is 110 pounds.

The aluminum-cased 30mm ammunition is stored in a 1,092 round "flat pack" magazine and fed to the gun over an endless conveyor (See **Figure 4**). The gun is designed to fire ADEN/DEFA type ammunition. High explosive incendiary and armor piercing rounds are in development.

Gun control

The principal fire control mode for the gun is through the gunners' TADS. This provides highly accurate gun positioning. All gun pointing corrections are handled automatically by the fire control computer. The gun can be fired in a backup, degraded accuracy mode by the pilot using his helmet sight. This enables the pilot to deliver suppressive fire when the gunner is occupied or disabled.

The AH-64 can carry a payload of up to 76 2.75 inch rockets (**Figure 5**). The rockets are carried in four 19-tube lightweight launchers equipped with precision mounting lugs. Controlled by the AH-64 fire control computer, articulated pylons permit highly accurate firing without pitch trimming the helicopter.

Two modes of rocket delivery have been incorporated. A precision mode using the TADS and a backup mode in which the pilot

Will Litton's strapdown HARS help the Apache aim and acquire targets faster?

Improve first strike kill probability?

Improve survivability?

Yes.

Litton's strapdown LR-80 Heading and Attitude Reference System uses Kalman filtering techniques extensively to provide extremely precise heading, pitch and roll information to the AH-64A onboard navigation and fire control systems.
Accurate acceleration, velocity, body rates and position data are available in digital format.

For more information about this modern, precise, low-cost HARS call 213-887-4321
or TELEX 069-8483, or write...

Litton **GUIDANCE & CONTROL SYSTEMS**
5500 Canoga Avenue, Woodland Hills, California 91365

can fire using his helmet sight. The rocket control system has been designed to accommodate seven different warhead options, including the multipurpose submunition warhead currently under development. Rockets can be fired in quantities of one, two, four, eight, twelve, twenty-four or a salvo of all seventy-six. Fuze setting is selectively controlled through the fire control computer.

Armament Payload

Varying altitudes and temperatures will dictate mission loads. The AAH requirement calls for a minimum of 450 feet per minute vertical rate of climb with eight HELLFIRE missiles and 320 rounds of 30mm ammunition with 1.83 hours endurance at the Army hot day (95° F, 4,000 feet density altitude, 95 Intermediate Rated Power). The APACHE AH-64 will exceed that minimum. The chart at **Figure 6** depicts the several armament options for the AH-64.

ADEN/DEFA AMMO & RSI

In September 1976, the AAH Program Manager initiated development of the new 30mm ADEN/DEFA class of ammunition for the Advanced Attack Helicopter that could also be used in the USMC's Harrier and in the ADEN and DEFA guns of our NATO allies. This was the AAH's first contribution to Rationalization, Standardization, and Interoperability (RSI) since 30mm ADEN/DEFA ammunition is used in many NATO and other country aircraft.

Automatic cannons on the British MK IV ADEN gun and the French 552 and 553 DEFA guns, fire this standard ammunition. There are over fourteen aircraft deployed in the active forces of the Free World which are equipped with the ADEN/DEFA cannons. Our job is to assure interoperability of this new and superior ammunition in those systems.

Survivability

Helicopter survivability on the modern battlefield is directly related to three elements:

- The inherent ballistic "toughness" incorporated into the basic design of the airframe.
- The optimization of weapons lethality and fire control during integration, giving the ability to acquire, shoot, and kill first.
- The doctrine, tactics, and training developed for employment.

We have already discussed the weaponry and its integration. **MG Lou Wagner,** Commander of the Armor Center; **MG Carl McNair,** Commander of the Aviation Center, **COL Wayne Knudson,** Commander of the 6th ACCB; and **COL Dave Funk,** our new TSM, will — in separate articles in this issue — walk you through their efforts and views on doctrine, tactics, and training for employment. So for now, let's focus on the hardware survivability features designed into the APACHE.

Detectability

The low flicker rotor, the low glint canopy, the use of composite materials, the scissor tail rotor, the overall compact design, and a new approach to engine plume suppression have resulted in a low signature across the aural, visual, radar, and infrared spectrums (See **Figure 7**).

Ballistic Tolerance

An assessment of the AH-64A indicates an invulnerability to 12.7mm rounds and low vulnerability to 23mm HEI rounds. Added features, such as the requirement for the main gearbox to operate one hour without oil, further enhance mission accomplishment. All other components of the drive system operate for extended periods after taking a 12.7mm hit.

The main rotor is designed to operate after a hit from a 23mm projectile. the rotor blades incorporate five overlapping independent spars. We currently have a "composite" blade development program that will give even greater life and added invulnerability. We expect the fifteenth production APACHE to have these blades. We will then retrofit the prior fourteen.

Low Detectability of the AAH

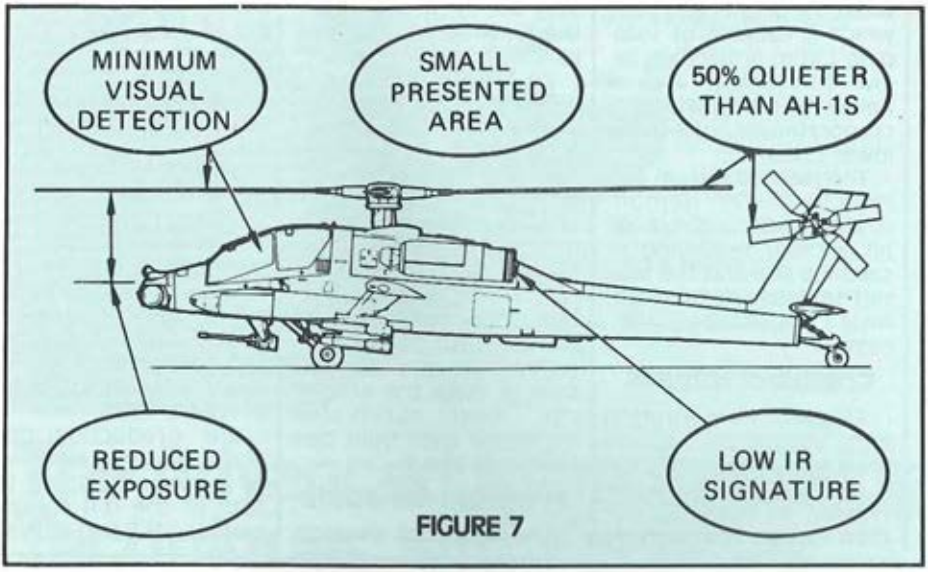


FIGURE 7

AAH Survivability

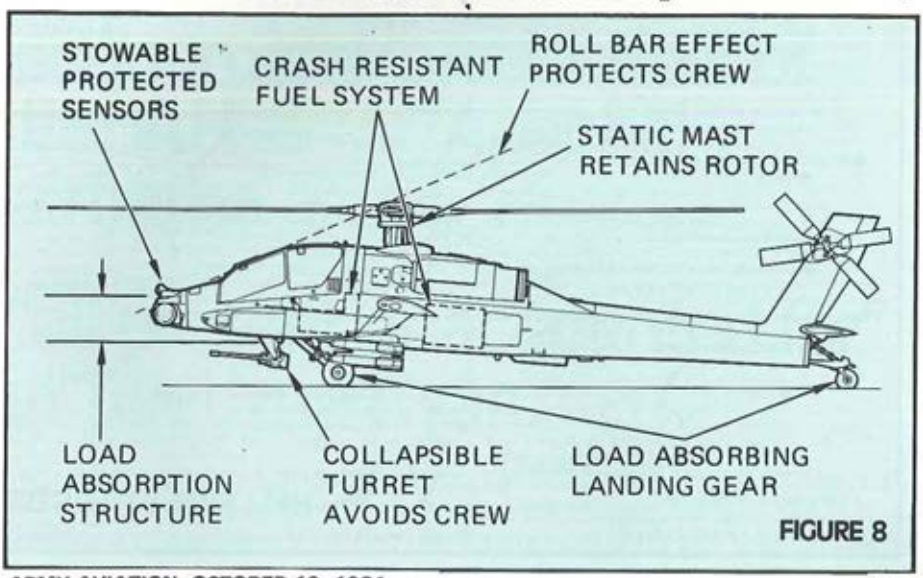


FIGURE 8

Protection to the crew is afforded by an acrylic clear shield placed between the gunner and pilot which is capable of stopping 23mm projectiles. Below this shield area a below-the-seat shield is incorporated to protect the lower torso.

The fuel cell system and structure has demonstrated taking a direct HEI hit without exploding or catching fire and the tank self-sealed! Now that's what I call ballistic toughness!

Crashworthiness

Rugged construction and innovative design features maximize low system attrition. Additionally, 95 probability of crew survival at a crash impact rate of 42 feet per second is engineered into the APACHE. Our goal is to save the crew and repair the AH-64 to fly and fight again.

To summarize, the APACHE is the most survivable helicopter known. Survivability is achieved due to its highly maneuverable, rugged twin engine airframe which is uniquely tolerant to high caliber HEI and invulnerable to mid-caliber projectiles. Redundance in the flight control systems, self-sealing fuel cells all combine to make the APACHE the most survivable helicopter ever built (See **Figures 8** and **9**).

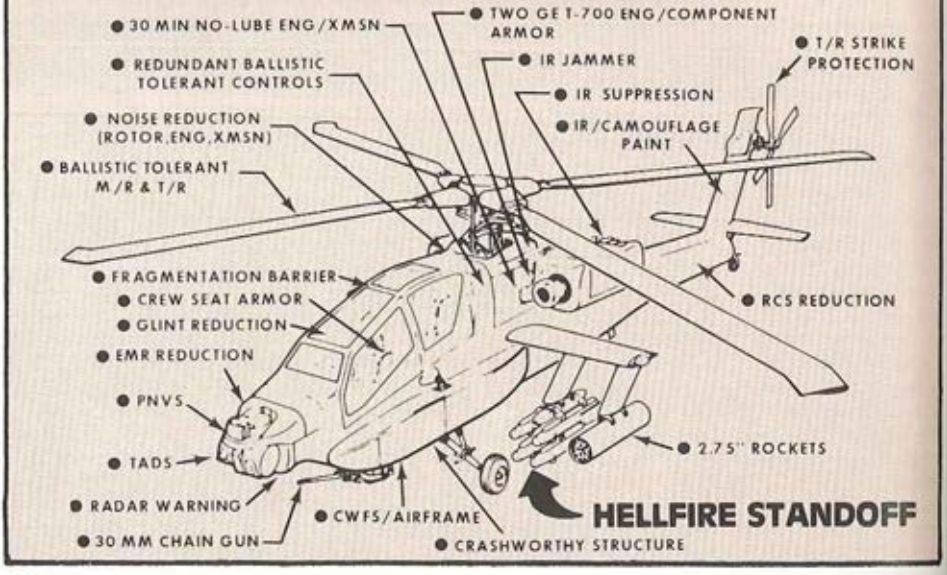
Program Schedule

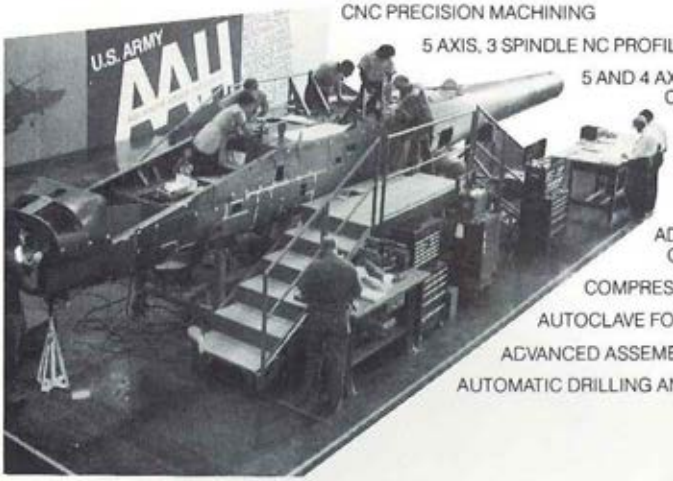
The 56 month development schedule was completed at the end of August when the three-month **Operational Test (OT II)** concluded. To protect delivery of the first production APACHE on schedule, **long lead time item (LLTI)** funding was placed on contract in February 1981 for those items requiring extensive lead times.

The ASARC/DSARC for the APACHE will be conducted in November/December and the initial contract award is planned for early December. (The detailed Program Schedule is at **Figure 10.**)

Our production planning includes a lead time of 34 months from the date of the LLTI contract award to the first delivery,

FIGURE 9—AAH SURVIVABILITY ENHANCEMENT





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AUTOMATIC DRILLING AND RIVETING

The Advanced Manufacturing Techniques and Facilities required for efficient and economical production of the AH-64A "Apache" airframe are . . .

"all present or accounted for" at Teledyne Ryan.

Involved in the development of the Hughes Helicopters AH-64A "Apache" airframe from the ground up over the past seven years, we are ready to produce that hardware on schedule and to exacting program requirements.

TELEDYNE RYAN AERONAUTICAL

When the target's

the Aquila artillery RPV.

You know targets are beyond the skyline. But exactly where? Your forward observer's line of sight is blocked by the high ground. Enemy air defense is too dense for aerial observers.

A proven solution to this age-old problem is taking shape at Lockheed under the direction of AVRADCOM. An RPV—so small it's hard to hit—will fly over the enemy and give you an eagle-eyed view of his forces. It's Aquila, and it will send back over its jam-resistant data link a real-time television picture of the situation on the other side. The Aquila system will interface with TACFIRE and will locate targets for artillery so accurately that you can fire for effect on the first round. If you are firing laser-guided munitions, it will illuminate the targets precisely, using its laser designator.

Think small, think jinking.

Even though enemy air defense may be dense, Aquila's small radar cross section and jinking ability will help it survive while it enables you to observe and adjust fire. Then you will be able to assess damage.

Survivability: the Ft. Bliss tests.

The Aquila program demonstration RPV made a number of flights under fire from several types of weapons. The small, jinking RPV—it's only 6 feet long and 13 feet wide in wingspan—wasn't hit

on the other side...

once. As for infrared seekers, it doesn't generate enough heat for homing.

The real world. Soldiers flew the Aquila program demonstrator RPV in 150 flights out of a total series of 218.

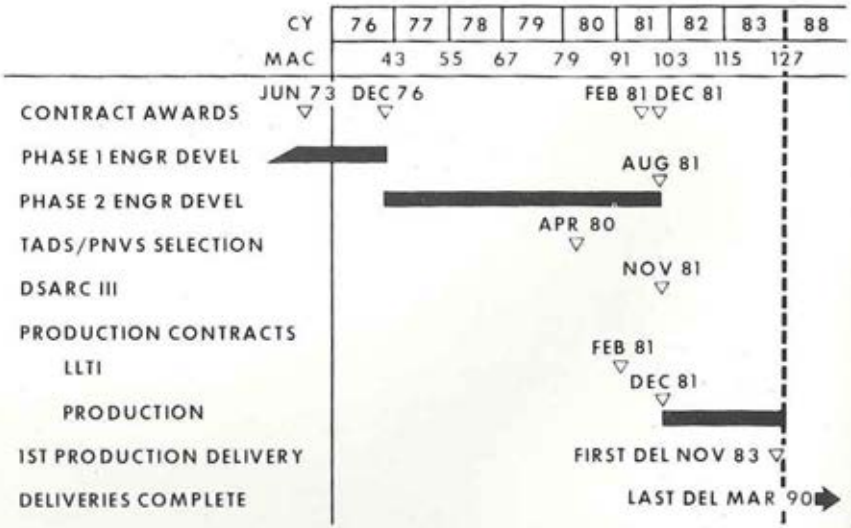
What else?

As a target locator and designator, this new system will be unmatched. But that's only a beginning. It can be equipped with FLIR for nighttime operations. And the same size and aerodynamic characteristics that enable it to carry its target acquisition payloads also can enable it to handle other missions.

When the other side has more men, more guns, more tanks, you'd better have a system that will help get steel on target faster, more accurately than ever before. You'd better have the target acquisition breakthrough: Aquila. It can be operational in the mid-1980s.

Lockheed Aquila

FIGURE 10—AAH PROGRAM SCHEDULE



AH-64A PRODUCTION MAJOR SUBCONTRACTORS

APACHE . . .
Field Tested Tough

The U.S. Army/Hughes AH-64A "APACHE's" on-time, on-schedule completion of the Army's Operational Test II milestone proved its troop compatibility with hands-on operation by Army personnel.

During this final demanding three-month long test, in hot (temperatures up to 114°), dusty conditions, the AH-64A demonstated outstanding mission reliability. With all maintenance performed by Army personnel, maintenance-man-hours per flight-hour and other operational characteristics significantly bettered the stringent requirements for the Army's new anti-armor system.

In OT II Army pilots logged over 400 flight hours in day/night operations of AH-64A's, bringing development flight test time to over 3,200 hours. The APACHE. . . fully tested. . . transitioning to production.

Hughes Helicopters, Inc.
Ahead of TIME Technology

Transitioning to Production

which would make the first APACHE delivery in November 1983.

Production and Procurement Goals

The Army currently plans to purchase 536 AH-64's over a six-and-a-half year period. Production will continue through FY 90 with the last aircraft being delivered in March 1990. I am happy to report that there is interest in the AAH by the U.S. Marine Corps and international interest from several European countries.

The Marine Corps conducted a preliminary evaluation of the APACHE last month. Hopefully, we will build many more AH-64's above the 536 figure and achieve some standardization and commonality of attack helicopters both within the U.S. forces and NATO countries. Some photos of USMC and foreign visitor interest are presented at the rear of this issue.

Contractors

Hughes Helicopters, Inc., as the prime airframe contractor and systems integrator, has developed a "Team Effort" with a number of major subcontractors. The subcontractors and their respective products are listed below:

Advanced Structures
Main and Tail Rotor
Aircraft Gear Corp.
Gearboxes
Bendix
Drive Shafts and Couplings
Bertea
Hydraulic Control Subsystem
Garrett AiResearch
Auxiliary Power Units
Grumman Aerospace
Boresight Kit
Hamilton Standard
Flight Controls
Honeywell
IHADSS
Litton Guidance & Control Systems — HARS
Litton Precision Gear
Main Transmission, Engine Nose Gearbox
Martin Marietta
TADS/PNVS
Menasco
Landing Gear
RCA
Automatic Test Equipment
Rockwell MSD
HELLFIRE
Science Applications
Fixed Base Data Acquisition System
Sperry Flight Systems
Multiplex, Automatic Stabilization Equipment & Symbology Generator
Teledyne Ryan
Airframe Structure
Teledyne Systems
Fire Control Computer

Reliable, Available, Maintainable

The Army, and especially the AAH PMO, placed a great deal of emphasis on the ability of the AAH to perform a mission without a failure; and should a failure occur, the ability to quickly and easily restore the aircraft to an operational status.

With this in mind, the Army developed an in-depth RAM program based on the principle that desired RAM characteristics must be inherent in the basic design.

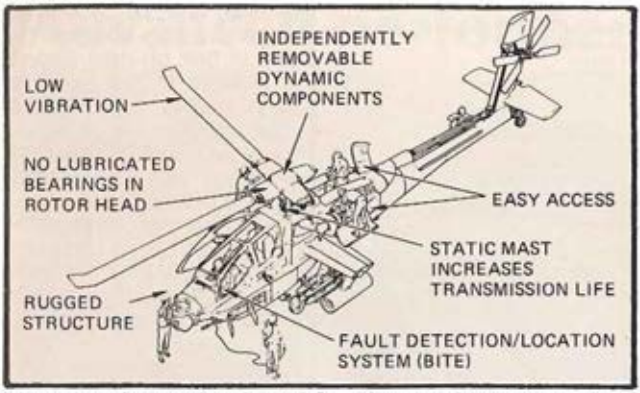
RAM improvements can then be expanded through minor design changes. Through the process of contractor requirements, management controls and RAM data monitoring, many improven to proded state-of-the-art design features were adopted.

Such features include:

- An on-board fault detection/location system.
- Built-in work platforms to eliminate work stands.
- Easy accessibility to all compartments.
- Quick release pins to secure main rotor blades.
- Use of quick disconnects for electrical and fluid lines
- Engine removal and replacement in 30 min.
- On-board auxiliary power unit.
- Static main rotor mast permits removal of main transmission without removal of main rotor.
- Improved reliability since flight loads are transmitted directly to the airframe rather than through the main transmission.

The objective of the RAM and ILS Programs has been to produce a reliable weapon system that can be maintained by Army mechanics. Through the use of an on-board fault location system, combined with a modular remove and replace maintenance concept, a complex sys-

FIGURE 11



tem has been developed which is relatively simple to maintain (See **Figures 11** and **12**).

The APACHE will have VHF-UHF-FM secure communication links and a lightweight doppler navigation system. Vertical scale instruments and overall panel/console arrangements are designed to keep crew workload to a minimum. (Shown at **Figures 13** AND **14** are the pilot's and co-pilot/gunner's display panels).

Apache Air Transportability

The AH-64 is capable of rapid strategic deployment worldwide. It is air transportable in C-141B and C-54 aircraft. Two AH-64's can be carried in a C-141B and six in the C-5A. Air transport preparation varies with aircraft involved. For maximum transportability the main rotor blades, rotor mast hub, tail rotors, stabilator, weapons platforms, and chain gun may be readily removed.

Six AH-64's may be prepared for C-5A transport in four and one-half hours. All preparations for air transport can be accomplished within the specified elapsed time. Flight preparation at destination is a simple reversal of the process (See **Figures 15** and **16**).

Self Deployable

The APACHE will self-deploy over extended ranges using four auxiliary fuel cells. The AH-64 has an 800+ nautical mile ferry range with up to a 20 knot headwind and a 45 minute reserve at the airspeed allowing maximum range (See **Figure 17**).

With proper configuration in-flight refueling is possible for even greater range and flexibility. Within a theater of operation, it is easily deployable with just internal fuel.

Rapid deployment, whether by Air Force transport or self-deployment, will make the AH-64 an important element of our rapid deployment forces.

Integrated Logistics Support

A **Physical Teardown-Logistics Demonstration (PT-LD)** was performed from 5 January through 1 May 1981 using the **Ground Test Vehicle (GTV)** Hardware Trainers and one Air Vehicle.

This PT-LD was conducted by 91 people who expended 15,000 man-

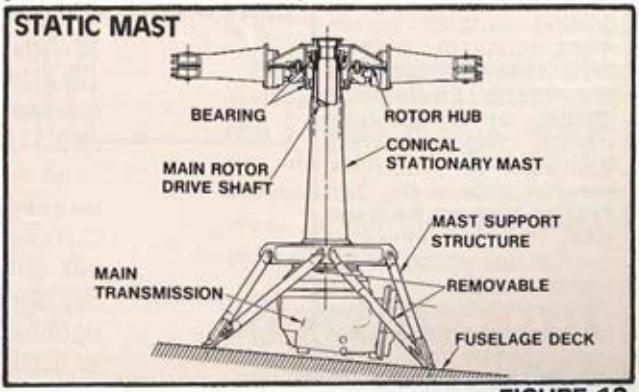
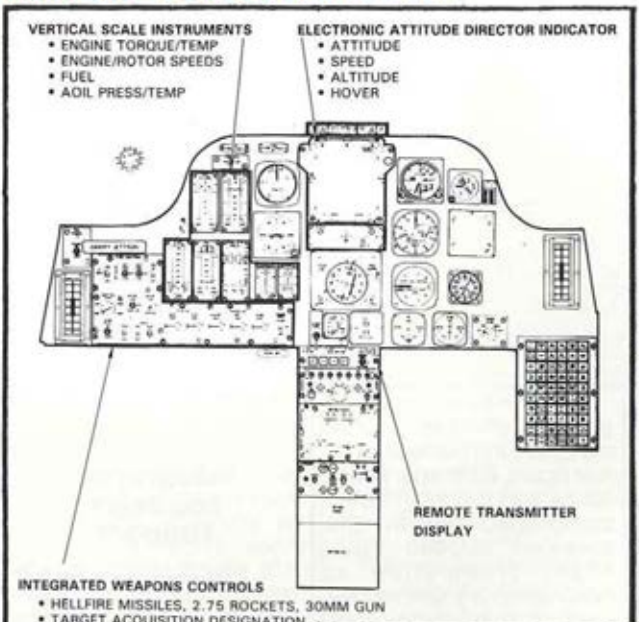


FIGURE 12

FIGURE 13—PILOT'S DISPLAY PANEL



hours performing 988 maintenance tasks. The entire APACHE weapons system, external stores, kits, peculiar and common ground support equipment, equipment publications, **Test Measurement Diagnostic Equipment (TMDE),** and appropriate trained personnel were evaluated to determine the adequacy of the OT II **System Support Package (SSP).** The results indicated the SSP was adequate for test support.

Maintenance training courses listed below were conducted by the contractor in support of the **Physical Teardown-Logistics Demonstration (PT-LD)** and OT II player training. (See **Course Titles** in box on next page.)

Training of the aviators participating in the full scale engineering development phase of the APACHE program was considered to be a crucial issue.

Insuring the crews' ability to adapt to the radically new APACHE aircraft/systems in various weapons configurations and day-night/ bad weather operational environments was highest priority. To prudently address the unique equipment without impeding the basic development of the APACHE, a separate AAH **Development Test Training Detachment (DTTD)** was formed to conduct preliminary flight

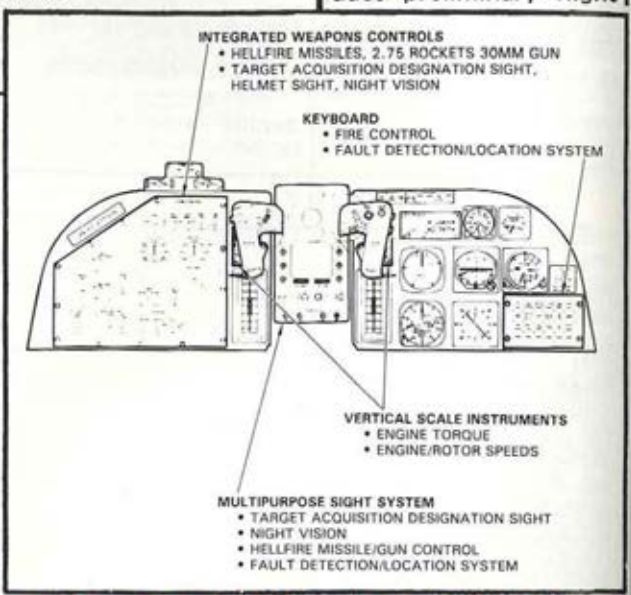


FIGURE 14—CO-PILOT/GUNNER'S DISPLAY PANEL

Advanced performers like this..

require high performance instruments.

When Hughes specified instruments for their YAH-64 program they wanted the best. Thats why they chose Rosemount to supply the ICE DETECTION SYSTEM and AIRSPEED TRANSDUCER. Rosemount products have been demonstrating their reliability on tough jobs like this for over 25 years, and Rosemount has the resources, the facilities and the people to back these products now, for the next generation of high performance aircraft, and beyond.

If you're involved in specifying air data instrumentation, we'd like a chance to show what we can do for you. Contact the Rosemount sales office in your area, or call Jerry Witowski at (612) 435-4000.

Rosemount
AEROSPACE DIVISION

ROSEMOUNT INC. 14300 JUDICIAL ROAD BURNSVILLE, MINNESOTA 55337

AH-64 DEPLOYABILITY

687 GAL. AUX FUEL (4 TANKS)
FERRY MISSION CAPABILITY:
NORTH ATLANTIC ROUTE
800 NM (20 KT HEADWIND,
45 MINUTE RESERVE)

AIR TRANSPORTABILITY

C-141B — TWO EACH

C-5A — SIX EACH

AAH COURSE TITLES

AAH COURSE TITLE	Applicable MOS	Hours Per Course	Number Trained PT-LD	Number Trained OT II
Autom Test Equip Sta Operator..	35C20	160	0	9
Printed Circuit Board Repairer...	35C	80	0	4
Avionic Mechanic.....	35K	80	4	4
AAH Helicopter Repairer.....	67R*	200	22	16
Powerplant Repairer.....	68B	72	7	6
Powertrain Repairer.....	68D	104	5	6
Aircraft Electrician.....	68F	112	6	4
Aircraft Pneudraulics Repairer...	68H	96	3	5
Aircraft Weapons Repairer.....	68M	104	9	8
Aircraft Fire Control Repairer....	68J	160	9	10

*Projected

Building the Best to fly with the Best. . .

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TELEDYNE SYSTEMS COMPANY 19601 Nordhoff Street Northridge, California 91324

training with AH-64 surrogate trainer aircraft (AH-1 helicopters modified to accept the Pilot Night Vision System, Airborne Target Acquisition System, and Integrated Helmet and Display Sight System).

Each trainee received approximately 25 hours of flight time in these aircraft prior to actual AAH training. In addition, each pilot and co-pilot/gunner received 15 hours in an **Aircrew Part Task Trainer (ACPTT)** which is a fixed, computer-assisted training device designed to teach switchology, starting and stopping, and the various emergency procedures.

All FSED and OT II player aviators were trained by the AAH DTTD prior to receiving contractor training.

Engineering design tests were conducted by Army Aviators on the airworthiness, TADS/PNVS competition flyoff, and flight characteristics of the AAH. All tests were completed prior to OT II player personnel training.

Operational Test (OT) II pilot, co-pilot/gunner training was successfully conducted at the contractor flight facility. A total of 12 pilots, co-pilot/gunners each received approximately 96 hours of ground school and 25 hours actual flight time during the training period. These flight hours were in addition to the DTTD provided training.

Prototype Qualification Test — Systems Evaluation (PQT-SE) and **Airworthiness Flight Characteristics (A&FC)** training was provided to qualified Army Aviators prior to OT II completion.

Training Devices

During the **Full Scale Engineering Development (FSED) phase,** 15 prototype trainers were developed; 13 were for support of maintenance training and two were for support of pilot/gunner training.

These included:

Pilot Training Devices

*Aircrew Part Task Trainer
Pilot Night Vision System Trainer.

Aircraft Maintenance Type Devices.

Composite.
Flight Control Powertrain.
Engine/APU.
Armament Fire Control.
Integrated Avionics.

Panel Devices

**Consoles, Mainframe.
Fuel System.
Electrical System.
Mission Equipment.
Hydraulic.
Integrated Pressurized Air System.
Automatic Stabilization Equipment.
Fault Detection/Location System.
De-Ice System.

*Nomenclature changed to **Cockpit Weapons Emergency Procedure Trainer (CWEPT).**

**Provides Floppy disc computer capability for other system panels.

Some 42 draft equipment publications in the new **Skill Performance Aids (SPAS)** format were distributed for use during PT-LD and OT II. Initial reaction is that the SPAS format was well received.

The **Authorized Stockage List (ASL)** and **Prescribed Load List (PLL)** furnished for support of OT II were delivered to the OT II test site 100% complete in both range and depth of spares and repair parts.

The performance of the Automatic Test Equipment and **Test Program Sets (TPSs),** furnished for support of OT II, has been outstanding.

In summary, the APACHE logistics program is looking good. OT II has demonstrated that it will truly be supportable when fielded.

OT II

We recently completed the operational test (OT II) on the APACHE. The three aircraft flew in excess of 400 hours to test the total system. OT II was truly a field test. For the first time the front line aviator and mechanic took the AH-64 and put it through a normal attack unit mission scenario.

While OT II results are not yet available, I am confident that the APACHE can indeed live in the forward battle area and do all that we in the Army expect it to.

Management

The APACHE is one of the Army's highest priority programs and is the **Number One** aviation priority. The APACHE Attack Helicopter Program Manager (AAH PM) is

A Call to Arms for the AH-64A

IMC is proud of its contribution as a supplier to the Army Aircraft Industry.

Bugler
Veteran Corps of Artillery, SNY
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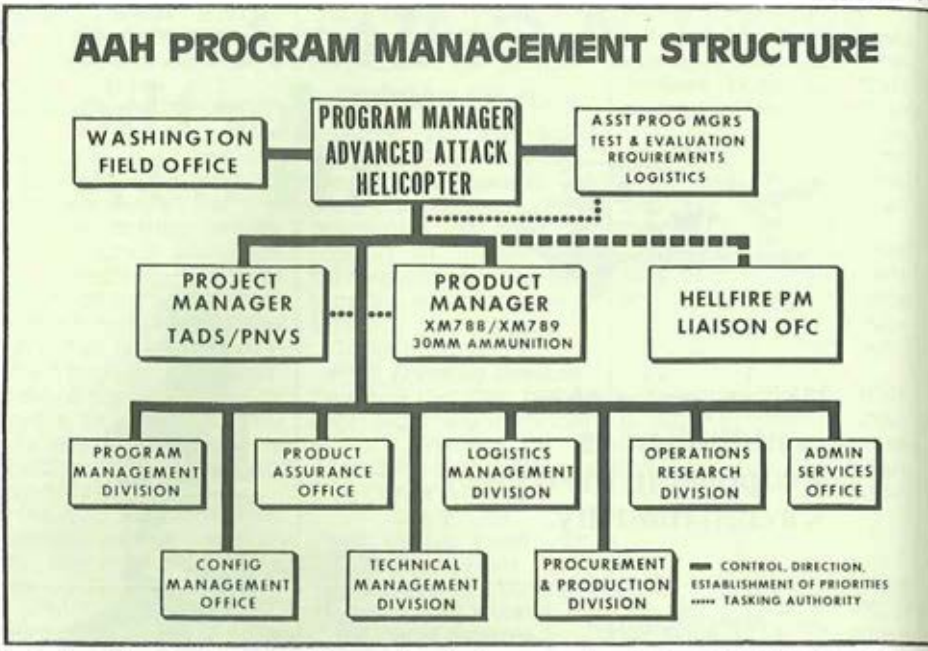
New Hampshire Division—Route 16B, Rochester, New Hampshire 03867
Western Division—12627 Hiddencreek Way, Cerritos, California 90701
Hansen Manufacturing Company, Inc.—McKaw Summit, Princeton, Indiana 47670
A.K. Fans Limited—32/34 Park Royal Road, London, NW10 7LN England



chartered by the Secretary of the Army and reports to the CG, USADARCOM.

The Program Manager is delegated full line authority for the management and the technical direction of the program, and is responsible and accountable for total program planning and directions, and controlling the allocation and use of all resources authorized for the execution of the program.

The AAH Program Office is structured under the multi-level project concept. The project managers of the TADS/PNVS and 30mm ammunition developments report to the AAH PM and use certain elements of the PMO staff to assist their respective project offices in their project efforts (See **Figure 18**).

The faces that go with the names and titles are shown on the AAH PM Management Team photochart appearing in the centerfold of this issue. Since the AAH development program is a joint effort of both the Army and industry, an organization chart of the prime contractor, Hughes Helicopters, Inc., follows immediately after the AAH PM photochart.

The APACHE Development Team, 19 major contractors in the aerospace industry led by Hughes Helicopters, Inc., has done a superb job in translating the Army's AAH requirements into a most outstanding weapons systems.

Program Manager's Comment

The **Target Acquisition Designation Sight/Pilot Night Vision Sensor (TADS/PNVS)** with the fire control comprise the heart of the APACHE. This equipment enables the AH-64A to find, fix, and destroy targets in both day and night, and in adverse weather.

In the next article, **Colonel "Don" Wray,** the Project Manager for the TADS/PNVS, discusses the system, its capabilities, and the status of the program.

DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA. 22333

Helicopter operations and field tests have confirmed the immediate availability and essential fire support attack helicopters provide the ground commander. The Cobra, presently undergoing modernization, has done a fine job, but it does have limitations. The Advanced Attack Helicopter (Apache) was developed and will be produced to offset the limitations and increase the Army's airborne weapons platform capability to rapidly mass anti-armor firepower at decisive points in the forward battle area.

The Apache helicopter has been designated the Army's Number 1 Aviation Program. The tough task of producing and supporting the Apache, with the resources that have been programed will require the combined efforts of Hughes Helicopters, their team of subcontractors and associate firms and seven Army program/project managers all under the direction of the AAH PM. The other Army Project Managers assisting him are: HELLFIRE/Ground Laser Locator Designations (HELLFIRE/GLLD), Target Acquisition Designation Sight/Pilot Night Vision Sensor (TADS/PNVS), Training Devices (TRADE), Aircraft Survivability Equipment (ASE), Navigation Control Systems (NAVCON) and 30mm Ammunition.

Let me assure you of my personal support for the Apache attack helicopter, and emphasize that all elements of DARCOM are in full support of the Program Manager as he prepares to produce and support this much needed Total System for Battle . . . the APACHE.

Donald R. Keith

DONALD R. KEITH
General, United States Army
Commanding

TADS/PNVS: The eyes of the Apache's Weapons System!

By Colonel Donald R. Wray, PM—TADS/PNVS, and Mr. John A. Steele, Office of the Project Manager

THE AH-64, a new generation of U.S. Army airborne attack vehicle, is designed to fly night or day, in good or adverse weather, and at altitude or below the tree line to deliver its ordnance effectively on enemy targets.

The **Target Acquisition Designation Sight/Pilot Night Vision Sensor (TADS/PNVS)** System, the "eyes" of the AH-64 helicopter, is the primary system used to accomplish this task. The TADS/PNVS incorporates state-of-the-art advancements which provide Army aviators with an adverse weather, day or night, fighting machine.

The AH-64 equipped with the TADS/PNVS completed **Operational Test II (OT II)** in August 1981, in preparation for a DSARC III and a full production decision in December 1981.

What specifically is the TADS/PNVS? How does it fit into the overall AAH Program? Read on and you will gain an appreciation for the "eyes" of the AH-64 weapons system.

COL WRAY

MR. STEELE

TADS

The TADS located in the lower turret assembly of the TADS/PNVS system (**Figure 1**) is used primarily for target search, detection, and designation. It is divided into two subassemblies: the **Day Sensor** and **Night Sensor.** All sensors are boresighted to a common line of sight.

The **Day Sensor** includes:

- **Direct View Optics (DVO):** Provides monocular viewing of the target area with a narrow or a wide field-of-view option.
- **Day Television (DTV):** Provides increased viewing capability during periods of restricted visibility, i.e., haze, fog, etc., with a narrow or a wide field-of-view as well as higher magnification for improved target detection/recognition at increased stand-off ranges.
- **Laser Spot Tracker:** Provides for the detection and tracking of targets being identified by a remote laser source.
- **Laser Rangefinder/Designator (LRF/D):** Provides for the ranging and designating of targets for delivery of onboard ordnance or remotely fired laser guided ordnance.

The **Night Sensor** includes a **Forward Looking Infrared (FLIR)** Sensor which provides for day or night recognition of tactical targets during good or adverse weather by resolving infrared (thermal) radiations into imagery imagery of all objects in the battlefield area.

The **co-pilot/gunner (CPG)**

has three **fields-of-view (FOV)** available to him in the Night Side Sensor; a narrow FOV, a medium FOV, and a wide FOV. Once the target is acquired by the Night Side FLIR and a closer look is desired, the CPG can go to narrow FOV and underscan the scene (zoom) by putting him visually within "hailing" distance of his intended target.

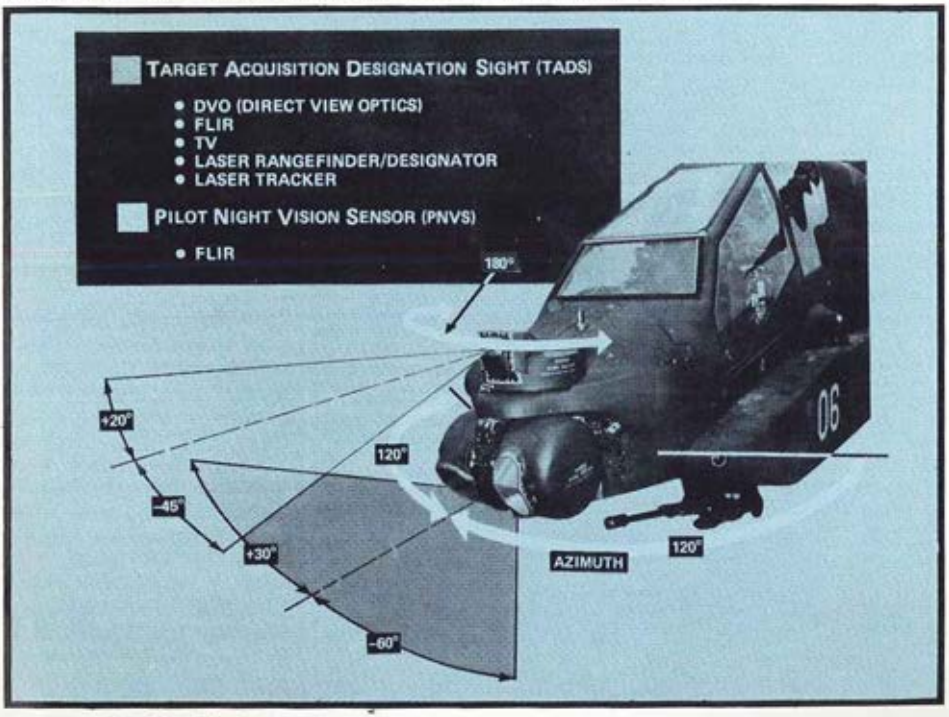
With a flip of a switch, the front seat aviator can command any of the above options on either a heads-down or heads-up display. Once the target is acquired and designated, automatic tracking of the target by the system allows ordnance to be delivered on both stationary and moving threats with pinpoint accuracy.

PNVS

The **Pilot Night Vision Sensor (PNVS)** located in the upper turret assembly of the TADS/PNVS (**Figure 1**) has the primary function of providing the pilot with adverse weather, day or night, flying capability to and from the designated engagement areas.

The PNVS consists of a gimballed (in both azimuth and elevation) FLIR sensor which responds to the position of the pilot's head as a result of infrared-optical coupling. With a high slew rate with no over or under shoot, and a high field of regard, the PNVS literally becomes the "eyes" of the AH-64.

As an added dimension, the FLIR imagery is displayed to the pilot along with all the necessary critical flight parameters for each of four separate flight modes — cruise, transition, hover, and bob-up. The vehicle for this display is through **Cathode Ray Tube (CRT)** to a single monocle in front of the pilot's eye. The CRT and monocle comprise the major portion of the **Integrated Helmet and Display Sight System (IHADSS).**



Operation of the PNVS has been demonstrated in all types of weather from fog to snow and from cold weather to hot during both day and night flying. The PNVS has shown through extensive test and flight operations to be a highly reliable system by which the AH-64 pilot can perform his designated function.

New: ANVIS

To further evaluate PNVS capability prior to AH-64 availability, the PM AAH and the Director, **Night Vision and Electro-Optics Laboratory (NV&EOL),** are supporting a joint flight evaluation of the PNVS and the third generation night vision goggles, i.e., **Aviator Night Vision Imaging System (ANVIS).**

The evaluation is designed to show individual system capabilities and limitations and inter-system compatibility during periods of darkness and adverse weather in a typically European environment when the probability of that adverse weather is the greatest.

Consequently, the evaluation will be conducted this winter. Each night vision system will be subjected to similar weather conditions during such flight profiles as nap-of-the-earth, precision hover, bob-up and remask, take-off and landing, and point-to-point navigation.

System performance will be evaluated to illustrate the capabilities of each night vision device particularly in adverse weather conditions. It is anticipated the data gathered from this evaluation will extend the known PNVS safe operating requirement limitations, to allow visual flight limitations in IMC conditions, a quantum jump in night/adverse weather operations.

ATE

To facilitate maintenance and trouble shooting of the AH-64 aircraft system, **Automatic Test Equipment (ATE)** stations are being developed. In order for the TADS/PNVS system to utilize those ATE stations, peculiar TADS/PNVS subsystem Test Program Sets are being developed consisting predominately of test programs loaded on magnetic tapes, back-up test requirements documents and particular interface equipment.

The TADS/PNVS related aircraft components will require a total of 92 Test Program Sets which will automatically test not only the electronics components, but also the electro-optical components (TV Sensor, Laser, Tracker) with the same speed and accuracy. TADS/PNVS Test Program Sets demonstrated during OT II that automatic testing of the TADS/PNVS components can be accomplished quickly and accurately based on calibrated baselines.

Testing of electro-optical devices, in particular, previously a time consuming and subjective task with marginal accuracy, has become a quick, quantitative effort with a high degree of accuracy. Thus, the use of the ATE for the AH-64 as a whole and the TADS/PNVS, in particular, will substantially reduce equipment test times and related maintenance efforts — a significant contributor to increased aircraft availability.

Program Status

After months of training on both the TADS/PNVS and the YAH-64, U.S. Army personnel from Fort Ord, CA, and the AAH Development Test Training Detachment at Yuma, AZ, conducted a successful AH-64 **Operational Test II (OT II)** at Hunter-Liggett Military Reservation, CA. The OT II exercise, which terminated on 31 August 1981, will set the stage for an ASARC/DSARC in December 1981, and a full production go ahead anticipated shortly thereafter.

In February 1981, a contract was awarded to Martin Marietta Corporation for $21 million to start the procurement cycle on Long Lead Time items required to meet the TADS/PNVS established delivery schedule. The final **Production Readiness Review (PRR)** was held at Martin Marietta Corporation, 3-7 August 1981, by the Government to assess Martin Marietta's production position.

The PRR team determined Martin Marietta Corporation was ready for full production and assessed them as "low risk" in terms of production readiness. With the delivery of the first TADS/PNVS equipped AH-64, now scheduled for November 1983, the U.S. Army will be receiving a proven, tested system.

TADS/PNVS represents the key to performing the AAH mission. The firepower available in all types of weather, day or night, will provide airborne capability never experienced in Army rotary wing aviation. Proven, tested and dependable, the TADS/PNVS is being demonstrated today as the "eyes" of the AH-64 weapons system.

Program Manager's Comment

Up to this point, we've provided an update of the APACHE, its technical status, and the current program with its Army and Hughes management teams. Training to use the complex equipment has been a tough task.

In order to train without interrupting the APACHE development program, surrogate equipment and the **Development Test Training Detachment (DTTD)** were established.

One of the Instructor/Admin Officers for the DTTD, **CWO "Chuck" Tidey,** covers the unit's accomplishments, challenges, and the future mission of this one-of-a-kind unit.

USN—USMC interest in the AAH was shown when the PM APACHE landed recently aboard the U.S. Navy "Peleliu"

DTTD. Mission Complete!

By CW4 Charles M. Tidey,
DTTD ATAFCS IP/Administrative Officer

As mentioned in previous **Army Aviation Magazine** articles (November 1979 and October 1980), the **Development Test Training Detachment (DTTD)** was activated on 1 February 1979 to train selected personnel in the use of the Advanced Attack Helicopter's highly sophisticated **Pilot Night Vision Sensor (PNVS), Target Acquisition Designator Sight (TADS),** and HELLFIRE Modular Missile System.

That challenge has been met, and by the time this article is printed, our mission will have been completed.

34 months of activity

On 31 December 1981, 34 months after it was activated with four commissioned officer aviators, 12 warrant officer aviators, 40 enlisted personnel and eight aircraft (two UH-1H, two AH-1S (EACS), two JAH-1S (ECAS) PNVS equipped, and one JAH-1R and one JAH-1G each **Airborne Target Acquisition Fire Control System (ATAFCS)** and HELLFIRE modular missile system equipped), the DTTD will be deactivated.

Complete **Programs of Instruction (POI's)** were researched, written, and presented for the PNVS qualification, familiarization, and orientation courses, the ATAFCS course, and the HELLFIRE Modular Missile System course. A total of 26 aviators were qualified in the PNVS system while an additional 26 received familiarization courses that varied in length from bare minimum of four flights to just short of a full qualification.

In addition to this, 32 aviators received ATAFCS and HELLFIRE Missile System qualifications in preparation for either the HELLFIRE Operational Test II, conducted during the summer of 1980, or for their participation in the Advanced Attack Helicopter's Operational Test II conducted in June—August 1981. Also in preparation for the OT's in excess of 20 Army Aviators received both Night Hawk and Night Vision Goggle Qualifications.

Extensive briefings

During the past two+ years, a total of 156 TADS/PNVS briefings were given throughout the world and 82 demonstration flights were presented to numerous personnel.

A recapitulation of those receiving briefing and demonstration flights would include the Under Secretary of Defense (R&D); the Minister of Defense for the Federal Republic of Germany; several four-star Generals, including the Army Vice Chief of Staff; numerous other General officers, including five foreign general officers; and Members of Congress and Congressional staffers.

In addition to the foregoing, many other dignitaries have re-

ceived only the TADS/PNVS briefing.

In May and June 1981, an aviator from both the Federal Republic of Germany and Italy underwent a 17.5 flight hour PNVS familiarization course at our training base while an English aviator received an orientation course. To underscore the Federal Republic of Germany's interest in this aircraft and its systems, it is interesting to note that three German aviators, including the one who had received PNVS training, observed the AAH during its Operational Test.

Additional free world attention and interest for possible procurement was exhibited by three French aviators who received a briefing and demonstration in the PNVS during September of 1981.

Zero accident rate

Another significant achievement of this unit has been that throughout all of our training courses we have maintained a "ZERO" accident rate.

This is particularly noteworthy because our training is conducted in the NOE environment and of the approximately 7,00C hours of flight time logged by our cadre of instructors over the past 34 months, almost 2,000 hours — or nearly 30% of it — has been in the night NOE environment.

As of this writing, **MG Edward M. Browne,** AAH Program Manager, is preparing to send the Martin Marietta equipped PNVS Surrogate aircraft and four of our PNVS, Night Vision Goggle, Night Hawk instructor pilots to Europe along with two Night Vision Laboratory pilots for an in-flight demonstration of the PNVS and **Aviator Night Vision Imaging System (ANVIS),** a follow on to the AN/PVS-5's, in the environment in which they will ultimately be "proven."

Cost effective way

Looking back over the last 34 months, all of us in the DTTD are in agreement that the establishment of a detachment such as ours, where a multitude of the "known" expertise in a given area (in our case it was the night NOE flight environment using two dimensional displays) is assembled and then surrogate trainers are used to train unqualified personnel, has proven to be a most cost effective way to introduce new, highly sophisticated systems such as those found on the APACHE into the Army.

Future involvement

The fact that the DTTD's mission is now completed does not, however, signal the end of our involvement with the Advanced Attack Helicopter program. All of the personnel of this detachment who have acquired AAH peculiar skills will be identified in their official records with a **Project Development Identification (PDI)** Code that will enable easy identification of these trained personnel at a later time in the AAH's procurement schedule.

In addition to this, three of our warrant officer aviators are going to Fort Rucker in early 1982 to begin the arduous task of putting together the YAH-64 transition course.

They will be followed a year or so later by three more who will be return-

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What do these uncommon space and defense systems have in common?

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AAH PROGRAM MANAGER
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COLONEL DONALD P. WRAY
PROJ MANAGER TADS/PNVS
1992

MR. WILLIAM H. BRABSON, JR.
DEP PROGRAM MANAGER
1911

MR. ROBERT D. HUBBARD
CHIEF, TECH MGT DIVISION
1961

MR. ROBERT L. JACKSON
CHIEF, LOG MGT DIVISION
1946

MR. FREDERICK D. MURPHY
CHIEF, PROG MGT DIVISION
1925

DR. FRANCIS E. SPRING
CHIEF, OPNS RES DIVISION
1931

MR. RONALD E. BOEHME
CHIEF, PROC & PROD DIVISION
1937

LT. COLONEL JOHN MARCY
ASST PROGRAM MANAGER (LOGISTICS)
1921

ANAGEMENT

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LT. COLONEL DAVID LOGAN
PROJ MANAGER 30 MM AMMO
AV 880-3612

MR. ALBERT J. LAUBER
CHIEF, PRODUCT ASSUR OFFICE
1952

LT. COLONEL GALEN ROSHER
ASST PROGRAM MANAGER (REQUIREMENTS)
1921

MR. JAMES N. HEMMER
CHIEF, CONFIG MGT OFFICE
1941

LT. COLONEL CARL PROPP
CHIEF, WASHINGTON, D.C. FIELD OFFICE
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MAJOR LYLE D. MONSON
ASST TO PM FOR ANALYSIS, RESEARCH, & MGT
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Hughes Helicopters

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TRADOC SYSTEM MANAGER (TSM) ATTACK HELICOPTER

COLONEL DAVID L. FUNK, TRADOC SYSTEM MGR

MAJOR(P) WILLIAM P. LEACH, TRAINING

MAJOR JIM ROOP, LOGISTICS

MAJOR MICHAEL L. BRITTINGHAM, TEST AND EVALUATION

MAJOR KENNETH LANDON, ASSISTANT TSM —COBRA

DEVELOPMENT TEST TRAINING DETACHMENT

MAJOR GARY M. BASS, COMMANDER, DTTD

CW3 GARY W. DOMBROSKI, MAINTENANCE OFFICER

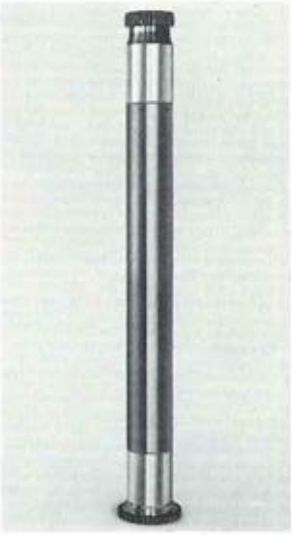
MAJOR ALLAN G. JOHNSTON, XO AND OPNSO

MASTER SERGEANT ANTHONY JOSEFOWICZ. 1SG — DTTD

SERGEANT FIRST CLASS JOE E. GASSETT, MAINT NCOIC

Aircraft Gear Corp. Performs
For Hughes Helicopters YAH-64 Team

Aircraft Gear Corporation produces the intermediate and tail rotor gearboxes for the Hughes YAH-64. A unique feature of the gearboxes is that they employ only grease lubrication for high reliability and low maintenance. These grease gearboxes represent the first time this technology has been successfully demonstrated in the helicopter industry. Complete load-run testing is accomplished on test facilities established at Aircraft Gear Corporation.



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ing from short tours in Korea and three months prior to Fort Rucker receiving their YAH-64 training aircraft three more of our warrant officers will be brought back from their upcoming assignments in Germany. Of the three remaining warrant officers, two will be assigned to DARCOM and one to the Aviation Maintenance Test Pilot School, Fort Eustis.

Before closing, each of us in the Development Test Training Detachment would like to thank **MG Edward Browne,** AAA Program Manager, and **COL George Christensen (Ret.),** Assistant PM AAH for Test and Evaluation at the time the DTTD was conceived and the out going Project Manager, U.S. Army Drone program, for giving us a chance to accept the challenges that the YAH-64's systems presented and for allowing us to be in the forefront of the development and testing of the Army's APACHE.

The key players

Following is a list of some of the detachment's supervisory personnel, so that if you in Army Aviation should happen to meet one of them, you can ask them for a first hand account of the AAH, its subsystems and capabilities.

MAJ Garry Bass, Cdr, asgmt pending; MAJ(P) Bill Leach, former Cdr, TSM—Attack, Ft. Rucker; MAJ Allan Johnson, XO/DPM, Germany.

CW4 Joe Koch, SIP/YAH-64 Qual, Ft Rucker; CW4 Larry Proper, IP/YAH-64 Qual, DARCOM; CW4 Mike Talton, IP/IFE, Germany; CW4 Chuck Tidey, IP, Korea.

CW3(P) Stu Park, SIP, Ft Rucker; CW3(P) Ken Shriver, IP/SafO, Germany; CW3 Jack Berry, IP, ERAU/Ft Rucker/Korea; CW3 Gary Dumbroski, IP, MaintO, Ft Eustis; CW3 Randy Dyer, IP/YAH-64 Qual, DARCOM; CW3 D. Ray Hixson, IP, ERAU/Fort Rucker/Korea; CW3 Al Sellers, IP, Ft Rucker; CW3 Bill Yarlett, IP/YAH-64 Qual, Germany.

MSG Tony Josefowic 1SG, Asgt pending; SFC Jo Gassett, Maint NCOIC, Ge many; SFC Aubry Barrin ton, Armament; SSG(Dave Blazek, Supply, Berli SSG Roger Clark, IT/Opr Korea; SSG Gene Munge Tech Supply, Recruiter d ty, site pending; SSG Sonr Englert, PNVS Flt Lir NCOIC, asgmt pending; SS Larry Trout, Qual YAH-(Maint, asgmt pending; SS I.G. Gaines, PNVS Surroga CE, Germany; SGT Ben Bra Qual YAH-64 Maint, asgr pending.

HELLFIRE Country
Where tanks fear to tread.

By COL Stanley D. Cass, PM-HELLFIRE/GLD, and LTC Eddie R. Sims, Assistant PM—Laser

THE **HELLFIRE Modular Missile System (HMMS)** is the primary armament for the AH-64 Advanced Attack Helicopter. The HMMS is under development by the **U.S. Army Missile Command (MICOM)** at Redstone Arsenal, Alabama.

Activity in HELLFIRE Country during this past year has pointed toward refinement of the system to increase its performance characteristics, and to prove by testing that the HELLFIRE Modular Missile System meets every aspect of the user's requirements.

Operational Tests

HELLFIRE has just successfully completed its second exposure to operational troops in the AAH OT II tests conducted by OTEA. The test which began on 1 June 1981 with exploratory testing, concluded during the last two weeks of August with twelve live firings of the HELLFIRE from the AH-64.

Non-live firing portions of the test included force-on-force trails pitting the AH-64 with HELLFIRE against an armored force complete with simulated air defense threats. In both day and night engagements, the laser weapon system proved its effectiveness against the "enemy.

The live firings wwre conducted under a variety of visibility conditions (day, night, smoke, and dust) and exercised many of the launch modes of this potent anti-armor system. HELLFIRE missiles were launched against remotely controlled target vehicles in a realistic test of the total system, including ground and remote airborne designation systems.

Preliminary scoring for accuracy shows that HELLFIRE scored ten-for-ten. Two of the missiles were declared to be "no tests."

COL CASS

LTC SIMS

The Army aircrews who fired HELLFIRE missiles and designated for them were not the only ones who had first-hand experience with HELLFIRE. Maintenance personnel, operating at both AVUM and AVIM levels, found HELLFIRE easy to maintain and very reliable. The system support packages tested during both of these operational tests were found to be satisfactory.

The HELLFIRE OT from surrogate **COBRA** aircraft was conducted during the Summer of 1980. The results of that test were equally outstanding in every respect. These opera-

tional tests demonstrated the capability of the total system to detect, engage, and kill stationary and moving hard point targets while operating in the autonomous and remote designation modes.

The Army is not the only member of the U.S. Armed Forces which intends to field the HELLFIRE Missile System. The U.S. Marine Corps has plans to put HELLFIRE on its SEA COBRA's. In late May 1981, four HELLFIRE Missiles were launched by Marine Corps personnel from a COBRA during the MULE OT tests. Fired in both the direct and indirect launch modes, all four missiles scored direct hits on moving tactical targets designated by a Marine Corps operator.

Qualification Testing

In addition to the operational testing, extensive environmental testing of the HELLFIRE system has been accomplished. These tests have demonstrated the system's ability to withstand the various transportation and storage environments expected to be encountered by a fielded weapon system.

Tests were concluded by firing missiles at ambient temperature to 145° and -45°F. Preparations are in progress for production testing. In addition to acceptance tests, these will include surveillance, source qualification, and flight confidence tests.

Engineering Development Testing

The effectiveness of electro-optical weapon systems under various battlefield conditions such as dust, smoke, and fog is an area of concern. Because of this, MICOM has developed a digital simulation to characterize total system performance where all significant elements of the integrated weapon system performance where all significant elements of the integrated weapon system and its environment are represented with physically correct models which have been validated by direct experimental methods.

The **Battlefield Environment Laser Designator Weapon System Simulator (BELDWSS)** is being used to evaluate various U.S. Army electro-optical systems. As a part of an extensive validation effort for this model, eight live firings of the HELLFIRE missile were conducted during the Spring of 1981. These eight missile firings accomplished the objective of providing engineering development data which was their original intended purpose.

The PMO took the opportunity to aid in the model validation effort as previously mentioned. The eight HELLFIRE missiles were tower launched under battlefield obscuration conditions. In addition to various kinds smoke, the engageme scenarious included bo rain and fog, and dem strated Laser HELLFIR capability to operate marginal environmen conditions whether na rally generated or m made.

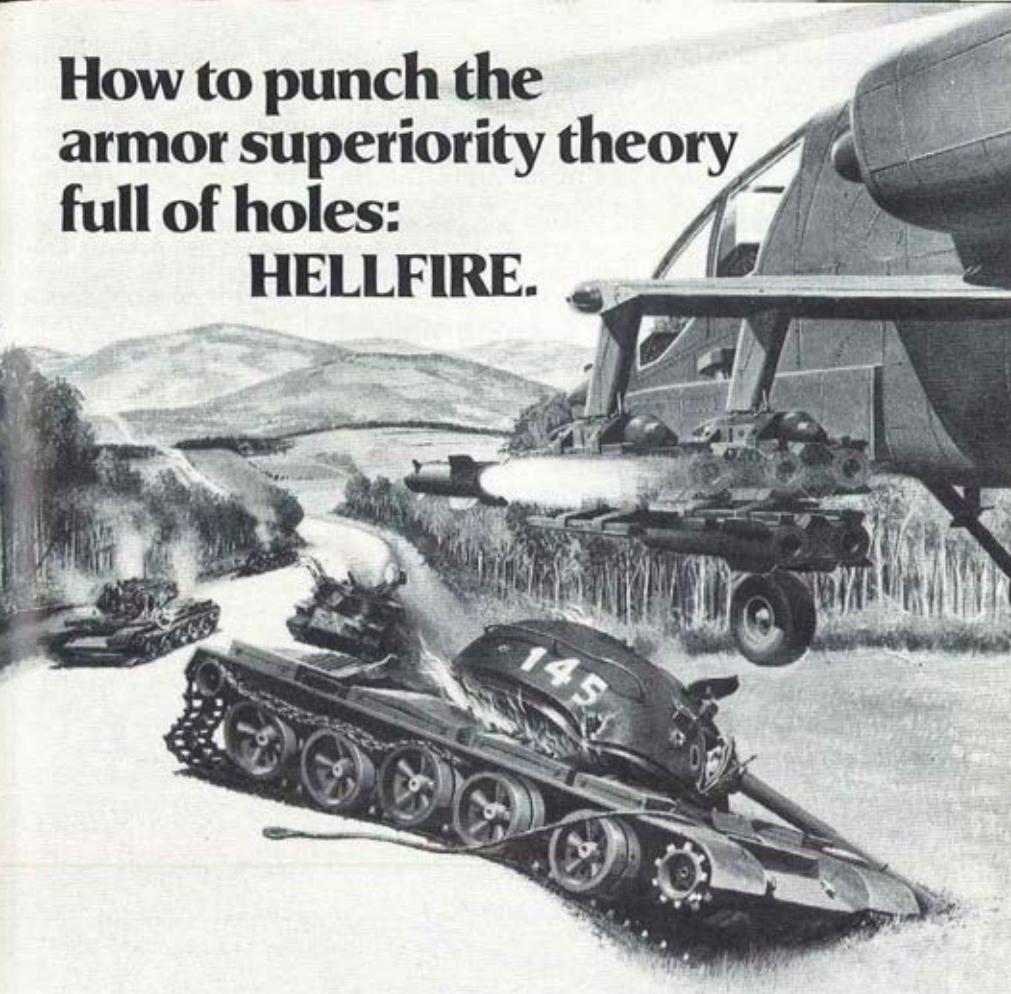
These firings served validate a "rule of thum regarding the launch HELLFIRE missiles unc certain adverse con tions. The value of t "rule of thumb" was sub quently shown duri the AAH/HELLFIRE OT.

Production

Operational Testing which the user opera and evaluates all aspects a new weapon system, a Qualification Testi where the developer c tifies the system are t final critical mileston prior to production. sults of both the HELLF Operational Test co ducted last year and t AH-64 Operational Test dicate that the HMMS ready for production. cordingly, the HELLFI PMO is deeply involved the preparation for t ASARC/DSARC Milestone review where the full p duction decision will made.

Preparations for the reviews are running co currently with activity insure that production c start in early 1982. Co tracts have been nego ated and signed for the quisition of long le times and for initial p

How to punch the armor superiority theory full of holes: HELLFIRE.



HELLFIRE is the armor-penetrating weapon system that's rated AAA — accurate, adaptable and affordable.

- Accuracy. Direct-hit capability has been demonstrated through test-proven performance. Lethality is high.
- Adaptable. Modular design accommodates present and future guidance systems. Airborne or ground launched. Direct and indirect firing modes.
- Affordable. Crew and aircraft survivability, launch and leave and multiple target engagement capabilities add up to true cost-effectiveness.

HELLFIRE was developed by the U.S. Army Missile Command at Redstone Arsenal, Alabama, and the Missile Systems Division of Rockwell International. Missile Systems Division, Defense Electronics Operations, 4300 East Fifth Avenue, Columbus, Ohio 43216.

Rockwell International

...where science gets down to business

duction facilitation. The prime contractor, Rockwell International Corporation, has submitted a production proposal to the Army for evaluation, and negotiations on this contract are in progress.

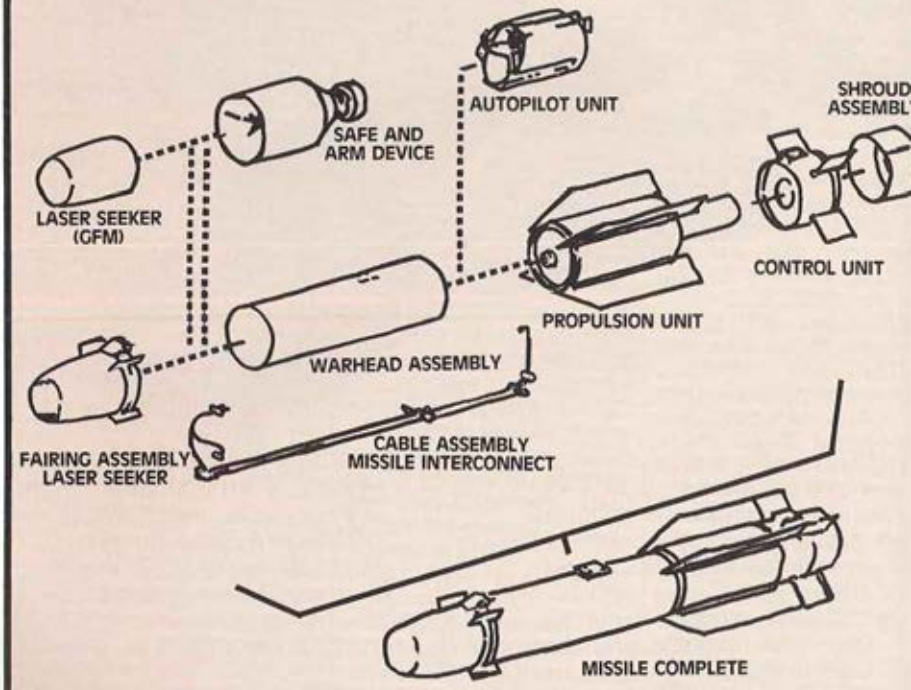
In the production plan the Army contracts with Martin Marietta Corporation for the missile seeker and then provides it to Rockwell International as Government Furnished Equipment Guidance and control units and the launcher will be assembled by Rockwell. Mating of the seeker, warhead, and missile bus will be accomplished by the Army. The efficiency of this arrangement is further enhanced by the fact that First Article Tests will conclude with product validation testing.

Decision Time

In the early 1970's, a threat was postulated for the 1980-1995 timeframe. That threat generated th Army's stated need for tank killing system wi HELLFIRE's capabilitie That threat is today's rea ty. It certainly has n diminished; it increase with each day that passe

HELLFIRE has demo strated the capability meet the need. Now is t time for the Departme of Defense to turn eve place where Army Aviati is deployed into HELLFI Country.

HELLFIRE MODULAR MISSILE



The AH-64A Apache Production Facility at Mesa, Arizona

A 581,200 square foot manufacturing facility on 200 acres will open July, 1983

HUGHES Helicopters, Inc., has completed the 56-month contract which was awarded to the company in December 1976 by the Army for development of an Advanced Attack Helicopter after the Hughes entry was declared the winner in an AAH flyoff against Bell Helicopter's YAH-63.

A decision by the Army and Department of Defense on production startup of the AH-64A APACHE is scheduled for December 1981 The Army has a requirement for 536 AH-64As.

November 1982 delivery

Current planning by Hughes and the Army calls for production of AH-64s through 1989, with a peak of eight ships produced per month. The AH-64s will serve in the Army Aviation inventory beyond the year 2000. The first production model of the AH-64A is scheduled to be delivered to the Army in November 1983.

The primary mission of the AH-64A is destroying tanks. The twin-engine helicopter's main weapon is the Rockwell International-developed laser-guided HELLFIRE anti-tank missiles, which gives the AH-64A the capability of standing off outside the range of enemy anti-aircraft weapons while firing its missiles. The AH-64A will be able to carry up to 16 HELLFIRE missiles.

In addition to the HELLFIRE, the AH-64A can carry up to 76 2.75 inch air-to-ground rockets. The two-man crew of the AH-64A will also have a Hughes-developed 30mm Chaingun® automatic cannon mounted under the fuselage of the helicopter in a turret for defense against enemy troops and lightly armored vehicles.

A special sighting system, designated the **Target Acquisition and Designation Sight/Pilot's Night Vision Sensor (TADS/PNVS),** which was developed by Martin Marietta, enables the AH-64's crew to operate in day, night or in adverse weather, and fire all of their weapons.

During the development program AH-64A prototypes — designated YAH-64s — have logged more than 3,000 flight test hours.

A major concern

For several years Hughes has been conducting studies to produce the AH-64A at the rate of eight ship sets per month. Of major concern has been the providing of adequate facilities to fabricate, assemble, and flight test the helicopters prior to delivery to the U.S. Army. The company-owned facility at Culver City, CA contains approximately 7 million square feet of floor space and is currently occupied by both Hughes Aircraft and Hughes Helicopters, Inc. Hughes currently operates a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Flight Test Facility at Palomar Airport, Carlsbad, CA where commercial helicopters as well as YAH-64 prototype are flight tested.

Early in 1980, Hughes recognized that the AH-64A could not be assembled and flight tested at production rates in the facilities used for the Phase I/II Programs. Company-owned facilities and land could be made available as Hughes Aircraft evacuated the Culver City plant in accordance with their plan established in 1979.

Also concluded was that only assembly could be accomplished in Culver City. A search for a flight test site/facility was initiated in mid-1980. Coupled with this search, an alternative analysis was initiated to determine advisability of performing assembly at the flight test site.

After evaluating 22 sites in the Western half of the United States, the site search and alternate assembly analysis was completed in May 1981, and after review, Hughes Helicopters, Inc., announced the decision to build a new facility at Falcon Field, Mesa, AZ, to assemble and flight test the AH-64A. The facility will consist of approximately 581,200 square feet on 200 acres including all site support functions and other flight test. (See **Figure 1** below).

Many factors were considered in the site analysis, some of which were weather, existing airfield, available land, zoning, airspace congestion, labor availability, and ordnance range proximity. Factors considered in determining where to assemble the AH-64A (Culver City or Mesa) included the ability to construct facilities in time to meet schedule, requirements for permits (air quality, environmental reports, building permits etc.), expansion flexibility availability of critical skills labor costs, labor stability energy availability and costs, and production efficiencies.

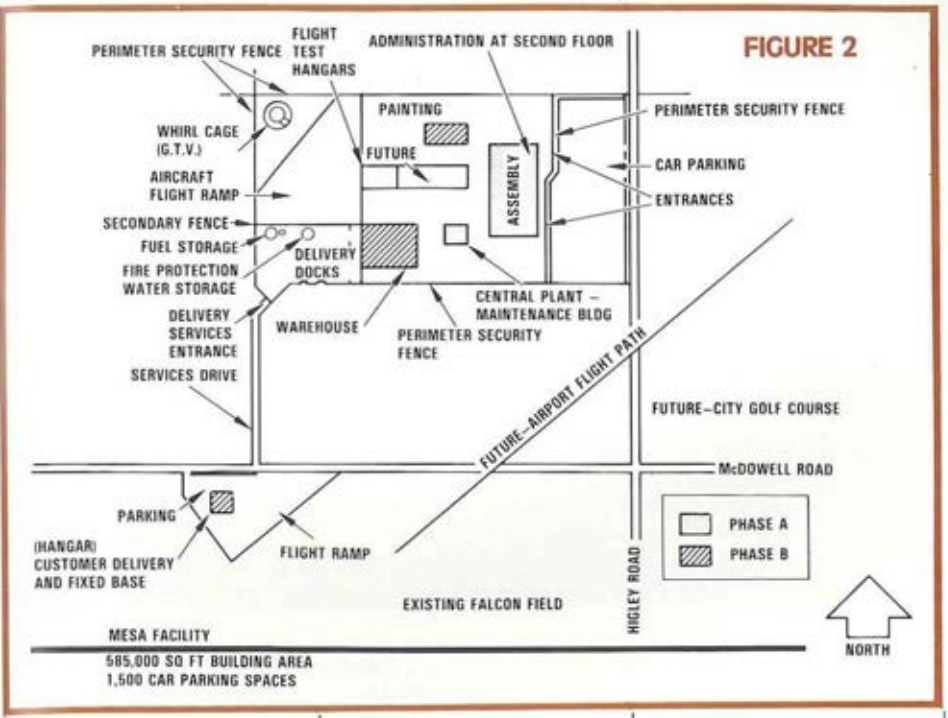
The primary benefits of the Mesa location to the AH-64A Program are labor availability, reduced risks in meeting schedule, and lower production costs.

Culver City use

The existing facility in Culver City will be utilized for AH-64A fabrication, engineering, product support, in addition to its production of the Model 300 and 500 series commercial helicopters and the production of the M242 Chain Gun® for the U.S. Army.

The construction of the new facility is planned in two phases with an assembly building and site work to be accomplished in the initial phase and a warehouse, paint facility, and

FIGURE 1
HUGHES
MESA, AZ
FACILITY



flight hangars being completed in the second phase. The initial phase is scheduled to be completed in December, 1982, and the balance of the facility by July, 1983. (See **Figure 2**).

Hughes Helicopters announced in July this year, the selection of Chanen Construction Company, Inc., of Phoenix, AZ, to design and build the initial facility. Hughes has completed the master planning for the site and design has started.

During 1982, 600 persons will be required to accomplish the initial production effort and will be housed in a leased facility in the vicinity of Mesa. After completion of the permanent facility at Falcon Field, the work force will increase to 1,800 persons at the peak of AH-64A production rate. A small percentage of the present Hughes Helicopters employees will move to Mesa, but the majority of people hired will be residents of Mesa and surrounding communities, with most of the hiring starting in the second half of 1982 and continuing through 1983.

After completion of the Mesa Facility, the AH-64A will be produced in new modern production buildings with assembly, flight test, and delivery being accomplished in a single integrated facility. (See **Figure 3**).

Program Manager's Comment

The new ODCSOPS Army Aviation Officer, **Brigadier General "Don" Parker,** provides us his comments in the following article. Since last year, you will note that **BG "Dick" Kenyon** (who is now DCG at Fort Rucker) has passed the baton to **BG Parker.**

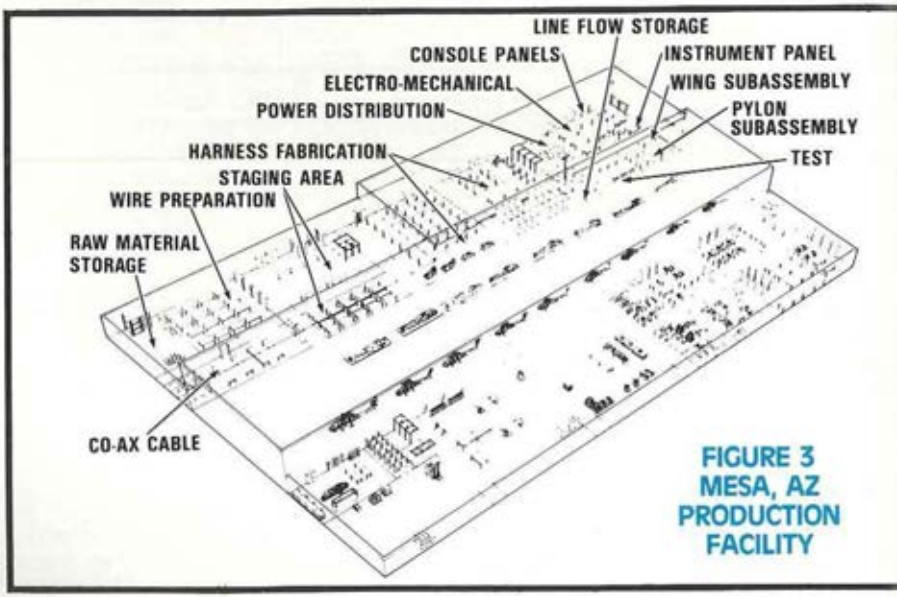


FIGURE 3
MESA, AZ
PRODUCTION
FACILITY

AAH. The Training Challenge.

By Brigadier General Ellis D. Parker, Army Aviation Officer, ODCSOPS, DA

DEVELOPMENT of the **Advanced Attack Helicopter (AAH)** started with the June 1973 authorization initiating an AAH development program through Phase I (competitive development) and Phase II (full scale engineering development).

This has evolved into a long, demanding, and most of all, challenging program. Now, with the successful completion of Operational Test II under our belt and the prospect of a successful production decision in December 1981, a new challenge will face Army Aviation — successful fielding of the AAH.

A lion's share

The Army spends a large portion of its budget on Army Aviation, and the AAH will get a lion's share of this portion. This is easily justified because the AAH is the most significant technological advancement in the history of Army Aviation.

From its inception, the AAH has been engineered and developed as an attack system incorporating the most advanced weapons system technologies. These system technologies have been integrated in such a manner that the AAH will be the first Army attack helicopter developed to live with the troops in the forward battlefield environment. It is specifically designed for the day, night, adverse weather anti-armor mission with the ability to fight, survive, and return to flight again.

Ultimately, this capability will provide the field commander with the most flexible combat power multiplier he has ever enjoyed and will give him the world's foremost tank killer. To achieve the full benefit of this system, the challenge of fielding the AAH must be met. A major part of this challenge often overlooked is that of training — at all levels.

The Training Trilogy

Less than two years will lapse between the production decision and the time when the first airframe rolls off the assembly line. During that short time span, our training plans must be finalized and prepared for execution. Part of this effort will be shouldered by Hughes Helicopters and the Program Manager, part by the TRADOC community, and the rest by the field commanders — I call it the training trilogy.

The AAH is a complex system and, coupled with the elements of attack tactics, **Pilot Night Vision Sensor (PNVS)** operations, and overall crew harmonization, presents some unique considations which those in Army Aviation must master.

The contractor will start the training of key personnel and instructor pilots in early 1984. Before arriving, these key personnel must already be PNVS qualified. Without thoroughly

trained instructor pilots, Fort Rucker would be unable to accomplish the subsequent mission of training the **Initial Operational Capability (IOC)** unit pilots — as well as the many follow-on unit and instructor pilots required.

Fort Rucker also has the mission of conducting the crew training (pilot and copilot/gunner). This will be more demanding now with the delay of the arrival of the AAH **combat mission simulator (CMS).**

What will this delay cost us in other resources?

All essential training aids, simulators, and field facilities — including the range complex for the HELLFIRE missile — must be ready to insure we produce a quality product acceptable to the field. In addition, the Aviation Center's training syllabus must be finalized in order to produce a fully qualified combat aviator.

An essential element of the institutional training program is teaching how to fight the AH-64 as a weapons system — tactical employment of the weapon systems and crew training which was formerly shouldered by units in the field. This will be a new challenge for the Aviation School.

Questions that must be answered are:

To what detail do we train the pilots?

Are there sufficient tactical training areas available at Fort Rucker?

Another important element of institutional training, individual flight training, will also present a challenge. Each pilot is scheduled to be trained to fly from either crew station and to fly and fight in all weather conditions during daylight or darkness.

The AH-64 will be the most complex aircraft in the Army inventory and as such will require our officers and warrant officers to master many complex skills.

Concurrent with Fort Rucker's crew training mission, Fort Eustis has the mission of qualifying maintenance test pilots and providing the 67 and 68 MOS series specialists, and Forts Gordon and Eustis must qualify the 35 MOS series personnel. These latter skills include operators for the new **Automatic Test Equipment (ATE)** and the **Equipment Repair Facility (ERF).**

The AAH is sufficiently sophisticated and different from current inventory aircraft that all maintenance personnel should be trained in an institutional environment as opposed to training under the **New Equipment Training Team (NETT)** concept. To achieve the full impact of the AH-64 as a force multiplier, our flying and maintenance support personnel must continue to be top quality and thoroughly trained from the outset.

With all the money, time, and expertise that the PM and the contractor

have expended in dev
oping the AAH, and w
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team, but it places a special premium on team training to maximize its effectiveness.

To master the training challenge, field commanders must take the new generation of training literature presently available, such as TC 21-5-7, FM 21-6, current ATM's, Soldier's Manuals, and ARTEP, and prepare a training plan that works effectively and can be measured.

These documents identify the tasks, conditions, and standards to which each officer, warrant officer, and soldier must perform. Every resource must be appropriately employed, while we realize that our critical resource is time.

The plan must quantify everything, must leave nothing to chance, and must emphasize training of the AAH and the scout as a team. This training must be combat and performance oriented in all respects.

It must look as far into the future as possible The plan must prioritize for subordinate unit commanders all the other requirements that are being placed on them, allowing them to "train around" the training detractors which have a tendency to ruin an excellent training program.

To help give focus to this training plan, I would like to quote the AAH operational concept from the **Material Need (MN)** document for you:

". . . will be employed with, or to the rear of, ground forces along the FEBA to counter enemy armor at the FEBA, to counter superior enemy armor penetration behind friendly lines, to guard open flanks, to reinforce thinly-held sectors, and, when needed, to provide helicopter escort and suppressive fire. It will be integrated into the scheme of maneuver of the ground commander and will provide 24 hour responsiveness."

Missions inherent in this operational concept are, for the most part, of the high risk category. As such, they demand highly skilled pilots and well trained scout/gun teams. Without each member of the training trilogy performing his training mission in an effective and efficient manner, the Army cannot hope to have trained crews that can fight the AAH to the limit of its technical capabilities, and maintenance personnel capable of maintaining the aircraft.

The Army is proud to be a part of this fascinating new aircraft. Let's give it our best shot!

Program Manager's Comments

In the material development process, the **Training and Doctrine Command (TRADOC)** represents the user. In the case of the APACHE, however several centers are involved as well as a TRADOC chartered system manager, the TSM.

In the next article, **Major General "Lou" Wagner** Commander of the Armor Center, discusses the employment of the APACHE on the future battlefield.

Many thanks, Skip!

This special issue of **'Army Aviation"** is devoted to the APACHE Advanced Attack Helicopter (AAH) APACHE marks the fourth time we've dedicated the major part of an issue to the AAH Program. Once again, as he has done on the last two special editions, **Major Lyle D. Monson** of the APACHE Program Manager's Office, coordinated the flow of the articles, charts, and photographs from the authors to the publisher.

In addition, **"Skip"** took the time to prepare and include this issue's article on the "History of the Attack Helicopter," finding many rare early AH photos in the process.

"Skip" informs us that this will probably be his last total magazine effort as he will be leaving the PMO Office next year for an assignment at Fort Rucker. Well done, **"Skip"!**

Employing the AH-64A on the future battlefield

By Major General Louis C. Wagner, Jr., Commanding General, USA Armor Center

AS Commanding General of the Armor Center and proponent for the development of tactics, doctrine, and training for all Air Cavalry and Attack Helicopter units, I welcome the opportunity to share some of my thoughts on the employment of the AH-64 on the future battlefield.

Before I describe how I envision the APACHE AH-64 being employed, I want to provide some background information on where the aircraft will be employed within the Army's organization.

In October 1978, TRADOC Schools and Centers formed Division '86 Task Forces which were tasked to develop organizations designed to take maximum advantage of the doctrine and weapons systems (like the AH-64) of the 1980's and beyond. A significant result of this study was a far reaching change in the ground and aviation force structure within the division.

ACAB: A major change

The most obvious change is the addition of the **Air Cavalry Attack Brigade (ACAB)** to the familiar three brigade division. The ACAB will enable the division to fight the extremely violent, lethal, and unpredictable battles of the future. The mobility inherent to helicopter operations coupled with the tank killing firepower of the attack helicopter enable the ACAB to find, fix, and destroy enemy armored and mechanized forces.

The ACAB's primary fire and maneuver elements are its two attack helicopter battalions which have 21 attack helicopters each. The only attack helicopter currently available is the AH-1S COBRA. The COBRA is equipped with TOW missiles, 70mm rockets, and either a 20mm or 30mm turret mounted cannon.

The TOW missile provides the tank killing capability that the ACAB needs at intermediate ranges but the COBRA's effectiveness as a tank killer is dependent upon battlefield visibility. It must be able to see its target before it can kill.

Limited growth potential

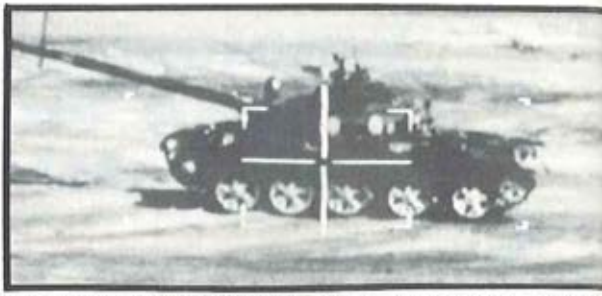
The COBRA does not have a night sighting system for the TOW so night operations are severely limited. Missions flown during daylight can be adversely effected by smoke, haze, or visibility moisture. In addition, the AH-1S growth potential is limited. We are already approaching the 10,000 pound gross weight limit of the AH-1S when the required mission packages, fuel, and ammunition are on board the aircraft to accomplish the mission.

The solution to these limitations is the APACHE Attack Helicopter. The AH-64 will augment our current AH-1S force with an around-the-clock reduced visibility capability that can

destroy enemy armored mechanized forces.

Armament configurations for the AH-64 include the **HELLFIRE Modular Missile System (HMMS),** the improved 70mm rocket, and a 30mm cannon. The HMMS is the primary point target system for the AH-64 and provides its tank-killing capability. The AH-64 is capable of sustained operations during day, night, and adverse weather because of the **Pilots Night Vision Sensor (PNVS)** and the **Target Acquisition Designation Sight (TADS).**

The target acquisition sensors in the TADS significantly increase the AH-64's mission capability to acquire targets at greatly increased ranges. This serves to increase target servcing and to reduce vulnerability. The PNVS allows the pilot to see through battlefield obscurants, smoke, haze, and fog during both day and night operations to maneuver the aircraft into a battle position.



I am confident that the improved capabilities offered by the APACHE AH-64 with HMMS will provid the Commander a mor flexible, lethal and high mobile, anti-armor maneu ver force with which he ca alter the course of battle

We at the Armor Cente are excited about the dy namic capabilities of th APACHE AH-64 and ar looking forward to fiel ing this superb anti-armo weapons system.

Night Attack!

By Colonel Wayne C. Knudson, Cdr, 6th Air Cavalry Combat Brigade

JUST after dark, the commander of the armored division on the Corps northern flank called the Corps G-3; "Colonel, the enemy has just launched a major attack with at least a tank division in my southern brigade sector. I have committed my reserve but we need reinforcements by midnight or be willing to accept a major penetration by daylight tomorrow." After some more general discussion on the situation, the Corps G-3 advised the division commander, "I'll whip up some options, review them with the Corps commander and get back to you in an hour."

Reviewing the options

As the G-3 began to review his options, he quickly saw that he would not be able to reposition the available ground combat force before mid-morning. He needed a wedge to drive into the attacking force, causing effective delay and concurrent attrition for about 12 hours. He turned to his operations officer and directed, "Call the attack helicopter squadron commander and alert him to reinforce the northern division and to meet me here at the command post as soon as possible."

Is the above tactical situation possible? I believe so; better than that I believe it is probable. Is the implied response plausible? Again, I believe so! The plausibility, however, is suspicious with the present fielded technology. If we want to assure ourselves of reliance on the attack helicopter under a broad range of climatic conditions, we must continue to enhance our attack aviation force with technological enrichments. Our current capabilities, significant as they are, have shortcomings in severe weather and extreme darkness. The power-to-weight ratio of the AH-1S (TOW-COBRA) is also a potential disadvantage in some scenarios.

Much to learn

Our attack aviation forces have come of age in the anti-tank mission with the TOW equipped COBRA and the modernized tactics of the last five years. There is still much to learn before optimization occurs, some of which may not occur until actual combat. We have however, over the past few years, executed enough tests and performed sufficient analysis to demonstrate that attack-aviation is and will remain a major component of our anti-tank combat power for this and future decades. The significance of this capability is only now being realized by much of our Army, and is also beginning to affect structural and material acquisition decisions of our world-wide allies.

To increase the Army's capabilities and modernization in the attack helicopter arena we

Shown durin a visit to th Hughes' facilit at Culver Cit GEN John W Vessey, Jr., Vic Chief of Staf U.S. Army (2 from the left is given a fligh line briefing o the APACHE b Hughes Pres dent Jack Rea (far left); AA Program Man ger MG Edwar M. Browne an Norm Hirsh, V -AAH Progran

will soon be fielding the APACHE (AH-64) helicopter. This superb weapons system has been developed with "us" the user community in mind, unlike the COBRA, the APACHE can see and fly and fight at night and in adverse weather, enabling it to be responsive to the commander when and where needed.

Major increase

The tremendous increase in effectiveness and combat power provided by the AH-64 will provide a new dimension for the role of Army Aviation as an integral member of the Combined Arms Team. Given the tactical situation above the APACHE will be immediately available to fly and fight when and where needed.

As we continue to modernize our Army's total force structure, attack aviation seems to be one of the key components in having combat forces that are strategically and tactically deployable, tactically flexible and extraordinarily lethal.

Increased lethality

We must continue, with great imagination, to pursue stronger combined arms tactics and technological enrichments which increase attack aviation lethality through a combination of increased capability and reduced vulnerability.

As the staff finished the situation briefing, the Corps Commander stated the following, "Direct our ground maneuver reserve to move north to counterattack that probable penetration in our northern sector by noon tomorrow. Have the attack-helicopter squadron initiate attack on the leading elements of that tank division by midnight. They are to delay that division essentially in place throughout the night and by daylight inflict as much attrition as possible without inordinate losses.

To roundout this attack, align quick fire channels with the attack-helicopter squadron and make sure the artillery has plenty of illumination, FASCAM, DP-ICM and by daylight they will also need smoke. Align the majority of our morning's TAC Air with the attack-helicopter squadron for **JAAT (Joint Air Attack Team)** operations. We need this combined attack to hold the penetration to a minimum and whittle down that force until noon when we can have the ground force in a posture to counterattack."

Bring it on!

"We're ready," says Major General Carl H. McNair, Jr., CG, U.S. Army Aviation Center

THE AH-64 — what a super helicopter! — perhaps the finest ever fielded, complete with the most modern visionics, fire control and onboard weapons to make it a formidable fighting system for the Air-Land Battle 2,000.

Placed in the perspective of time, the AH-64 is to the COBRA of today as the COBRA was to the UH-1B gunship of Vietnam fame — a generation apart in performance and capability — but soon to be in the hands of the troops.

Duly impressed!

In fact, troops of "D" Co. 7th Combat Aviation Battalion put the AH-64 through its paces during OT II this past summer and came away duly impressed with its great potential.

In a very brief period, these personnel trained on and employed the system against a wide array of simulated threat arrays in many different scenarios, day and night — proving that the AH-64 is ready for the Army and the Army is ready for the AH-64.

As we move rapidly toward the production and fielding of the AH-64 we at the Aviation Center are looking far ahead to insure that the Advanced Attack Helicopter, with all its impressive combat capabilities, finds its appropriate niche in the Combined Arms Team — for training and doctrine is our business.

And in concert with the Armor School and other elements of the TRADOC community, we must prepare the training program and tactics which will give us the most from this all new "Total System For Battle."

The Air-Land Battle philosophy is a far reaching advance in our "thinking through" the next war.

The integrated and extended battlefield represents real challenges in fighting outnumbered and winning.

A most lethal factor

Pound for pound and dollar for dollar, the attack helicopter represents potentially one of the most lethal factors in the Air-Land Battle equation; we must make certain that the machines, the crews, their training, our organizations, our doctrine, and our ability to support and sustain the total system are as good as our best professional efforts can make them.

It has been DARCOM's and the AAH Program Manager's mission to provide the machines to meet the user's needs. Their job in the development area will soon be drawing to a close and we must then sustain it in our units.

We will be faced with the real challenge of accepting those machines and integrating them into the force. We must be ready and have been preparing toward that end since

the requirement was first conceived.

Working full speed

One of the immediate tasks before us at the Aviation Center will be to train the crews who will fly and fight the AH-64. Our training developers are working full speed at developing, designing and defining the programs we will use to accomplish this training.

If all goes as planned, we should be graduating fully combat-qualified crews concurrent with the delivery of the initial AH-64s to the Army in the field.

The AH-64 program of instruction will ultimately encompass some ninety hours of system flying time to include a diverse (and sophisticated) collection of simulators, training devices, techniques and methods, all of which will coalesce to produce the total crew for the total system. At the present, the ultimate AH-64 combat mission simulator is not yet fully defined.

Whether it will feature a full terrain board, display or **computer generated imagery (CGI)** remains to be determined. Much will depend upon the outcome of our current operational test of the UH-60A, BLACK HAWK, simulator which features both techniques in a "head on" test to determine the best for the Army.

In the interim, until the AH-64 simulator is defined and developed, institutional training at the school will be provided in the actual aircraft and hopefully an interim simulator.

The real challenge

The Transportation Center and the Signal Center are conducting parallel development of the vital training programs for those who will maintain the AH-64 and its onboard systems. While the technical sophistication of the aircraft and its systems is unprecedented, concepts for their maintenance will be more streamlined and efficient than ever before.

Dealing with this seeming contradiction has been a challenge to the Army Aviation Maintenance Community, one which is being met exceptionally well. One simply needs to look at the automated test equipment associated with the check-out of the AH-64 to appreciate the sophistication and the complexity of the onboard electronics and visionics — all very modern and reliable but requiring checks and rechecks in order to insure "missles on the target" when and where needed.

Doctrine and tactics

We are working closely with the Armor Center, the Combined Arms Center, TRADOC Headquarters, and other Army agencies to insure that our doctrine and tactics for employing the AH-64 evolve along with the systems maturation. Similarly, new organizations are under consideration to provide the necessary command, control, communication and support channels for maximum AH-64 effectiveness.

The key players

The Aviation Center, Division/Corps/Army 86 Task Force, along with our Aviation Mission Area Analysis Team, are key players in the organization/doctrinal development effort.

In addition to these special tasks, our combat developers are monitoring and coordinating combat development efforts related to AH-64 systems in every functional area of combat. Their unique blend of technical expertise and field know-how have proven invaluable to date and will be even more so in the future.

A team effort!

In short, the Aviation Center's contribution to the AAH Program has been truly a team effort, both internally as well as with all other agencies, activities and organizations involved and associated with the APACHE.

Only by continuing and intensifying our collective efforts will we assure that the AH-64 Advanced Attack Helicopter will take its place on the first-string of the Combined Arms Team.

The Army is ready for the APACHE. **Bring it on!**

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With inputs from external heading and vertical references, the ASN-128 system provides accurate aircraft velocity, present position, and steering information. It is completely self-contained and requires no ground based aids.

The DRVS accepts heading, roll, and pitch as synchro inputs and converts them into digital format for transmission to the computer. The DRVS can also be used separately from the ASN-128 to provide velocity inputs to other aircraft equipment.

The CDU accepts beam velocities, heading, roll, pitch and true air speed (in some installations) from the Doppler Radar Velocity Sensor and performs the navigation computations. The front panel includes provisions for entering operator inputs and for displaying system data such as present position, steering information to 10 destinations, and status of the system. The CDU also puts out velocity and navigation data in ARINC digital format.

The CDU performs three functions for the ASN-128:

- Provides mode controls, display controls, and keyboard entry of destinations and other data.
- Performs all computations for LDNS including Doppler processing, velocity coordinate transformations, navigation in both UTM and latitude/longitude, steering signals to 10 destinations, and BITE functions.
- Displays navigation data on its front panel.
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- Provides BCD and binary outputs for external equipment.

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Shown at the 26 May 1981 graduation of Army Aviators on the AH-64A Advanced Attack Helicopter at this summer's Operational Test II (OT II) test site, Hughes, AAH—PM, and 7th Infantry Division aviation personnel pose for an informal group photograph. They are, **Front Row,** L—R, Norm B. Hirsh (VP-AAH Prog), MG Edward M. Browne (Prog Mgr), Jack G. Real (President, Hughes Helicopters), Robert J. Whalen (President, Orlando Div., Martin Marietta Aerospace), Joseph J. Halisky (Dir of Prog, Rockwell Int'l). **2nd Row,** L—R, LTC Burl Zorn (Cdr, 7th CAB), CW4 Larry Proper, CW3 R. Helton, CW2 J. Sandberg, CPT Lawrence Casper (Cdr, D Co, 7th CAB), CW2 G. Coppersmith. **3rd Row,** L—R, CW3 Bill Yarlett, CW4 Joe Koch, CW3 T. Willmore, CW3 F. Gabriel, COL Don Wray (TADS/PNVS-PM). **Back Row,** L—R, CW3 J. Ropcik, CW3 Dennis Dvorchak, CW3 Randy Dyer, and CW3 W. King.

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Some comments by COL David L. Funk, TRADOC Systems Manager—AAH

I'M happy to have this opportunity to to speak to you from the Office of the **TRADOC System Manager (TSM)** for Attack Helicopters. **Colonel Len Shrader,** my predecessor, departed for brigade command in January, which put me back into the attack helicopter business on a full time basis.

This past year has been a busy one for all of us involved in the AH-64 program. Much of the TSM effort has revolved around preparations for actions during the **Operational Test (OT) II.**

A two-month stint

OT II began on the first of June, and ran through the end of August. It was conducted by the TRADOC **Combat Development Experimentation Command (CDEC).** Most of the TSM officers spent a good deal of time at the test site, but **Major Bill Leach** did the lion's share of the on-site work in his capacity as Deputy Test Director for Combat Developments and Training.

His team on-site included representatives from the Aviation Center, Transportation Center, Signal Center and Combined Arms Center; and had the mission of assessing and reporting on training related questions associated with the AH-64 OT.

An important member of his team was provided by the Armor Center; the Aviation Center and the Armor Center, together, were tasked to validate and certify each OT event from a standpoint of conformance to published doctrine and tactics.

Special commendation is due the OT II player units, D&E Companies, 7th Aviation Battalion and 7th Infantry Division. **Captain Larry Casper's** D Company encountered and overcame numerous challenges during the past year, not the least of which was replacing their AH-1Gs with fully modernized AHS-1S aircraft.

Double duty!

No sooner was that changeover complete than it was time to begin training of AH-64 aircrew and maintenance personnel for the OT II. In essence, D Company had to complete two unit training programs simultaneously, while shuffling personnel to and from AH-64 training facilities. Without exception, D Company did an outstanding job, both before and during OT II.

Army personnel from D Company performed the AVUM and E Company performed the AVIM functions during OT II. The **System Support Package (SSP)** provided by the contractor included all tools, maintenance publications, repair parts (ASL/PLL), command and peculiar ground support equipment necessary to support the aircraft.

In addition to keeping the AH-64s flying during OT II, the

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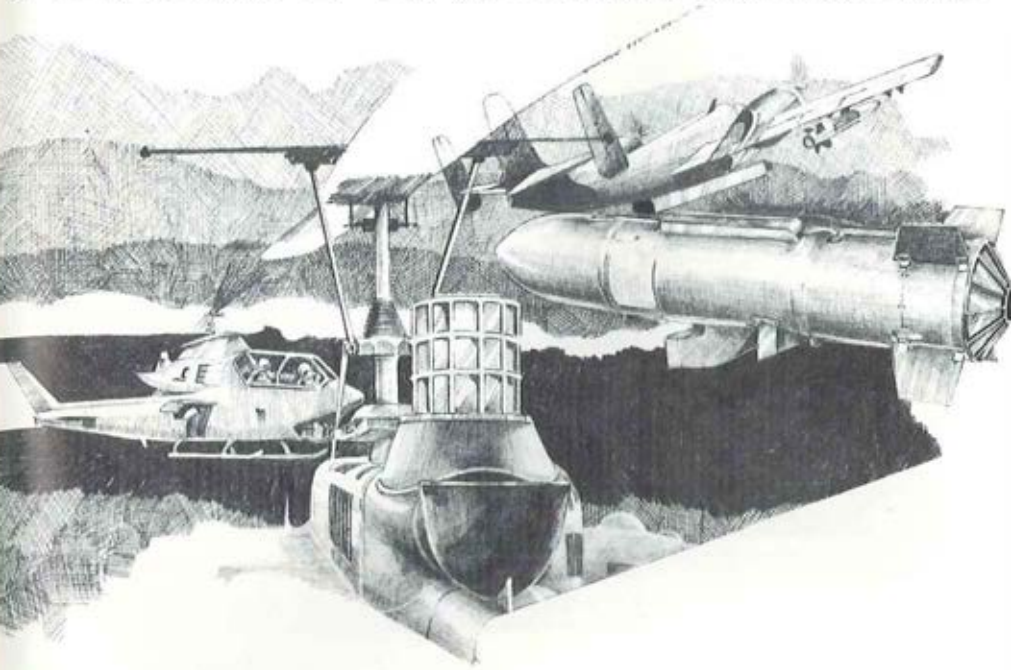

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SSP was evaluated to provide the Army insight into the soldier-machine interface and logistic supportability of the total system.

The final report of OT II will be prepared by CDEC and forwarded to the Army's **Operational Test and Evaluation Agency (OTEA),** who will conduct an independent evaluation of the test results. Together with the results of all previous testing and detailed Cost and Operational Effectiveness Analysis, the results of OT II will be presented to the **Army System Acquisition Review Council (ASARC)** this November, and the **Defense Acquisition Review Council (DSARC)** in December.

Assuming no show-stoppers between now and ASARC/DSARC, the decision will be made following DSARC whether or not to enter full-scale production. Given that production decision, you can look for the first production model APACHEs to begin coming off the assembly line in November 1983.

All indications are that the AH-64 will do everything we've asked it to, and a little more to boot. When it has been produced and integrated into the force, the AH-64 will add to the Combined Arms Team the significant capabilities of the most sophisticated and combat effective attack helicopter in the world.

Program Manager's Comment

The Army has been working on an armed helicopter to meet its requirements for many years. In the next article **Major "Skip" Monson** of my Office has put together a thumbnail sketch of these efforts in order to show you readers just how much effort has gone into the attack helicopter program.

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The Attack Helicopter. It has a long and interesting history.

By Major Lyle D. Monson, Sr., Asst to the PM for Analysis, Research & Management

THE desirability of the helicopter as a weapons carrying platform was first studied by the Army in the mid-1950's. The armed helicopter efforts that followed, with one exception, were modifications of aircraft designed for other than armed purposes.

The exception, the AH-56 **Cheyenne** which was replaced by the AH-64A APACHE Advanced Attack Helicopter led the Army to its current attack helicopter position.

The attack helicopter role has evolved into two mission categories: (1) escort or soft target suppression, and (2) anti-armor. Early aircraft weaponization concentrated on the escort role due to a lack of an airborne weapon system capable of defeating armor. Emphasis shifted to the anti-armor role with the airborne TOW system and its demonstrated success in Vietnam.

The Army recommended arming the H-13, H-19, H-21, H-23, and H-34 with 7.62mm machine guns as early as 1957. In 1962, UH-1s were armed with guns, rockets, and missles as a result of initial Vietnam involvement and the **Howze Board** studies. In 1962, 102 aircraft were authorized for each infantry division.

The Army **Howze Board** even considered increasing troop mobility by substituting more helicopters for ground vehicles. The air mobility concept was supported by the Board's recommendations which called for a large number of attack helicopters which were to provide close air support with guns, rockets, and missiles.

In June 1963, the Commanding General of Army Materiel Command appointed the first PM for the **Fire Support Aerial System (FAS).** This action was to affect the Secretary of the Army's goal of quantitatively improving support of Army aircraft.

Comparative testing and analysis of the Kaman UH-2 and Bell UH-1 showed that neither came close to the FAS requirement to justify a modification program. The Army, therefore, decided to use existing systems until an optimum system was available.

In the meantime, the French developed an anti-tank guided missile which was adapted for use on the UH-1B helicopter. The system was considered satisfactory until its replacement, the TOW, became available.

In 1965, a limited number of the French systems were deployed. Reports from Vietnam during the same timeframe indicated the 40mm grenade launcher and the 2.75 inch rocket system were most effective and reliable for aircraft application. With the advent of

the AH-1 COBRA, a derivation of the UH-1, the Aircraft Weaponization Project Office made provisions to meet the armament requirements for the aircraft. The XM-128 armament subsystem consisted of two 40mm grenade launchers or two 7.62mm high rate of fire machine guns or a combination of one each mounted in the COBRA's flexible nose turret. This choice of weapons was intended to give the combat commanders the desired flexibility in battle.

Enter the COBRA!

In 1965, a group met to evaluate proposals for an improved armed helicopter. Those evaluated were Bell's COBRA, Sikorsky's S-61, Kaman's UH-2, and Vertol's CH-47. The objective was to select an aircraft which offered the most significant increase in capabilities over the armed UH-1B IROQUOIS helicopter. The three highest ranking aircraft, the COBRA, the S-61, and the UH-2, were selected to undergo flight evaluation.

As a result, the COBRA was recommended as the best candidate for the interim armed helicopter. Subsequently, the COBRA was produced and served well in Southeast Asia and reconfirmed the value of the attack helicopters. Performance limitations, however, highlighted the need for an improved aircraft.

In 1964, the FAS Program was redesignated the **Advanced Aerial Fire Support System (AAFSS).** Later that year the Army released the **request for proposal (RFP)** to prospective contractors. A Source Selection Board convened and in February 1965, Lockheed and Sikorsky were announced as winners.

The two contractors were issued revised RFPs and each responded with three versions of the AAFSS. Lockheed was announced as the winner in November 1965. Between May 1967 and June 1968, ten prototype vehicles were provisionally accepted by the Army.

'69-'71 Reevaluation

The development program experienced a variety of system and subsystem failures and one aircraft was damaged. A fatal test flight accident occurred in March 1969. A series of reviews were convened to assist Lockheed in solving the flying quality problems with the AH-56 CHEYENNE.

Much activity took place during the next two years. A reevaluation by the Army of its attack helicopter requirements identified a more agile, smaller, slower, and less sophisticated aircraft than the CHEYENNE. As a result, the Secretary of the Army terminated the CHEYENNE in August 1972.

The **Materiel Need (MN)** document was developed by the **Advanced Attack Helicopter (AAH)** Task Force in 1972. The AAH RFP was released in November 1972. Bell Helicopter, Boeing Vertol, Hughes Helicopters, Lockheed, and Sikorsky responded to the RFP. An **Army Source Selection Evaluation Board (SSEB)** evaluated the proposals and Phase I.

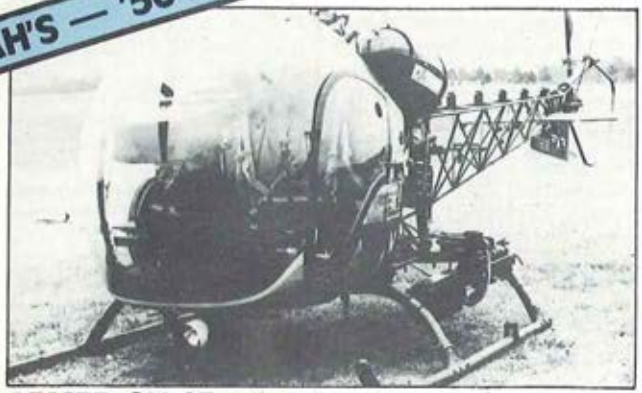
Engineering Development contracts were awarded to Bell Helicopter and Hughes Helicopters in June 1973. Both contractors fabricated a ground test vehicle and two flying prototypes. A competitive fly-off was conducted and in December 1976, the Hughes YAH-64 was selected as the winner.

We're confident!

Phase II engineering by Hughes was completed in May of this year and the AAH underwent its operational test this summer. In December of this year, we are confident that the APACHE Attack Helicopter will go into production culminating over 25 years of effort to field an armed helicopter to meet the Army requirements.

The photo montage is a few of the numerous armed helicopters that the Army and industry have assembled throughout this timeframe.

You'll also see, in the pages ahead, some info on the APACHE's popular name, a look at worldwide AAH efforts, and the interest of key military, foreign, and Congressional leaders in the APACHE.

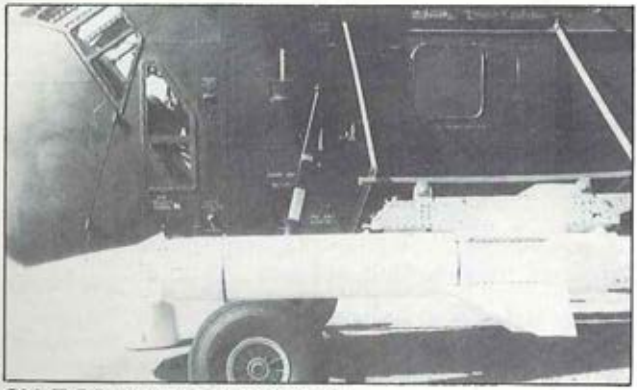


ARMED OH-13

ARMED OH-13

ARMED UH-19

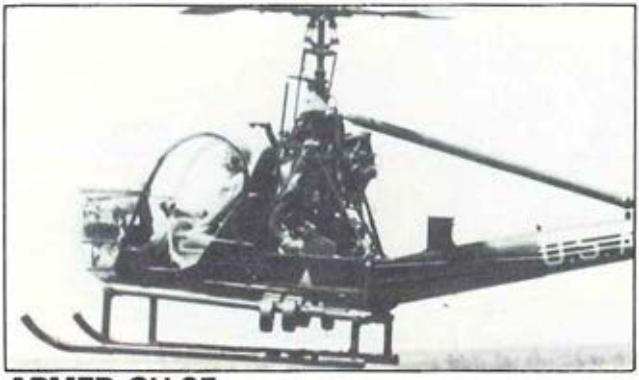
ARMED UH-19



CH-34A WITH BULLPUP

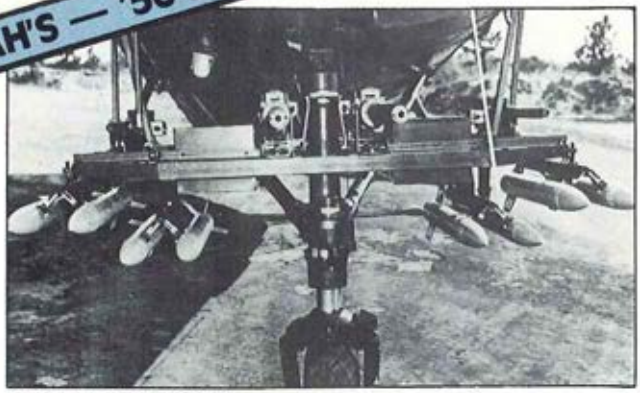
ARMED CH-34

OH-13 WITH ACR KIT "K"



ARMED OH-23

ARMED CH-21C



ARMED CH-21C

ARMED BELL SIO

ARMED UH-1A

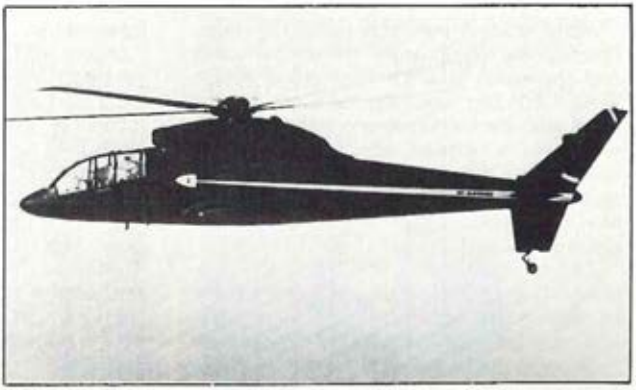
ARMED UH-1B

AH-1 COBRA

ARMED CH-56

ARMED UH-2

CH-47A "GUNS AGO-GO"



S-67 BLACKHAWK

The Last Apache

CREWMEMBERS on board the U.S. Army's Advanced Attack Helicopter — which has been officialIly designated the APACHE — are expected to be quick, stealthy, deadly masters of the art of hit-and-run warfare much like the fearsome Indian raiders of the Old Southwest for whom their ship is named.

A great mystique of terror and dread still surrounds the very word "Apache" both here and abroad. Drawn from a Zuni word meaning "enemy", it was adopted long ago by the French to denote a vicious class of criminal thugs.

Here in America, the word conjures up images of a fierce, warlike people who fought a savage guerrilla battle to the bitter end and who were only defeated after an intense struggle lasting more than 25 years.

In fact, these tough, nomadic hunters and marauders were veterans of more than 250 years of guerrilla warfare against the Spaniards before they ever encountered their first American.

> "God made us not as you; we were born like the animals, in the dry grass, not on beds like you. This is why we do as the animals, go about at night and rob and steal."
>
> —Cochise

Something epic and heroic

Many modern eyes can see quite clearly - through the fog of history - the terrible cruelty and oppression to which these proud people were subjected over the centuries by the Spaniards, the Mexicans, and the Americans, and there is, indeed, something epic and heroic about the diehard struggle of Apache renegades like Victorio and Geronimo to defend their rights to their homeland and their ancient, lawless heritage.

On the other hand, the Apaches themselves were an extremely aggressive people by nature; they raided and plundered at will and could be very cruel and merciless toward their own victims, including countless Indians from other tribes who learned from bitter experience to fear and dislike the Apaches intensely.

Many people today would accept the popular view of years ago that the Apache renegades were merely malcontented drunkards, murderers, and thieves who were too violent and too reactionary to adapt peacefully to changing times and to the evolution of a modern society.

The truth, as always, is paradoxical; it's often forgotten that the unbending renegades only represented a tiny minority of the Apache people — despite the horrible conditions on their hot, barren reservations — and that the U.S. Cavalry actually employed hundreds of loyal Apache scouts to track them down.

Establishing a culture

The six tribes of the Apache people are descended from Athapascan-speaking Indians who crossed from Siberia into Alaska about 5,000-6,000 years ago and who remained in the sub-arctic region of northwestern Canada as nomadic hunters and fishermen for countless generations.

About 900 years ago some of these people began moving southward — possibly seeking a land with milder winters, or perhaps just following the migration of the buffalo herds they hunted.

Gradually, the ancestors of the Apaches spread out across the rugged, sun-bleached land of the peaceful Pueblo Indians in what is now Arizona, New Mexico, Sonora, and Chihuahua. They quickly set about raiding the rich, adobe towns of the Pueblo for slaves, livestock, and other booty and they established the nomadic, warlike Apache culture that would last for centuries.

The Spanish Conquistadors arrived in the

Old Southwest in the mid-1500's, bringing powerful war horses and firearms into the area for the first time, and they were soon sacking Pueblo towns and killing, torturing and enslaving thousands of Indians as they established their own colonies and churches in the region.

The Spaniards were eager to keep horses out of the hands of the fierce Indian raiders stalking the arid countryside, but the Apaches eventually stole horses and taught themselves to ride. Still, they were not essentially horsemen: the Apache warrior was a powerful runner who liked to eat the horses he stole and then raid for more when they were needed. He usually liked to do his raiding and fighting on foot.

By the mid-1600's a savage pattern of raid and counter-raid, murder and revenge, had been established between the Apaches and the Spaniards. There were occasional periods of peaceful trading, but the basic relationship was one of unremitting hatred and bloody hit-and-run warfare.

Turmoil and bloodshed

After achieving their political independence in 1821, the Mexicans carried on the old Spanish customs of offering bounties for the scalps of Apache warriors (who by then had acquired the use of firearms) and mounting slave-catching expeditions against the Apache homelands. When the United States took control of New Mexico and Arizona in 1848, it inherited a situation filled with constant turmoil and bloodshed.

The two great Apache war chiefs of this period were old Mangas Coloradas of the Warm Springs Apache tribe and Cochise, his younger son-in-law, a member of the Chiricahua Apaches. Although there were occasional thefts and killings by Apache warriors north of the border, neither leader was truly hostile toward the Americans during the 1850's. Instead, they concentrated their depradations on the hated Mexicans south of the Rio Grande.

All this changed in 1861, however, when Cochise was invited to parley by an overzealous Army lieutenant who wrongly accused him of stealing some cattle and kidnapping a young boy from a nearby ranch.

Cochise managed to escape, but hostages were taken and killed on both sides and the Apaches promptly launched a campaign of death and destruction against any Americans in New Mexico or Arizona whom they could isolate and outnumber.

Over the next 12 years, there was a brutal guerrilla war on the frontier in which the Americans pursued a policy of concentration or extermination toward the Apaches; all those warriors who refused to resettle on reservations were to be hunted down and killed like dangerous wild game.

In 1872, small, highly mobile Cavalry strike forces began to probe deeply into the Apaches' wilderness strongholds, forcing the Indians to live as fugitives in a constant state of insecurity. The horse soldiers were everywhere, and their pursuit was both ruthless and relentless. Finally, sensing the futility of further resistance, the Apache people began to surrender by the thousands in 1873 to be enrolled on the hot, dusty reservations set aside for them.

A brief period of peace ensued, and then the final chapter in the story of the Apache Wars was written by the renegades like Victorio, Nana, and Geronimo who hated the reservation system and the corrupt or incompetent Indian agents who fleeced and starved their people.

From their strongholds in the Sierra Madre Mountains of Mexico they continued raiding on both sides of the border — eluding thousands of Mexican and American troops for more than a decade until Geronimo, the last of the Apache diehards, finally surrendered in September, 1886.

—Dale Kesten

Geronimo, 1886

What the rest of the world is doing in Attack Helicopters

There is global military interest in the Attack Helicopter with many nations fielding anti-armor versions. The aircraft shown on this page reflect some of the major international efforts generated during the past few years.

ATTACK HELICOPTERS WORLDWIDE

Top left and clockwise: Mil MI-24 Hind-A, USSR's armed assault helicopter

Top center, Great Britain's Westland LYNX

Top right, France's DAUPHINE SA 361H

West Germany's MBB BO-105 PAH-1 (Panzer Atk Hel-1)

The German PAH-2

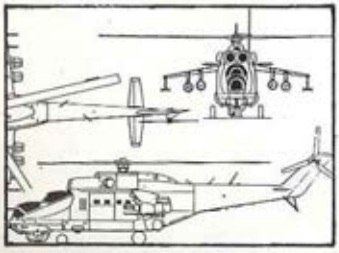
Bottom right, France's ALOUETTE 3

Below, Italy's Agusta A-109

At bottom left is Italy's Agusta A-129

The Soviet Union's Hind-D

France's GAZELLE SA 342L



Numerous military and Congressional leaders have visited the Hughes Helicopters' facility at Culver City to receive AH-64A briefings. All encompassed a visit to the flight line and an orientation ride in the APACHE.

Shown in the AAH cockpit in the photo just above is Representative Wm. L. "Bill" Dickinson (R-AL), a key member of the Armed Services Committee. In the photo at the right, GEN John R. Guthrie, then CG of USA DARCOM, listens to last-minute flight instructions prior to his orientation flight in an AH-64A APACHE, as does Sen. Barry M. Goldwater in the photo appearing at the left.

International Interest

The visit of an Italian delegation to the Hughes facility to view the APACHE included MG Mencha, BG Santucci, BG Graziano, BG Viesta, and COL Valenti.

Herr Hanse and Members of the German Bundestag view the APACHE

Members of a German Delegation are shown during their visit.

MG James Withall (center), Director of the British Army Air Corps, and a member of his staff listen intently while MG Edward M. Browne, right, AAH Program Manager, discusses the survivability features of the AH-64A APACHE.

The Apache . . . Flight and Fight at Night!

By MG Edward M. Browne

AS the foregoing articles on the APACHE have described, we have had a very busy year of integrating and testing. In November of last year we suffered the loss of three of our coworkers and AAH–4. Reprogramming and extra work by all members of the "APACHE Team" has kept the program on schedule. Flying this super machine in the nap-of-the-earth environment simply cannot be matched.

No longer free

Night operational capability offered by the PNVS will enable us to alter battle schemes. The enemy will no longer be free to move under the cover of darkness or inclement weather. The TADS/PNVS will definitely influence the battlefield.

The APACHE with the HELLFIRE missile will provide the improvement/equalizer in defeating the numerically superior Warsaw Pact Armor threat. Routine, around-the-clock assignments will become an everyday occurrence with the APACHE.

Our goals for this year have been met:

We have met or exceeded performance goals.

We have provided the U.S. Army with a new dimension of lethality to our combat power.

The Army/Industry team is making sure that the APACHE can accomplish its tank-killing mission.

Combined Arms Team: **Your APACHE is truly production ready.**

months takeoffs

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