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THE AVIATOR'S NIGHT VISION IMAGING SYSTEM

January/February 1994

Aviation Digest

Professional Bulletin

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Cover: The lead article centers on Army Aviation's night vision goggles training program as it affects the confidence of initial entry rotary–wing aviators. ANVIS AN/AVS–6, depicted on the cover, and the AN/AVS–7, discussed in the second article, give aviators the optimum capability to see in the dark and perform nap–of–the earth and other terrain flight modes. This unique capability provides round–the–clock availability of aviation assets to support the joint and combined arms teams.

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WARFIGHTER 6

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Aviation Restructure—What Does It Mean to You?

As we advance into the new year, the rate of change in our world is amazing. The *Information Age* seems to achieve new success at an almost exponential rate. In fact, the only thing that has not changed is change itself. Technology permeates every facet of our lives. Evidence of revolutionary breakthroughs abounds, from synthetic and composite materials, to instantaneous data transfer, to discoveries in medical research. Clearly, those of us in the military and Army aviation must also be affected by the monumental changes in our environment.

The "Speed of the Competition" requires us to break the old paradigms and resist business as usual. Precision munitions, weapons with the effects of mass, and other sophisticated military hardware are being proliferated throughout the world. High technology is no longer the sole possession of industrialized nations. Developing nations with hard currency are acquiring state–of–the–art weapons systems from cash–strapped nations selling first–rate equipment. This presents new challenges to our National Military Strategy at the very time fiscal realities are leading to downsized forces and reduced training and acquisition budgets.

The new world order calls into question the very essence of how we train, fight, and equip our forces. Ambiguous missions with untold dangers will be the norm. It is in this era of change that Army aviation has found challenge and great opportunity.

The Army Aviation Warfighting Center and the Aviation Branch stand on the threshold of the twenty–first century, poised to move forward with an unprecedented modernization and restructuring plan. The Aviation Restructure Initiative (ARI) will refit our rotary and fixed wing inventories with technologically superior aircraft and provide our Army a total aviation force of highly skilled, agile–minded warriors ready to meet the challenges of future conflict.

Founded on Headquarters, Department of the Army (HQDA) guidance, ARI fixes the deficiencies in the Army of Excellence (AOE) force structure, reduces logistic requirements, drives down total aviation costs, retires old aircraft, and stays within directed resource constraints. For a detailed discussion on the history of ARI and specific changes to organizational structures, please see the series of articles on the Aviation Restructure Initiative beginning with the September/October 1993 issue of the ***Aviation Digest.***

Central to our ability to successfully implement the ARI and displace older, obsolete aircraft with modern airframes is our plan to transition our aviators and maintainers into modern systems. Equipment modernization efforts hinge on divesting the UH–1, AH–1, and OH–58A/C systems from the inventory and replacing them with technologically superior platforms. The modern fleet is based on four advanced systems—the Longbow Apache, the Black Hawk, a follow–on version of the Chinook, and the Kiowa Warrior as an interim to fielding the Comanche. The Army's rotary wing inventory will go from slightly less than 8,000 aircraft in 1993 to just under 5,000 aircraft by the end of this decade. We will realize a total reduction of nearly 3,000 aircraft and a substantial cost savings.

The ARI conversion period starts in Fiscal Year (FY) 95 and continues through FY 99. However, activities are well underway in lead units to ensure a smooth transition that minimizes impacts on readiness. Units will convert to ARI organizations in accordance with an implementation plan approved by the Deputy Chief of Staff for Operations and Plans, HQDA. United States Army, Europe, will convert first, followed by the contingency forces. Our goal is to progress from a fleet ratio of 38–percent modernized airframes to 78–percent modernized by 1999, and ultimately, a 100–percent modernized fleet by 2015.

Currently, we are considering several options for the disposition of older aircraft ranging from foreign military sales to decommissioning in place. However, fiscal realities indicate we will retain some of the older systems in the inventory well past the ARI conversion period. The medical evacuation fleet will use some UH–1s, and an unfunded requirement for a small number of light utility helicopters may be temporarily filled by UH–1s. Extensive planning is underway to ensure we rapidly modernize to meet the challenges of future missions.

With plans in place to field the advanced systems, it is absolutely essential to transition our great aviation soldiers and aviators into the modernized systems. Training base

resourcing presents some challenges, but let me reassure you, they are not insurmountable. Facilities, budgets, and time may not permit immediate transitions into advanced aircraft for every aviator and maintainer, but we are searching for innovative alternatives to reduce the burden this places on the field.

We are studying the feasibility of unit transitions, exportable training packages, temporary duty at Fort Rucker for ground school portions of aircraft qualification courses (AQCs), and several other options or combinations. Regardless of aircraft qualifications, the Personnel Implementation Plan (PIP) will ensure professional development and career enhancing opportunities remain for everyone. The PIP will be fully aligned with the Army Aviation Personnel Plan and other personnel policies and procedures outlined in DA regulations and pamphlets.

The transition plan focuses on the challenges associated with accessions, training, and distribution in order to meet two primary goals. First, we must train and position soldiers to converting organizations early and in sufficient numbers to ensure unit fielding in accordance with the published conversion schedule. Second, we must access, train, and distribute personnel at 100 percent in Force Package One, Two, and Three units to eliminate the unit manning deficiencies embedded in the AOE structure. An important aspect of ARI is accommodation in the structure of all units organized at authorized level of organization 1.

The last goal focuses on increasing warfighting capability and, therefore, aims to fill aviation company level positions first with fully qualified personnel by grade. Again, because of fiscal realities, some units will continue to be equipped with nonmodernized aircraft well past the ARI conversion period. These units will require the same high quality personnel with tactical and technical competence as organizations with modernized systems.

Personnel without advanced transitions should not feel left out; you are far too valuable to the force to be overlooked. The personnel plan ensures everyone will have equitable, career enhancing professional development opportunities. Performance is the key to retention and advancement. It is absolutely vital that we retain the quality people now serving in the older systems until we get them through a modernized transition.

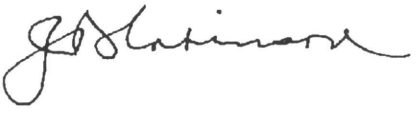
The aviator transition plan begins with several initiatives associated with initial qualification training. First, the Aviation Warfighting Center has reconfigured Initial Entry Rotary Wing (IERW) training from multitrack to dual track. This enables us to shift significant cost savings from initial training into graduate AQCs. Next, the U.S. Total Army Personnel Command (PERSCOM), Office of the Chief, Army Reserve, and the National Guard Bureau will closely manage Reserve Component (RC) new aviator accessions to ensure we have sufficient RC aviators to fill Force Package One, Two, and Three units to 100–percent requirements but, at the same time, reduce overstrengths. Also, to ensure company level units are filled by personnel qualified in the modern systems, most IERW graduates, active and reserve, will be selected by PERSCOM to remain at Fort Rucker to undergo an advanced AQC.

A final initiative is aimed to improve the availability and utilization of our maintainers. Because test pilot flight training resources are constrained, commissioned maintenance officers and maintenance company commanders would complete only the Maintenance Manager (MM) portion of the MM/Maintenance Test Pilot Course for qualification as an aviation logistician (what was known as "15D"). This will allow commissioned officers time to devote to commanding and managing maintenance rather than performing maintenance functions. The bottom line for aviator training is that we will limit aircraft transitions to no more than one advanced qualification per aviator to maximize the number of aviators with an advanced aircraft.

The ARI strategy for transitioning our enlisted soldiers is similar to the aviators in that force structure requirements for modernized systems are significantly increased. Personnel increases reflected in modernized table(s) of organization and equipment are a result of going to the full Manpower Requirements Criteria. Several options are available to train and reclassify our maintainers. Skill Level One soldiers will attend the requisite advanced individual training to be retrained, and transition courses have been or will be established to retrain Skill Levels Two and Three. Senior enlisted soldiers, Skill Level Four, will be transitioned as needed. During the transition and beyond, we must retain the wealth of aviation maintenance experience we have invested in our maintainers of the older systems. Once again, we will have some of these systems well into the next century.

Currently, we are looking at options for maintaining the nonmodernized aircraft as long as they remain in the inventory. In any case, the ARI goal is to train or reclassify as many soldiers in modernized aircraft and supporting military occupational specialties as possible. With highly trained, quality soldiers, Army aviation will be well–suited to maintain the modernized fleet. Readiness will undoubtedly be the beneficiary, and Army aviation will be up to any challenge to ensure decisive victory.

In fact, readiness is the basis for the Aviation Restructure Initiative. History has shown in the post–cold–war era, the international community will look to the United States for policy direction and commitment in areas of regional conflict or natural disaster. In turn, America will expect its men and women of the armed services to implement its foreign policy initiatives. In this uncertain era of great change, Army aviation will be ready. Equipped with technologically superior aircraft and highly skilled, agile–minded warriors, Army aviation will leap into the twenty–first century ahead of the competition and will clearly be "Above the Best."



VIEWS FROM READERS

Junior officer response—missing the point

While I enjoyed reading *"Perspective on a Junior Officer's Perspective,"* (November/December 1993 ***Aviation Digest***) by CW4 Stephen R. Selby, I could not help but notice CW4 Selby's failure to comprehend the message of the two prior ***Digest*** articles.

Both articles, May/June 1993, *"Assignment: Fort Rucker,"* by MG Dave Robinson, and September/October 1993, *Views From Readers, "Assignment: Fort Rucker–A Junior Officer's Perspective,"* by the undersigned, advocated the positive opportunities of current and future assignments to the Army Aviation Warfighting Center. Both focused on the opportunities available to top–quality officers, warrant officers, and enlisted soldiers assigned to Fort Rucker in training the future of Army Aviation.

Unfortunately, CW4 Selby seems to have missed the point. Instead, he appears to have personalized the generalization of "overweight and somewhat complacent instructor pilots . . . from years past." If this statement hit home, I apologize. However, this was only a generalization of past images. It was not intended to lessen the pride or reduce in magnitude the myriad of significant contributions made by the thousands of professional instructor pilots who have served and continue to serve Fort Rucker with distinction.

Last, let me express appreciation for CW4 Selby's contribution to the *Views from Readers* section of the ***Aviation Digest***. Although I did not agree with his position, the ***Aviation Digest*** is **our** digest, which allows us the forum to exchange ideas and dialogue on meaningful issues that affect our profession. The quality of soldiers assigned to Fort Rucker is clearly an issue that affects the future of our branch. With that, I will continue to assert that Fort Rucker is an excellent assignment—full of opportunities for the junior officer.

CPT James R. Schenck
Commander, B Company
1–13th Aviation Regiment
Fort Rucker, Alabama

Feedback from an aerial fire support observer

Response to feature article by LTC Paul J. Pozorski Sr. and CPT(P) Peter E. D. Clymer, Fort Polk, La., "Killing Air Defense Artillery in Low–Intensity Conflict," November/December 1993 ***Aviation Digest.***

Let me add one more player to the field of this operation or any other offensive aviation operation. Please consider using available aerial fire support observers (AFSOs). As senior fire support NCOs, AFSOs are OH–58A/C–qualified and bring their unique skills of indirect fire control to whomever they support. Using an AFSO in the mission proposed would free up the attack helicopter pilot to concentrate more fully on his own mission.

Many AFSOs have further sharpened their close air support (CAS) directing skills by attendance at the Air Ground Operations School. Thus they are perfectly comfortable directing CAS strikes as well—again freeing up the designated attack pilot.

When using a combined arms approach, look to the subject matter experts. Normally assigned six per heavy division, AFSOs are out there just begging for these missions. Aviation brigade FSOs, don't let your dedicated assets be controlled by just anyone. Call your division artillery headquarters or your target acquisition reconnaissance platoon.

We'll be waiting for your call. Fire Support!

SSG John A. Robinson
AFSO
24th Infantry Division
Fort Benning, Georgia

TRADOC Hotline

The U.S. Army Training and Doctrine Command (TRADOC) has established a Warfighting Idea Hotline to solicit suggestions that can be applied in existing doctrine or used to develop future doctrine.

The telephone hotline has gone through a trial within TRADOC after being established in July 1993 by GEN Frederick M. Franks Jr., TRADOC commander.

"Soldiers of all ranks have always contributed to the development of our keystone warfighting doctrine," said COL Gary Griffin, director of the future battle directorate for TRADOC's deputy chief of staff for doctrine.

The major focus of the hotline is on doctrine, materiel, and training

for warfighting environments and operations other than war.

An example Griffin uses to illustrate the type of suggestion TRADOC seeks is the creation of the Culin Hedgerow Device, also called the Rhino or the Culin Fork.

During the fighting in Normandy in World War II, Sherman battle tanks could not penetrate the hedgerows—high, strong shrubs that lined fields in southern France. When tanks were driven over them, their fronts were lifted in the air, exposing their vulnerable undersides to enemy fire.

SGT Curtis Culin III, of the New Jersey National Guard's 102d Cavalry Regiment, suggested adapting the steel underwater barricades Germans had placed around the Normandy beaches. When the contraptions were welded to the fronts of Shermans, the tanks could penetrate the hedgerows and plow through them. Only a few tanks had to be fitted with the device; others could follow through the openings they created.

"Ideas do not have to be as dramatic as the Culin Fork," Griffin said. "We are soliciting imaginative ideas on TRADOC's central areas of focus: doctrine, organization, training, leader development, materiel, and soldiers, as they apply to the battlefield."

A caller to the Warfighting Idea Hotline will be notified that the idea was received and is being considered. The notification will be sent within two working days of a call.

Thirty days later, a suggester will be updated on the status of the idea.

"Every idea submitted will receive fair evaluation," Griffin said. "We realize some may be good, but the Army may not have the resources to implement them. Regardless of whether an idea has merit, each caller will be notified of a status."

The Warfighting Idea Hotline number is 1–800–445–IDEA (4332) or DSN 680–4332.

Warrant officers needed in aviation and aviation maintenance

Despite the Army drawdown, the United States Army Recruiting Command (USAREC) is seeking qualified soldiers to apply for warrant officer training as U.S. Army aviators. The application process is not very complicated; however, four nonwaiverable mandatory prerequisites must be met. Each applicant must—

- Be a U.S. citizen.
- Have a GT Score of 110 or higher.
- Be a high school graduate or have a GED.
- Have a secret clearance before Warrant Officer Candidate School (WOCS) attendance.
- Be at least 18 but less than 29 years old before selection for training.
- Pass a Class IW flight physical.
- Score 90 or higher on the Alternate Flight Aptitude Selection Test (AFAST).

USAREC also is currently seeking qualified soldiers to apply for warrant officer training as aviation maintenance technicians. Four nonwaiverable mandatory prerequisites must be met. Each applicant must—

- Be a U.S. citizen.
- Have a GT Score of 110 or higher.
- Be a high school graduate or have a GED.
- Have a secret clearance before WOCS attendance.
- Have less than 12 years' active federal service—waiverable with Department of Army (DA) approval.

In addition to the mandatory prerequisites, to be competitive, you must have an enlisted feeder military occupational specialty (MOS) directly related to the warrant officer specialty you are applying for. You must also meet specific training and experience prerequisites established by the proponent.

These prerequisites are waiverable; however, waiver requests are reviewed, approved, or disapproved on a case–by–case basis, determined by the proponent.

The aviation maintenance warrant officer specialty MOS—151–A, Aviation Maintenance Technician—is open to interested soldiers. Its required enlisted feeder MOSs are all career management field 67–series MOSs.

Soldiers interested in receiving more information about a specific specialty or wanting an application with instructions are encouraged to call a warrant officer recruiter at—commercial 502–624–0820/0832/8779/8789 or DSN 464–0820/0832/8779/8789 or write to—

Commander
USAREC
ATTN: RCRO–SM–O
Fort Knox, KY 40121

If you have a written request, include the following information—

- Name and rank.
- Primary MOS.
- Complete unit mailing address.
- Years of federal active service.
- Return mailing address.

U.S. Military Academy needs graduate students–instructors

The Department of Social Sciences at the United States Military Academy, West Point, N.Y., is looking for highly qualified company–grade Reserve Officers' Training Corps (ROTC) or Officer Candidate School (OCS) officers from Basic Yeargroups 1986 to 1990 who are interested now or may have a future interest in civilian graduate study, followed by a teaching assignment at West Point.

The Department of Social Sciences educates cadets in the academic disciplines of political science (American and international) and economics. The department's selection process is exceptionally competitive and requires officers to express their interest early—it is never too early to begin the application process.

Applications must include reported graduate record exam (GRE) or graduate management admissions tests (GMAT) scores. Selection criteria include branch qualification before beginning graduate school, demonstration of strong long–term military potential, and undergraduate or graduate records that indicate the ability to gain admission and successfully complete graduate study at a top American university.

For more information, write to West Point:

Department of Social Sciences
United States Military Academy
ATTN: CPT Dana Isacoff
West Point, NY 10996

Source for DOD technical information database products and services

The Defense Technical Information Center (DTIC) is the central point within the Department of Defense (DOD) for acquiring, storing, retrieving, and disseminating scientific, technical, and engineering information.

DTIC's Online Services

• *Defense Research, Development, Test and Evaluation Online System (DROLS)* provides online access to DTIC's databases (Technical Report Bibliographic Database, Research and Technology (R&T) Work Unit Information System, and Independent Research & Development Database).

• *Technical Report (TR) Bibliographic Database* is a collection of nearly two million bibliographic records and abstracts of products such as technical reports, patent applications, conference papers, theses, software, data files, databases, and videos.

• *Research & Technology (R&T) Work Unit Information System (WUIS)* is a collection of ongoing DOD research and technology. WUIS answers the questions of what, where, when, how, at what cost, and by whom research is being performed.

• *Independent Research and Development (IR&D) Database* contains descriptions of technical program data, proprietary to federal government contractors that furnish it. Access is limited to DOD personnel and to other federal agencies with the approval of DOD. Online access to this proprietary data can be accommodated only through a classified terminal.

• *Department of Defense Gateway Information System (DGIS)* offers access to more than 1,000 commercial and governmental databases. Its sophisticated capabilities include post–processing, electronic mail, and access to the Internet.

• *SearchMAESTRO (Menu–Aided Easy Searching Through Relevant Options)* is a menu–driven system that helps novice searchers access more than 900 commercial and government databases.

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For more information, contact the Product Management Branch, commercial 703–274–6434 or DSN 284–6434, or write to DTIC–BCP, Building 5, Cameron Station, Alexandria, VA 22304–6145. The electronic mail address is—bcporder@dgis.dtic.dla.mil. You can order any of DTIC's database products and services through your agency's library.

Test pilot reunion

U.S. Air Force (USAF) Test Pilot School (TPS) alumni and friends will gather for a trip back in time when the school celebrates its 50–year reunion, 7–10 September. The newly formed TPS Alumni Association is updating the graduate roster and has begun planning for events representing the varied professional and social characteristics of the school.

The search for information about TPS graduates and staff has been complicated by the transient character of military life. More than 2,000 men and women, from the United States and 21 foreign countries, have attended classes at the school since its creation as the "Flight Test Training Unit" at Wright Field, Dayton, Ohio, in 1944. Moves to Vandalia Field (now Dayton International Airport) and Patterson Field preceded the 1951 transfer of all flight and academic activities to Edwards Air Force Base (AFB), Calif. Several name changes over the years have reflected the varied curriculums. Its naming as the "USAF Aerospace Research Pilot School (ARPS)" in 1961 showed a shift in emphasis to support manned space flight training. Redesignation to the current "USAF Test Pilot School" occurred in 1972.

Plans for anniversary activities include a facility open house, past and present aircraft in ground display and aerial demonstration, and classic barbecue and evening social events as well as sport tournaments. An aerial/auto rally, similar to events held by students in the 1950s, is expected to be the favorite of attendees.

Special hotel and event packages are being created for the celebration.

A fiftieth anniversary pictorial history of the school and a cookbook of favorite recipes of the students and staff throughout the years are being created. Both are seeking submissions of material and anecdotes for publication.

All past students, staff, and friends of the Wright–Patterson AFB and Edwards AFB schools are asked to contact the USAF TPS Alumni Association; P.O. Box 404; Edwards, CA 93523–0404, with updated addresses and information about their relationship to the school as soon as possible.

Army Science Conference

The 1994 Army Science Conference sponsored by the Assistant Secretary of the Army for Research, Development, and Acquisition, Department of the Army (DA), will be held at the Peabody Orlando, Orlando, Fla., 20–24 June. The conference theme is "Army Science Conference: Assuring the Competitive Edge" for soldiers in the twenty–first century. The conference anticipates featuring presentations of 110 papers and posters judged as best among those submitted by Army scientists and engineers. Authors of the most outstanding papers will be selected to receive special recognition and awards. The audience will include representatives from academia, industry, U.S. Government officials, and allied–nation officials.

Conference exhibits will be available throughout the conference to demonstrate the latest technologies in government laboratories and research, development, and engineering centers. This setting will encourage face–to–face discussions. For more information about the conference, contact—

Department of the Army, U.S. Army Research Office, ATTN: Mr. Donald Rollins, P.O. Box 12211, Research Triangle Park, NC 27709–2211, FAX: 919–549–4310; DSN 832–4310.

The conference will—

- Provide a forum for the Army's best research and science.
- Enhance networking among those at the state–of–the–art.
- Share accomplishments with academia, industry, and the Army leadership.
- Give Army scientists recognition and appreciation.

Programs areas to be presented include the following:

- Advanced materials and manufacturing (including structures and energetics).
- Microelectronics and photonics.
- Sensors and information processing (including communications).
- High–performance computing and simulation (including modeling, displays, artificial intelligence, and virtual reality).
- Advanced propulsion technologies (including mobility and lethality).
- Power generation, storage, and conditioning (including directed energy).
- Biotechnology.
- Life, medical, and behavioral sciences.
- Environmental sciences and geosciences (including space and environmental protection).
- Engineering sciences (including robotics, structures, mechanics, fluid dynamics, and survivability).

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Photo: U S Army

The Effect of the U.S. Army Night Vision Goggles Qualification Training Program on the Confidence Level of Initial Entry Rotary–Wing Aviators

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U.S. Army helicopter operations using night vision goggles (NVG) are becoming more vital to the mission of Army Aviation. Major General Rudolph Ostovich III, (Retired), former Commander, U.S. Army Aviation Center, Fort Rucker, Ala., said, in 1990, "Every soldier who graduates from flight school at Fort Rucker is qualified to fly at night. It is simply the way we do business. Army Aviation owns the night and we plan to keep it that way." This statement indicates the importance of effective NVG operations.

During the past 10 years, heightened Armywide concern about the safety of NVG has contributed to increased research. While researchers have documented many limitations of goggles use, none have categorically condemned NVG as being unsafe. The key factors of safe NVG operations appear to be pilots' awareness on the limitations of NVG usage and proper training.

Since NVG use is an unnatural way to view the world, aviators may be apprehensive when flying a helicopter wearing NVG. Contributing to aviators' potential apprehension is the controversy surrounding NVG. It is possible that before NVG qualification, aviators have a negative view of NVG effectiveness and safety.

Purpose

This article discusses to what degree apprehension in U.S. Army initial entry rotary–wing (IERW) students exists before the U.S. Army NVG qualification training, and the students' confidence level on goggles use after completing qualification training.

Review of Related Literature

In 1990, the U.S. Army had just completed one of its safest years on record in Army Aviation (Furson, 1990). According to Furson, this accomplishment reflected the general decrease in daytime flight accidents.

However, recently the number of night flight accidents has increased. Night accidents currently account for about one third of the total rotary–wing accidents, fatalities, injuries, and cost. Although NVG use is not specifically responsible for the increase in night–related accidents, there is speculation about the effectiveness of the current U.S. Army NVG qualification training.

According to Leber (1985), frequently a technological advancement is introduced into military systems with benefits so great that little effort is expended to optimize its use by human operators.

Several studies have concluded that physiological limitations exist using NVG, Leber (1985), Dudley (1990), Wiley (1976), and Wiley (1989). Because of physiological limitations and negative press concerning NVG use, students embarking on NVG qualification often are noticeably apprehensive about the training, Loro (1991). Apprehension may produce stress that could lead to many undesirable effects on performance while flying, Schul (1990).

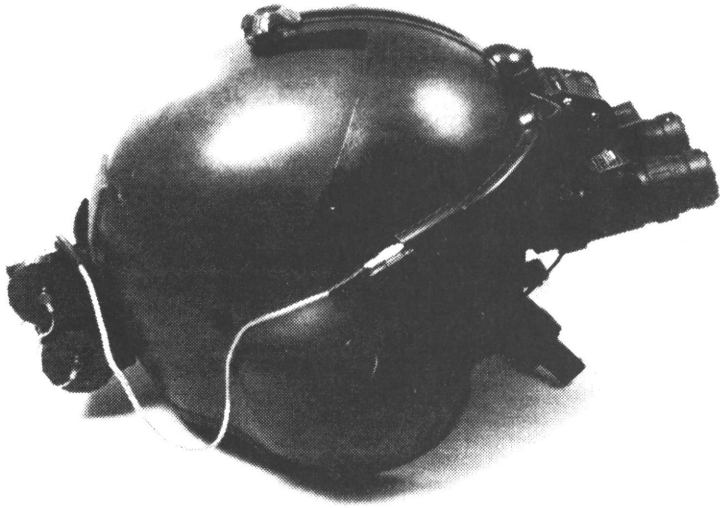
Statement of Hypothesis

The research evidence strongly suggests that NVG use presents physiological and possibly psychological difficulties to student pilots and rated aviators. Also, it was established that, before exposure to NVG, students were aware of the controversy surrounding NVG use. Therefore, it was concluded that IERW student pilots, while apprehensive before NVG qualification, became confident and positive in their ability to use NVG after the U.S. Army NVG qualification training was completed.

Subjects

Students for this study were selected from a population of about 1,000 U.S. Army IERW flight students' undergoing training at Fort Rucker. The U.S. Army arbitrarily divided the population into 10 intact groups of about 100 students so that a proper ratio of students to aircraft could be managed. The groups were called flights. All flights were treated the same and took part in the same training. Each flight had a cultural mix similar to that of the United States itself.

Included in the total population was a significant number of warrant officer candidates (WOCs). The WOCs had a highly controlled lifestyle while in training by U.S. Army training and counselor (TAC) officers. Since the lifestyle of WOCs was different from commissioned officer flight students, it was likely to affect the outcome of the experiment. A stratified sample of an equal number of WOCs was included in each group. No effort was made to ensure equal representation of males and females in the groups.



ANVIS–AN/AVS–6

Instrument

A Lickert Scale (1932) was the measuring instrument for this study. The Lickert Scale is a well–proven instrument for measuring attitudes. The scale was designed using Strongly Agree = 1, Agree = 2, Undecided = 3, Disagree = 4, Strongly Disagree = 5. In effect, it was a 1 to 5 scale. A low number represented a favorable view toward NVG, while a high number represented a negative attitude toward NVG.

The questionnaire (see Appendix) was constructed with the assistance of Chief Warrant Officer 3 (CW3) Steven Loro, the officer in charge of training at the Army Aviation Night Vision Device Laboratory. Every effort was made to ensure honesty in the responses.

CW3 Loro assisted in preparing the content of the measuring instrument used in this study so that it sampled the situation about which conclusions were drawn. The Lickert Scale study was determined to be an economic and practical method of collecting data related to the attitudes of U.S. Army IERW students and their attitude towards NVG.

Design

Two intact groups with officer grade level as a blocking variable were selected for this study. (See table 1.) This design was selected because of the lack of random assignment of the subjects to the groups. Each questionnaire was numbered so that a random selection of the questionnaires could be obtained after the questionnaires were completed.

Table 1. Two Intact Groups With Blocked Variable

Group	No.	Block	Treatment	Post Test
1	15	WOC[a]	NVG Tng	Lickert Scale
	15	COMM[b]		Questionnaire
2	15	WOC[a]	No NVG Tng	Lickert Scale
	15	COMM[b]		Questionnaire

[a]Warrant Officer Candidate [b]Commissioned Officer

Procedure

One group of about 100 students was randomly selected from among those flights that had received NVG training. Another group of about 100 students was randomly selected from among those flights that had received no NVG training. From each of these two groups, 30 students (15 WOCs and 15 commissioned officers), were randomly selected using stratified sampling techniques. The officer in charge of each flight administered the Lickert Scale questionnaire.

Data Analysis

The Lickert Scale questionnaires used in this study had 11 questions. The questions had a choice of five responses ranging from Strongly Agree to Strongly Disagree. The scale was arranged as follows: Strongly Agree = 1, Agree = 2, Undecided = 3, Disagree = 4, and Strongly Disagree = 5. In effect, it was a 1 to 5 scale. A lower score for each question equated to a favorable response, while a higher score indicated an unfavorable response. Since the scale from 1 to 5 is considered to be an interval scale, a mean score for each question was computed. A T–Test of independent means was used to compare the means for each question between the two groups.

Results

Table 2 provides the basic data describing the responses to the questions on the questionnaire. Although some questions produced similar responses, others produced significant differences at the 0.05 test level. All of the responses to the questionnaire were more favorable toward NVG after receiving NVG training. Only questions 4, 9, and 11 revealed significantly different results in favor of NVG training.

Table 2. Descriptive Data

Group 1 No NVG Training				Group II NVG Training			
Question	Mean	Standard Deviation (SD)	No.	Mean	SD	No.	p
1	1.700	0.750	30	1.667	0.711	30	0.8604
2	1.400	0.675	30	1.400	0.498	30	1.0000
3	1.433	0.679	30	1.366	0.556	30	0.6789
4	1.733	0.785	30	1.367	0.556	30	0.0412
5	1.533	0.776	30	1.533	0.629	30	1.0000
6	1.700	0.837	30	1.833	0.950	30	0.5662
7	2.500	0.820	30	2.267	0.828	30	0.2772
8	2.100	1.029	30	1.733	1.112	30	0.1902
9	2.167	1.085	30	1.467	0.571	30	0.0035
10	3.100	0.923	30	2.667	1.155	30	0.1138
11	2.400	1.192	30	1.700	0.837	30	0.0108

Question 4 assessing student pilots' attitude toward equipping all Army aircraft with the ability to perform NVG missions indicated that students, after NVG training, felt significantly more favorable toward this idea than before NVG training.

Question 9 revealed that student pilots, after receiving NVG training, believed NVG will improve their night flying performance. This favorable opinion of NVG was significantly more favorable after NVG training. Question

11 gave the student pilots the choice of flying with or without NVG. Students, after NVG training, responded significantly more favorably toward this question, choosing to fly with NVG.

Conclusion

The present results highlight the fact that the U.S. Army NVG qualification training program improves the confidence of IERW aviators. Perhaps more important, the results indicate IERW students are not overly apprehensive before NVG training. *Studies have concluded apprehension may produce stress that could lead to many undesirable effects of performance while flying, Schul (1990).*

Higher confidence levels reduce apprehension, thereby enhancing future training and performance. Since none of the questions on the questionnaire received unfavorable responses, it is unlikely that the success of the U.S. Army NVG training program is threatened by overly apprehensive students.

This study supports, at lease in part, the fact that the U.S. Army NVG program is healthy. Because of the results of the total mean scores ($\bar{x} = 3.96$, no NVG training and $\bar{x} = 3.49$ with NVG training), I suggest that a repeated measures study be done on the same group of students. Because of time requirements imposed on this study, a same–group study was impossible. Also, a comparison between male and female students' undergoing training may provide some interesting results.

APPENDIX

RANK _____ SEX _____ AGE _____

SCALE: A = Strongly Agree B = Agree C = Undecided
D = Disagree E = Strongly Disagree

1. I have the flying ability to fly NVG missions.
   A B C D E
2. I have the physical ability to fly NVG missions.
   A B C D E
3. I have the emotional stability to fly NVG missions.
   A B C D E
4. All Army aircraft should be equipped to fly NVG missions.
   A B C D E
5. I want the opportunity to fly NVG missions.
   A B C D E
6. Not being able to fly NVG could affect my career.
   A B C D E
7. NVG are safe.
   A B C D E
8. It is safer to fly with NVG at night than to fly at night with unaided vision.
   A B C D E
9. NVG will improve my night flight performance.
   A B C D E
10. NVG are not difficult to use.
   A B C D E
11. If I had a choice, I would want to fly with NVG.
   A B C D E

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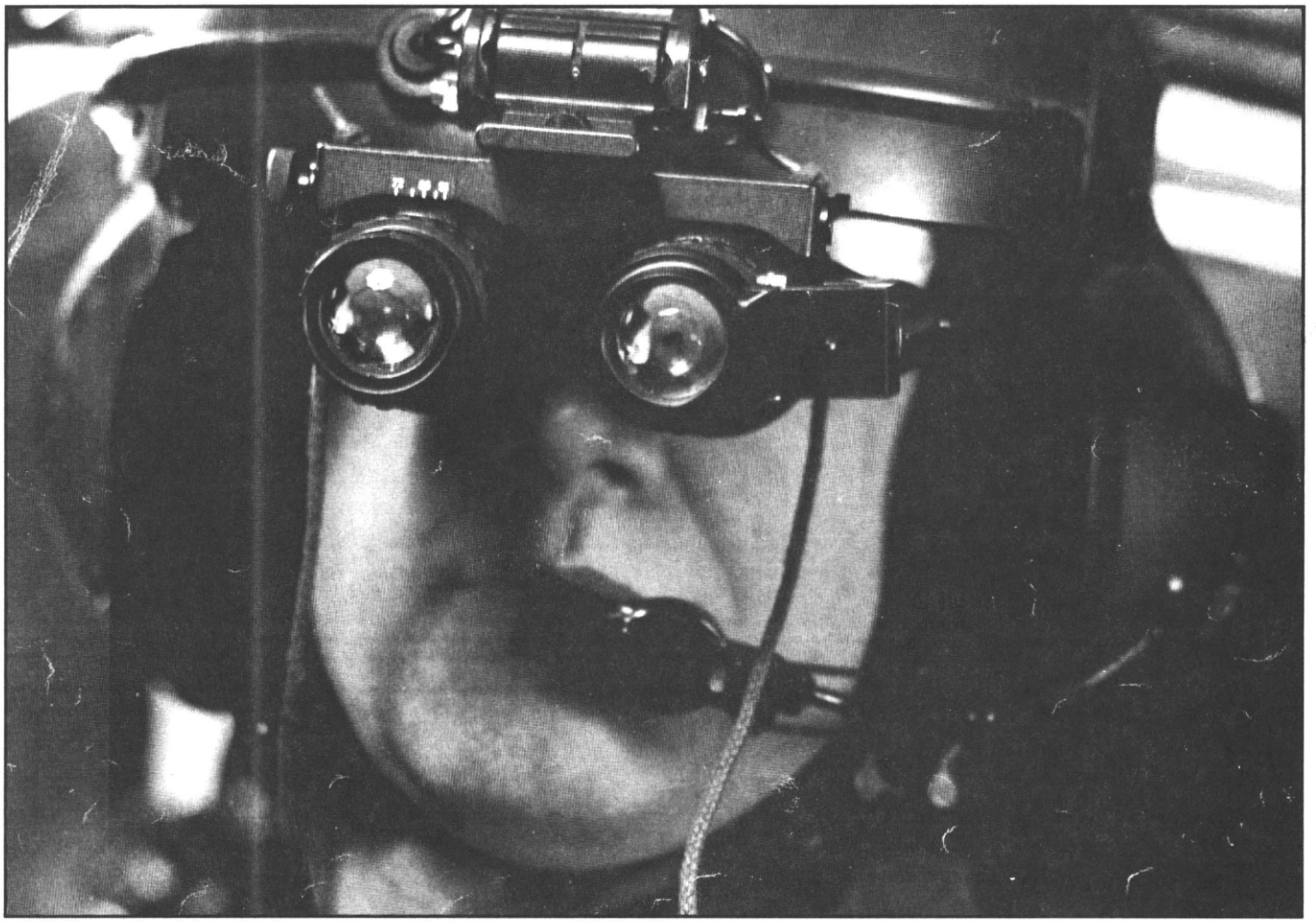

Photo: U.S. Army

AVIATOR'S NIGHT VISION IMAGING SYSTEM, TOTAL PERFORMANCE

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Fort Belvoir, Virginia

In the operational environment of Army Aviation, the Aviator's Night Vision Imaging System (ANVIS), AN/AVS–6, is mission–essential equipment for night operations. The ANVIS has profoundly altered Army Aviation history. The aviator must see at night, and that insatiable need "to rule the night" is accomplished with ANVIS.

ANVIS is an electro–optical system designed to provide aviators with the optimum capability to see in the dark and perform nap–of–the–earth and other terrain flight modes during starlight conditions.

The ANVIS system provides a very cost–effective night pilotage system that was highly effective during Operations Just Cause and Desert Storm.

OMNIBUS II Contract Features

The ANVIS system was first fielded in 1984, and its design has been improved many times since. Changes during the 1980s included:

- Improved third generation image intensification tube resolution to operate effectively at lower light levels.
- Redesigned battery packs that accept AA batteries (BA–3058) and lithium batteries (BA–5567).
- Increased electromagnetic interference system protection.
- Laser protection with light interference filters.
- Redesigned light emitting diode (LED) in the visor mount, which allows the LED to blink, making the low–battery indicator more visible.
- System construction material changes from LEXAN to ULTEM making the parts more durable.

These design changes were accomplished through constructive feedback from the aviator, the maintainer, and

operational lessons learned. They were also achieved through cooperation of the manufacturers in a way that continually improved their management and quality–control processes to manufacture image intensifier (I^2) tubes. These manufacturers are at a point where they are consistently producing high–performance tubes with minimal defects.

Safety in aviation is paramount. The best way to make ANVIS safer is by continually considering and improving reliability, availability, and maintainability.

It takes considerable effort to produce a highly reliable image tube. Manufacturers of this tube combine technologies that create an integrated product using microchannel plates, miniature power supplies, gallium arsenide photocathodes, phosphor screens, fiber optics, and sophisticated vacuum technologies. This creation is the heart of the ANVIS system and means better performance under a wide range of low–light conditions.

OMNIBUS III Contract Changes

The most recent changes will come about when deliveries of the OMNIBUS III contracts begin. These systems will be fielded by the Project Manager Night Vision & Electro-Optics (PM–NVEO) starting in fiscal year (FY) 1994. Enhancements to the OMNIBUS III ANVIS system include:

- 25 millimeter (mm) eye relief eyepieces.
- Increased fore–aft adjustment range.
- Independent interpupillary (eyespan) adjustments.
- Smoother objective, eyepiece, and binocular movements.
- Greater improvements in tube performance.
- Increased tube reliability (10,000 hours minimum).

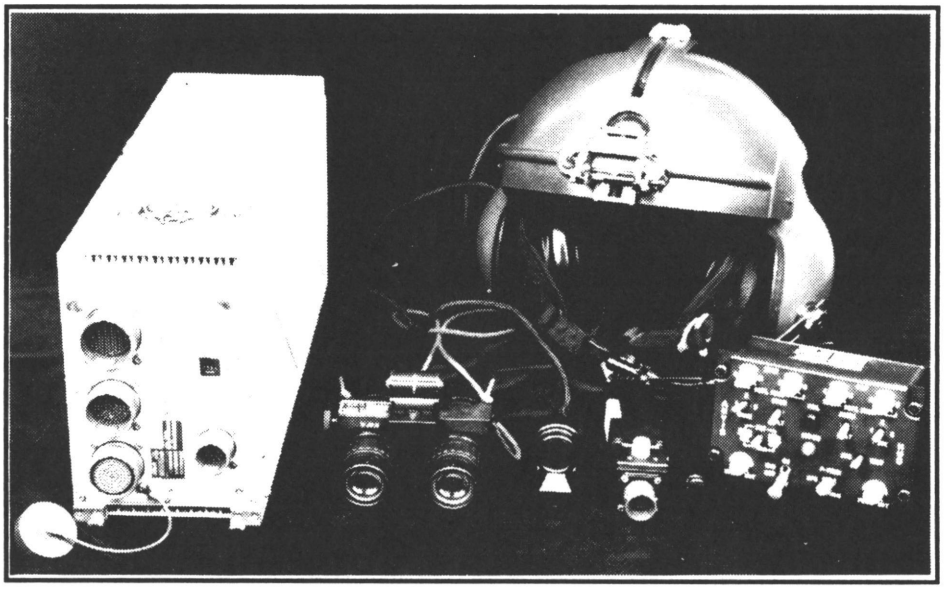
These design changes will allow the aviator to more effectively accomplish his mission. Many aviators cannot currently obtain a full 40–degree field of view (FOV) because their eyes are too far from the eyepieces. Currently fielded eyepiece assemblies are designed to be set at a maximum distance of 15mm from the eye to see a 40-degree FOV. The most comfortable setting of eye–to–eyepiece distance is greater than 15mm for many aviators, however. The distance of the lens assembly from the eye is called eye relief. If the current eyepieces are adjusted beyond the 15mm eye relief, the FOV is reduced. The new 25mm eye relief eyepieces have larger diameter lenses than the current eyepieces allowing the aviator to adjust the ANVIS to a distance of up to 25mm from the eye and still maintain the full FOV.

Another design change proposed as part of the new contracts is independent interpupillary distance (IPD) adjustment or eyespan adjustment. The current system is designed so that both monocular assemblies move either toward or away from the centerline of the goggles as the IPD knob is turned. The new ANVIS will have IPD knobs on both the right and left hand sides of the goggles to adjust each monocular individually. Because our eyes are not necessarily symmetrical with respect to the centerline of our face, individual IPD will allow each aviator to "custom fit" each monocular to the location of his own eyes. This feature further enhances the aviator's ability to achieve the full field of view in both eyes.

The fore/aft adjustment range of the new ANVIS also has been increased. The combination of the new 25mm eye relief eyepieces and the increase in fore/aft adjustment range allows aviators who wear eye glasses to set their goggles and still achieve the full 40–degree field of view. In addition, the increase in available adjustment range away from the face will allow protective masks to be used more effectively with the ANVIS. Improved look–around capability for direct view of the cockpit instruments is another benefit resulting from the increase in fore/aft adjustment range. Advances in image intensification tube technology have led to improvements in both quality and reliability. The new ANVIS will incorporate improved image tube resolution to provide a much sharper and clearer image to the aviator. In addition, the new image tube will last at least one third longer than currently fielded image tubes, thereby increasing operational availability and readiness. The image tube is truly the heart of the ANVIS system.

Procurement Techniques

An innovative procurement technique, best value, allowed the product enhancements described above to be adopted as part of the new ANVIS system. The PM–NVEO, with the U.S. Army Communications–Electronics Command (CECOM) procurement office, awarded two OMNIBUS III



contracts in November 1992. The ANVIS portion of these contracts amounted to $8 million, which was split between ITT, Roanoke, VA (60 percent) and Litton, Tempe, AZ (40 percent). The contracts procure both ANVIS systems and spare parts and also have options available to support future force structure changes.

The ANVIS system offered by each manufacturer was required to meet the minimum Statements of Work and specification requirements provided with the solicitation. The best–value approach to procurement also allows improvements to the minimum requirements to be offered. It is somewhat analogous to ordering off of a menu. A menu provides many available options and the customer then chooses the combination that best suits his needs and available resources. A "wish list" of possible enhancements was compiled using lessons learned from the field and Operations Just Cause and Desert Storm. The list was included as part of the solicitation package. The contracts resulted in a more robust product that includes many "best values" for the ANVIS system.

The Army Acquisition Executive has praised the best–value acquisition strategy as an example of how procurements should be structured to obtain the best possible equipment for the soldier. The new ANVIS is a total system designed together by the aviator, the maintainer, and the manufacturer. This joint effort has resulted in the best possible ANVIS for the ultimate user, the aviator.

ANVIS/HUD

The PM–NVEO and Night Vision & Electronic Sensors Directorate are working together to continue improvements for pilotage.

ANVIS HUD (AN/AVS–7) is a modification to the ANVIS (AN/AVS–6) that will collect instrument symbology and display it in one eyepiece of the goggles. The system will allow "heads–up" flight without the need to continuously look down at the instrument panel. ANVIS heads–up display is currently in the production phase. First unit equipped is scheduled for October 1994.

The advanced image intensifier is a Department of the Army–approved advanced technology demonstration. The leap–ahead technologies demonstrated apply for both ground and aviation helmet–mounted applications. It will increase by 50 percent the FOV, integrate flight symbology, with both low–light and high–light improved visual acuity and human factors designs. In addition, it will be capable of displaying imagery from thermal sensors. System development is scheduled to start in early 1994 with user evaluation scheduled for FY 1995.

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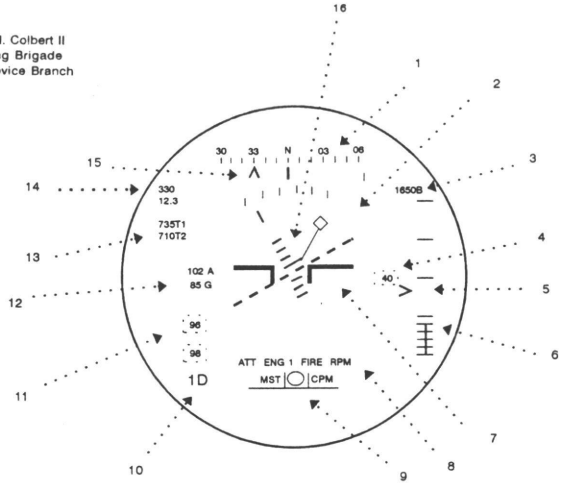


Symbology List

1. 120 Degree Heading Tape
2. Velocity Vector & Accel Cue
3. * Barometric Altimeter
4. Radar Altimeter Digital
5. Vertical Scale Indicator
6. Radar Altimeter Analog
7. * Aircraft Reference Symbol
8. Warning Panel
9. Trim Indicator & Master Caution
10. HUD Mode Indicator
11. * Torque Indicators
12. * Airspeed / Ground Speed Indicators
13. Engine Temperatures
14. Direction Next Waypoint & Distance
15. Next Waypoint Caret
16. * Attitude Indicator

* Indicates nonremovable symbols.

Seven 7 CRUCIAL ELEMENTS TO ACHIEVE COMBAT READINESS

CW3 Blaine Pendleton
OH–58D(I) Instructor Pilot
E Troop, 2–229th Attack Helicopter Regiment (AHR)
Fort Rucker, Alabama

"Don't major on the minors and don't minor on the majors."
Anonymous

"When you don't have time to do everything, make sure you focus on the right things."
Lieutenant Colonel Kenneth L. Travis
Commander, 2–229th AHR
Fort Rucker, Alabama

These simple statements contain valuable wisdom; the principles they promote are easy to understand. And they are crucial to achieving and maintaining combat readiness in Army Aviation today.

Every commander in the field knows well the tremendous challenges imposed by all the personnel upheavals, unit restructuring, and reduced operating budgets. Despite the challenges, we must all be prepared to perform our unit's Mission Essential Task List (METL) to standard. How can we be prepared to do that with the obstacles we face? By applying the two opening statements!

When briefing incoming action officers, Colonel Ted Cordrey, former Training and Doctrine Command (TRADOC) System Manager (TSM) for the Kiowa Warrior, gave this advice, "You're going to be doing a juggling act in this job because you have more to do than time or resources allow. To succeed you must figure out which of the balls you're juggling are glass and which are wood. Don't drop any glass balls!"

Today we are all performing a juggling act. We need to ask ourselves, "Which of our responsibilities are glass and which are wood?"

This article applies these words of wisdom to the combat readiness of a tactical unit. We'll examine seven vital areas: command climate, safety, standardization, battle rostering, mission preparation, realistic training, and afteraction review. The OH-58D Kiowa Warrior–equipped air cavalry unit is referenced; however, regardless of the type of unit or aircraft, the ideas discussed benefit all.

BACKGROUND

The motivation for this article came from the recent Kiowa Warrior Force Development Test & Experimentation II (FDT&E).

E Troop, 2–229th AHR, Fort Rucker, conducted the FDT&E during the first OH–58D(I) rotation at the Combat Aviation Training Brigade (CATB), formerly the Apache Training Brigade, at Fort Hood, TX, during October-November 1993. The FDT&E was declared a tremendous success by all concerned from participants and evaluators through various agencies at Department of the Army and Department of Defense.

Significant is the fact that the unit went from aircraft transitions through Troop certification in less than a year.

The crucial factor in the success of the FDT&E was E Troop's ability to employ and maintain the Kiowa Warrior armed reconnaissance aircraft. When the last missile had been fired and the last zone reconnoitered, E Troop unquestionably emerged as a highly trained, proficient, and extremely skillful air cavalry troop. Aircraft availability surpassed 80 percent throughout the test. Missions were executed like clockwork with objective times consistently achieved within seconds of those required in mission orders. Reconnaissance tasks were completed in a timely manner with performance routinely exceeding expectations. All aircrews qualified on the gunnery tables.

E Troop set an Armywide record for HELLFIRE engagements over the previous 2 years by scoring a perfect

100 percent firing autonomous and remote designations, Lock–On Before Launch (LOBL) and Lock–On After Launch (LOAL), and even ripple fire (one aircraft launches multiple missiles on separate codes for multiple designators). Most importantly, even though over 50 percent of all flight hours were night vision goggles (NVG) at nap of the earth (NOE) altitudes with many against actual threat vehicles or on a gunnery range, E Troop concluded the entire trainup and FDT&E accident and incident free.

Was it superior skill and intelligence that enabled E Troop to achieve such fantastic results? No. They merely followed the wisdom found in the opening statements and focused on the right things! Let's get to the meat of this article and address specifically what those right things are for tactical training.

COMMAND CLIMATE

This is the pivotal area upon which all others depend. A command climate that stresses safety first, followed closely by realistic training, is essential to success. Too often we see safety or realistic training being paid only lip service. A successful commander stresses both with conviction and keeps them in their proper perspective.

Another piece to the command climate equation is the need to provide clear , concise direction, but not micro-manage people. A good commander knows how and when to provide guidance. As those who receive that guidance, warrant officers, especially senior warrants, should respect and support their commander. When differences of opinion arise, the rule is to appeal to those in authority, not confront them. If possible, address disagreements in private; don't be one who stirs up dissention. The commander is the key ingredient to command climate; those under his charge contribute positively or negatively.

The last item we'll discuss under command climate is esprit de corps. It's the overall positive attitude and sense of pride reflected by the unit. A good commander can make soldiers work long and hard and do it with a smile on their face. He does this by fostering an air of professionalism in the unit and keeping esprit at a high level. All members need to know they are an important part of a winning team. To achieve this the commander must treat them that way.

SAFETY

"It's not just paragraph six in the OPORDER [operation order]."

Safety must permeate everything a unit does—from flying a mission to

A Kiowa Warrior fires a 70mm rocket during a gunnery exercise.

putting up a tent. The guideline of "crawl–walk–run" must be applied to all aspects of training. Avoid the temptation to proceed faster than is prudent because of real or perceived pressures. Call timeout if necessary. When flying allow the extra 10 feet of altitude, slow down 10 knots, and give yourself an extra 10 feet of clearance from obstacles. Don't take a chance on weather; the old saying "it's better to be on the ground wishing you were flying than to be flying and wishing you were on the ground" is one to keep in mind. Stick to the unit's crew endurance policy, and not just the letter but the spirit. Ensure adequate flightline/assembly area procedures are established and adhered to by air and ground personnel. Properly ground guide vehicles. Know who to call if you shouldn't be driving home from the club...and so on.

Be aware of two ends of the spectrum that historically lead to accidents: boredom with routine or an unhealthy sense of urgency. Many mishaps can be traced back to one of these two factors. Mission briefers need to assess whether or not a flight has the potential to be influenced by either one.

The extra time it takes to operate safely is actually time saved when compared to how much a unit loses because of a mishap or accident—not to mention the monetary loss in damaged equipment or grief caused by serious injury or death.

STANDARDIZATION

This is another element that is key to operational success. The best way to achieve it is with a good tactical standard operating procedure (TACSOP). The TACSOP should be a "living" document with pen–and–ink updates as well as periodic printed changes. It must be a detailed and thorough how–to–fight book and contain information essential to mission accomplishment such as planning checklists, weapons matrices and mission–oriented protective posture (MOPP) levels. It should not contain a bunch of trivia or minutia. It needs to reflect the most current doctrine and tactics, techniques, and procedures (TTPs) published by the U.S. Army Aviation Center, Fort Rucker.

All aviators must thoroughly know and understand it. Important sections in a TACSOP for a Kiowa Warrior–equipped unit include:

- COMMAND, CREW, AND TEAM RESPONSIBILITIES
- AIRCRAFT SYSTEM CONFIGURATION AND SET–UP
- PREMISSION ACFT READINESS/ORAL WARNING ORDER
- RUN–UP THROUGH TAKEOFF PROCEDURES/COMMO CHECKS
- TECHNIQUES OF MOVEMENT AND FORMATION FLIGHT
- ROUTE PLANNING AND EXECUTION
- AREA RECONNAISSANCE (planning and execution)
- LZ/PZ RECONNAISSANCE (planning and execution)
- ROUTE RECONNAISSANCE (planning and execution)
- ZONE RECONNAISSANCE (planning and execution)
- SCREEN OPERATION (planning and execution)
- ATTACK OPERATION (planning and execution)
- RELIEF ON STATION (planning and execution)
- NBC AERIAL SURVEY (planning and execution)
- NBC PROTECTIVE EQUIPMENT/MOPP LEVELS
- STANDARD TACTICAL AIR MISSION BRIEF
- TACTICAL MISSION DEBRIEF
- AFTERACTION–REVIEW
- FIGHTER MANAGEMENT (Crew endurance)
- MISSION ABORT CRITERIA
- DOWNED AIRCRAFT PROCEDURES
- READINESS CONDITIONS (REDCON)
- HAND AND LIGHT SIGNALS
- CREW BRIEFING CHECKLIST
- HELLFIRE INFORMATION
- 70mm ROCKET INFORMATION
- ARMING/RE–ARMING CHECKLIST
- REPORT FORMATS

No discussion of standardization is complete without addressing battle drills. A battle drill essentially involves multiple aircraft performing standardized actions without the application of a deliberate decision–making process. A battle drill is the link between an individual aircrew training manual (ATM) task and a unit performing a mission. A battle drill can be likened to infield practice for a baseball team; each member instinctively knows what they are to do when the ball is hit to a particular place with runners on specific bases.

For years battle drills were imbedded in sections of a unit's TACSOP. In many cases they still are. Reality is that we as a Branch are still growing in incorporating formalized battle drills. It's very beneficial for units to break them out into a separate document and conduct training flights focused on specific battle drills.

BATTLE ROSTERING

Experience proves the tremendous enhancements gained through strict adherence to battle rostering, especially in aircraft like the Kiowa Warrior where an aviator must become qualified in each seat. E Troop carried this further than merely crewmembers and seat positions. Assignments were made for aerial weapons teams (AWTs) of two aircraft each, and the position of Team Lead and Wing within the AWT.

The goal is to mature an aviator from a pilot to pilot–in–command (PC) of the Wing aircraft, and ultimately to PC/Team Lead of an AWT. Even after thousands of flight hours,

opinions differ as to whether a Kiowa Warrior PC should operate in the left seat or right seat, or if a new aviator should start in the left seat and progress to the right or vice–versa (the mission equipment package is operated from the left seat and the aircraft is flown and weapons fired from the right seat). Good arguments are made for both opinions in either case.

E Troop generally went with PC/ Team Leads in the right seat managing the macro aspects of their AWTs mission. However, the commander flew in the left seat of his aircraft and operated in a "quarterback position," one or two control measures behind the forward AWTs. This enabled him to manage the macro aspects of a mission at the Troop level rather than getting bogged down in only part of it in a particular AWT. In addition, it allowed his aircraft to maintain a screen if a gap developed between AWTs during a relief on station, or add additional firepower when and where necessary. (Oops, almost got side tracked on TTPs.)

Clearly, the optimum method to extract the most proficiency from individuals and capability from a unit is to battle roster to the maximum extent possible. Some would argue that flexibility is lost. The truth is that, if the TACSOP advice above is followed, flexibility is actually increased. This is because, if there must be crew or team swaps, you are swapping much more proficient aviators. E Troop easily adapted the few times crewmembers or AWTs were changed around. Last but not least, if there are an uneven number of pilots, the IP is a good selection for "odd man out." He can best fill any seat that becomes vacant for whatever reason.

MISSION PREPARATION

First, it's important that each training mission have clear training objectives. Determine what specific areas will be focused on during the flight at individual, crew, team, and Troop levels. Select the ATM tasks/battle drills and then the best situational training exercise (STX) to meet the training objectives. Conduct classes and/or talk through the objectives before mission planning.

Speaking of mission planning, a planning cell approach does a lot for a unit. It saves time since tasks are divided up; it allows for more detailed planning since a greater amount of time is devoted to each area; and it provides a vehicle for getting new aviators involved in the planning process by assigning them simpler tasks and then progressing them to more difficult tasks. In E Troop, the commander divided up sectors or portions of the mission and then had the Team Leads perform the detailed planning. This would include selecting combat positions, movement techniques, prepoints and so on. Other aviators were assigned areas such as fire support, signal operating instruction (SOI)/ communication, weather and illumination data, communications security (COMSEC) loading, filling out the aircrew mission briefing form, and filing the flight plan/strip.

At the mission brief the standard five–paragraph OPORDER format is followed. The TACSOP should include a detailed Standard Tactical Air Mission Brief that covers all critical elements so the commander need only to plug the information into the proper place. It also serves as a checklist to ensure important areas are not overlooked. E Troop had a detailed planning checklist for each type of mission. The commander would take the detailed planning performed by the Team Leads and incorporate it into the Standard Tactical Air Mission Brief. At the end of each brief, the commander selected a junior aviator to back–brief the mission. This is a great way to ensure the mission is clearly understood and also motivates everyone to pay attention during the briefing.

Perform a "rock drill" after the mission brief. Some are fairly elaborate with representatives from all units taking part with large areas marked with engineer tape depicting grid lines and so forth. All that is necessary, in most cases, is to mark some points on the ground to indicate key terrain features and control points, and then have crews literally walk through the mission. (Often times just the Team Leads or Team Leads and PCs from the Wing aircraft would participate and everyone else would observe.) The commander should throw in unplanned events such as unexpected enemy contact or an aircraft going down so crews can react. After they react, back-up and continue on with the mission as planned. The focus of the rock drill is communication, sequencing, and coordination.

REALISTIC TRAINING

"Train as you fight!" Always keep in mind that your ultimate purpose is to face and defeat an enemy force. Apply the crawl–walk–run approach to training so safety is never compromised, but don't forget the ultimate goal is to RUN! Don't gloss over critical tasks such as secure commo checks, relief–on–station procedures, ordnance management during an engagement, downed aircraft procedures, forward arming and refueling point operations, the collection and dissemination of reconnaissance information...and so on. If a unit's training program is realistic and safe, the unit will enter the battlefield prepared to fight, survive, and win.

An important aspect to realistic training is determining the simulated threat. If adequate targets are not available (such as armored vehicles on a military reservation), an effective method is to send a pilot who is not flying on the mission out to the area of operations in a military vehicle (more than one is desirable). He should place himself in a realistic position based on mission, enemy, terrain, troops and equipment available, and time available (METT–T). This gives aircrews

Photo: CPT Mike Cumbie

A Kiowa Warrior fires a stinger missile in an FDT&E, Fort Hood, TX, during October 1993.

something to actually look for and it can be a valuable learning experience for the aviator on the ground. He should have a radio with a discreet frequency, a set of NVG for night operations, and a strobe light from the survival vest to simulate gun fire. He can record time, location, and duration of aural or visual detection of aircraft. If available, a video camera used from the objective area with a time display is helpful. Otherwise, when outside the tactical training area, use the standard "farm vehicles are bad guys and TV satellite antennas are enemy C^3 [command, control, and communications] nodes."

Want to add variety and spontaneity to training? A technique used for evaluation by CATB that is also a good training tool is the use of "situation envelopes." Simply write various situations on paper and seal them in numbered envelopes, things such as: "receiving ZSU–23–4 indications on the APR–39A(V)1 at 12o'clock," or "simulate an aircraft downed by small arms fire at grid 1234–5678" (the locations can correspond to the guys on the ground mentioned in the paragraph above). The commander/IP directs specific aircraft to open and react to selected envelopes during the mission. Remember—no battlefield is benign and "Murphy" is always there, so plan your training that way.

AFTERACTION REVIEW (AAR)

Upon completion of a mission, the lessons learned must be captured in an AAR. It is best to have and follow a standardized format located in the TACSOP. The AAR should not be a roasting session but rather a positive, constructive critique of the mission, both strong and weak points covered. To ensure important details are not forgotten, trainers should take notes during the flight for reference at the AAR. Cockpit video tapes are an excellent training tool for individual and group–level AARs. At the end of the AAR, lessons learned should be summarized, corrective actions determined when necessary, and then shared with nonparticipating pilots at the next pilot meeting.

CONCLUSION

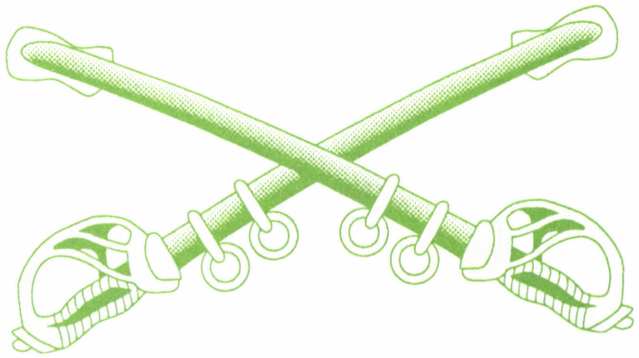
Command climate, safety, standardization, battle rostering, mission preparation, realistic training, afteraction review. Seven areas that contribute significantly to success or failure in a unit's ability to perform it's METL. When it comes to tactical employment all of them are "glass balls!"

The ideas and concepts discussed about each of the seven areas are only a starting point intended to help regain or maintain proper focus. Commanders and IPs would benefit from an informal discussion of each topic to identify strengths and weakness, and then they should formulate proper courses of action.

Army Aviation is facing some of the hardest challenges yet in it's relatively short history as a branch, but we can and will meet these challenges. In today's unstable and uncertain world, there is no other alternative! To do so, we must keep our focus—"Our mission is WARFIGHTING!"

DSUFTP?

Captain Joseph Blackburn
Commander, E Troop
229th Attack Helicopter Regiment
Fort Rucker, Alabama



The Dual Station Unit Fielding and Training Plan (DSUFTP) is the vehicle by which a unit can become a deployable, lethal, combat–ready organization ready to fight the OH–58D Kiowa Warrior and WIN!

It is a program developed and implemented by the Combat Aviation Training Brigade (CATB) at Fort Hood, TX, to field selected cavalry and attack units with the production Kiowa Warrior and train them in the latest tactics, techniques, and procedures for armed reconnaissance aircraft.

Although my unit will not go on to a division or corps and continue to train, I am convinced that, at the completion of the DSUFTP, we were one of the best trained units in the U.S. Army. I am equally convinced the Kiowa Warrior Combat Aviation Training Team (CATT) is staffed by some of the best "Warriors" that the Aviation Branch has to offer.

My story starts at about the T–270 mark, February 1993, the point at which we were finally given the green light to field the aircraft, undergo the DSUFTP, and complete the Kiowa Warrior Force Development Test and Experimentation Phase II (FDT&E II).

By this time some of our pilots had completed qualification training but most of us were either in, or just starting, the course. Most units will know their fate much farther in advance but, since we were only a Troop, we were able to recoup the lost time during the following months.

It bears mentioning that the Kiowa Warrior FDT&E is the reason we

Photo: CPT Mike Cumbie

LTC Travis, Commander, 2–229th, with E Troop pilots during FDT&E mission brief.

were going through the CATB program. The plan was to do a noninterference, "over–the–shoulder" look of E Troop as we went through the CATB Remote Station Training and unit certification process.

The U.S. Army Test and Experimentation Command (TEXCOM), Fort Hood, tried their best to keep it that way; however, I think we all recognized that a test of this magnitude could not be done without interference.

The test began as soon as we arrived at Fort Hood. In our case, TEXCOM was gathering and evaluating data upon our arrival.

E Troop pilots conduct a sand table exercise to prepare for FTX and unit certification.

Our charter was to arrive at Fort Hood as well trained as we could be.

Our early focus simply was obtaining the aircraft and the associated push package that would enable us to start training. An advantage we had was having our maintenance officers and instructor pilots (IPs) in the first supplemental courses. This paid huge dividends in that we were able to establish our training base and maintain the aircraft as soon as we had enough aircraft to start the training program.

The single largest factor, however, that contributed to our eventual success was the dedicated, focused training time we had once we entered the program in earnest.

Both the TRADOC System Manager (TSM)-Comanche (our parent organization) and the 2–229th Attack Helicopter Regiment commander (our headquarters), recognized that the unit could not accomplish the DSUFTP goals without a total focus and they made some tough sacrifices to ensure we had just that. Without support from the top, I can't imagine how we could have done it.

Some early milestones we had were to establish a working standard operating procedure (SOP), send our IPs to Fort Hood to be certified, and establish a maintenance program from scratch. In addition, early in the program, I got my IPs together with the platoon leaders.

We identified crew assignments down to the actual seat that each aviator would occupy. We went one step further and made aerial weapon team (AWT) assignments at that time. We managed to stick with this concept through the entire program. We felt that was the only way to maximize our limited training time and ensure we deployed with the best trained Troop we possibly could.

Because of the limited existing doctrine on Kiowa Warrior employment, our SOP became our training bible. We published a working copy early on to get the unit started and kept refining it until just before our deployment.

Particularly in the case of a newly formed unit, a workable SOP is an absolutely essential ingredient in a unit training plan. CW3 Blaine Pendleton, working with our other experienced OH–58D pilots, delivered an outstanding product (article on page 15).

We executed the classic crawl, walk, run training philosophy with the majority of training committed to getting through the crawl stage. By that I mean readiness level (RL) progressions.

We did the RL training by crew and team so when a team was finished they were able to begin training as an AWT. Because of outstanding maintenance and some great flying weather, we were able to get through RL training in a little over 2 months.

The end result was that, by the time we started to execute some Troop level missions, we had a solid foundation to build upon. In addition, throughout this entire process, we were refining our tactical SOP (TACSOP). Like many units, the lesson we learned is that, when you commit to conduct all training by your SOP, it becomes exactly what the name implies, the standard way you operate.

The walk stage included some Troop missions that seemed to validate our tactical foundation but really tested our communications plan. We struggled with this early on mainly because of the sudden arrival of the single channel ground and air radio

system (SINCGARS) radios.

SINCGARS really complicates communications, but they are excellent radios when you get the procedures down. I would quickly add that the best benefit from these initial Troop missions was the refinement of our communications check procedures and communications architecture.

There are any number of ways to do it; however, we ended up using one frequency modulation (FM) secure, for talking to our higher or supported ground commander; ultrahigh frequency (UHF) for Troop internal communications; very high frequency (VHF) for internal team communications; and the other FM radio for tactical fire (TACFIRE) and digital communications.

We also conducted a Table VI gunnery while at home station to exercise our weapon systems; refresh our aviators; and complete Table V, the Helicopter Gunnery Skills Test; so we would have that out of the way once we arrived at Fort Hood.

The final event we had before the crew and team evaluations was our first–ever Troop field training exercise (FTX). The first CATB administered evaluations were focused at the individual crew level, and were only 2 weeks away. However, I felt we were at a point that supported Troop operations.

This again paid dividends because the Troop validation was only 2 weeks after the crew validations. The schedule did not allow much time for collective training in between. During the Troop FTX, I believe the unit transitioned into the "brisk walk" stage. We would not go further than that until we completed our gunnery at Fort Hood.

A final note on home station training is that we flew 661 hours, which is just above what was called for in the DSUFTP. More than 50 percent of these hours were flown under NVG. This served to maximize the training time available and enabled the Troop to attain the highest possible proficiency.

Crew and Troop validations were good indicators of our training status. The outside look from the CATT team provided some much needed feedback to judge our individual and collective training weaknesses.

After the Troop validation, we spent the next 4 weeks preparing for deployment and installing version 5.4 software (soon to be 6.0); the test instrumentation package; and infrared (IR) position lights. Our battalion S–3 left a week early along with a Troop advance party and smoothed the way for the main body arrival.

Test instrumentation "pilot tests" along with local area orientations were the first order of business upon arrival at Fort Hood. Besides the required day and night orientation flights, we conducted "dry run" rehearsals at the Dalton–Henson Range complex to prepare for aerial gunnery.

Aerial gunnery at Fort Hood was easily the best training I have ever experienced. Our unit master gunner, CW5 Chris Wollard, had developed an outstanding gunnery plan we were able to follow almost to the letter.

For 15 days, E Troop executed a gunnery plan that took us from Table III through Table XII (combined arms live fire exercise (CALFEX)), and all tables in between. This approach again uses the crawl, walk, run strategy. I could easily see crew proficiency building rapidly.

Five of eight crews qualified on Table VIII both day and night on the first attempt. The other three crews required at least one additional run but did qualify to some very challenging gunnery standards.

The Stinger shoot produced less than stellar results. Only four of eight crews scored hits, all at ranges of less than 2,000 meters.

Following the Stinger shoot were Tables IX and X, which challenged the AWTs to perform collectively as they had individually.

The highlight of gunnery was the CALFEX. We executed a tactical mission with a ground cavalry Troop and a tactical fire (TACFIRE) shelter that provided digital artillery traffic.

E Troop scored 15 direct hits with 15 HELLFIRE missiles at ranges from 2,900 to 4,900 meters with roughly 50 percent of the shots autonomous and the remainder remotely designated.

Our senior instructor pilot (SIP), MW4 Hugh Alderson, successfully fired his two missiles in the ripple mode with outstanding results.

In total, we flew over 300 hours and fired 22,080 rounds of .50 cal ammunition, 1,400 rockets, eight Stingers, and 15 HELLFIRES during the 15 days of aerial gunnery.

Our aircrews, armament, and forward arming and refueling point (FARP) personnel, and crew chiefs all rose to the occasion and performed superbly while flying and supporting that aggressive and challenging schedule.

Aerial gunnery was followed by recovery, preparation for deployment to the field, and sand table exercises. The sand table exercises served to refocus the battalion and Troop back into the decisionmaking, orders preparation, and tactical mission planning processes. We were also able to plan and execute two missions on the sand table that we would eventually fly during the FTX.

We were extremely fortunate during our FTX and unit certification phase to have a live OPFOR and genuine threat vehicles to operate against. The threat array included ZSU 23–4s, SA–13s, SA–9s, BTR–60s, and jammers. The mission scenarios generated and briefed by the CATT were diverse and tailored to reflect likely contingency operations.

Throughout the course of the FTX and certification, we executed virtually all of the missions a cavalry unit might expect to receive. With the added realism of active air defense artillery (ADA) systems, the unit was

challenged to maintain tactical flight discipline and execute actions on contact frequently. Terrain at Ft Hood also is ideally suited for Kiowa Warrior operations; it includes an abundant supply of armor and mechanized targets of opportunity.

During this phase, we used the Aviation Mission Planning Station (AMPS) extensively. AMPS is clearly the wave of the future for aviation mission planning.

The software is housed in a 486–based, ruggedized, lightweight computer unit with CD ROM, magneto optical drive, and a data transfer cartridge to load the mission in the aircraft.

Coupled with a digital map capability, this system dramatically improves mission planning effectiveness and reduces planning time for Kiowa Warrior units. Because the system was not yet fielded, we completed an initial assessment of the AMPS concurrently with the Kiowa Warrior FDT&E.

E Troop fires tables 3-12 during an intensive, 15-day aerial gunnery exercise at Fort Hood, TX, as part of an FDTE in October 1993.

All indications are the AMPS program is on track and the systems may soon be available for other units. I would strongly encourage other Kiowa Warrior units to do what is required to obtain this valuable piece of equipment.

Unit certification was transparent in that missions were received, planned, and executed in the same manner and at the same tempo as they were during the FTX phase. The FTX is, in fact, a training exercise and allows units the opportunity to fine tune their operation before doing it for the formal evaluation and ultimate certification.

Following the FTX and certification phase, it was time to lick our maintenance wounds, get some well-needed rest and prepare for redeployment to Fort Rucker. The CATB awards ceremony recognized some outstanding aircrew performances with the awards of Top Scout crew, Top Gun, and Top Combat Crew (combination of scout and gunnery skills).

MW4(P) Alderson and CW2 Fugazzi took Top Scout honors while CW3 Pendleton and WO1 Cook won both the coveted Top Gun award and overall Top Combat Crew award. Both crews were outstanding throughout the trainup and deployment and set a high standard for others to strive for.

I would like to discuss briefly the way we used the AWT concept. First, I was as skeptical as you probably are about tying my hands with the crew and seat assignments but, in hindsight, I am convinced they made the difference. As stated earlier, we committed to this concept even before we actually began flying.

With the exception of RL progressions, some administrative requirements and maintenance flights, our training program was built entirely on flying battle–rostered crews and teams. This carried through gunnery, the FTX, and unit certification.

By the time we finished the DSUFTP, our crews were about as "crew coordinated" as they could possibly be.

This also built into a high degree of team coordination with internal roles and responsibilities clearly established and produced some very effective AWTs.

Without exception, we executed all of our missions with the AWT (two aircraft) as the basic combat element.

Photo: CPT Mike Cumbie

E Troop 2–229th at Fort Hood after FDT&E.

This ensured each aircrew was provided some degree of immediate suppressive fire and provided for coordinated reconnaissance of a specified area. We adopted the phrase "two is one, one is none" as Troop doctrine. METT–T may not dictate this organization and aircraft availability may not always permit it; however, I believe it should be the rule instead of the exception.

In addition, this does not mean we always operated in the traditional scout–gun configuration. We would typically switch roles while bounding, and the lead aircraft would normally be the scout. It does not have to limit the commander but can, in many cases, increase the unit effectiveness.

Mission planning is the last subject I will discuss. We used the planning cell approach and it worked extremely well for us. I would receive a mission from Squadron and return to the Troop command post (CP) to issue the Troop a warning order and get things in motion. After the warning order, the planning cell would be remain at the CP.

The planning cell consisted of the team leads and PCs. Each person had an area of responsibility during planning. I would brief them on the concept of the operation, solicit their input, and make any required modifications. Then the planning would begin in earnest.

The AMPS cell, lead by resident expert CPT Corey Steinke, would work with the team leads as they conducted thorough map recons of their areas. From this would come waypoint selections and any additional graphics we needed to add. Other members of the planning cell would work on fire support planning, timelines, communication data, and mission brief preparation. Since it was all done in the CP, internal coordination was easy.

While this was going on, the copilots would be preflighting aircraft, loading communications security (COMSEC) fills, planning performance, and completing all other required actions before flight. Each person in the Troop had specific responsibilities.

Again this had been included in the SOP. We put it all together at the Troop mission brief. While I was briefing the concept of the operation, the Team Leads would come up individually to brief their respective areas. At the conclusion of the brief, I would ask one of the individuals who had not been part of the planning cell to come up and backbrief the mission to ensure the message was received as intended.

The briefing was followed either by a rock drill or a map exercise (MAPEX) if time did not allow us to construct a sand table. The planning cell approach proved very effective for us, particularly in cases where time was at a premium.

In conclusion, the DSUFTP works. The CATB staff and the Kiowa Warrior CATT are trainers first and foremost. Their success depends on the unit's success and their whole approach reflects that philosophy.

The DSUFTP provides commanders with a structured, resourced roadmap to individual and collective proficiency. Training should only improve in the future as more units transition through the program and provide their expertise and lessons learned. Kiowa Warrior—"Armed and Unafraid."

New Training Helicopter Arrives at the U.S. Army Aviation Warfighting Center

The TH-67 makes its "grande debut"

The TH-67 arrives on the parade field...

This is the first of the two arriving TH-67 Creeks, the Army's new training helicopter, during ceremonies 15 October 1993 at the U. S. Army Aviation Warfighting Center, Fort Rucker, AL. A total of 157 TH-67 Creeks are slated for delivery from manufacturer Bell Helicopter TEXTRON by April 1996.

It's here. The new Army Aviation training helicopter, the TH-67 Creek. The commanding general, landing in the first of two TH-67s to arrive at the ceremony, stood tall, looked at the crowd, looked at the TH-67s, and clearly said without hesitation, "Welcome to the future."

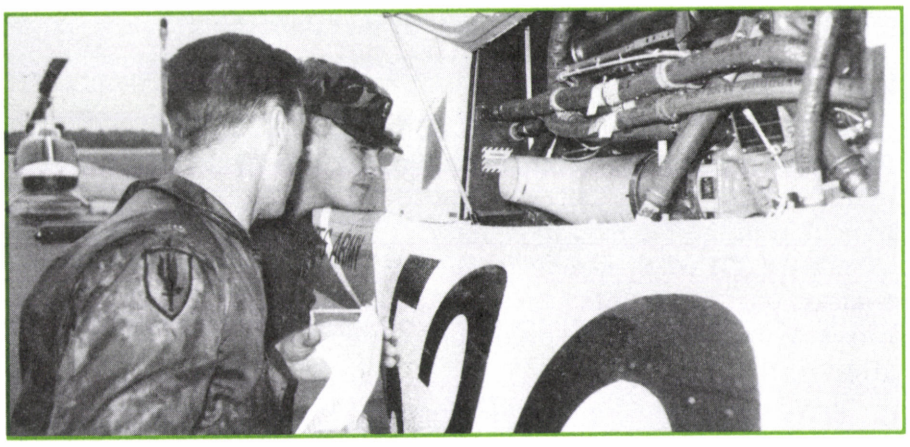
Mr. Ted Walls
Public Affairs Office
Fort Rucker, Alabama

Hosting the ceremony 15 October 1993 was Major General (MG) Dave Robinson, Commanding General, U.S. Army Aviation Warfighting Center, Fort Rucker.

"Our commitment to the American people starts with a willing student, an able instructor pilot, and an aircraft," MG Robinson said. "A commitment that runs as deep as the Mississippi, as high as the Rocky Mountains, and as wide as an Iowa corn field," he said.

"And yes, that commitment is to provide the best trained aviators in the world at the best possible value to meet the needs of an ever-changing world."

Other guest speakers at the ceremony were Mr. George Dausman, Acting Assistant Secretary for Research, Development, and Acquisition; Mr. Webb Joiner, Bell Helicopter TEXTRON President; and MG Dewitt T. Irby, Aviation Program Executive Officer.



Selection of the Bell aircraft is said to be based on the evaluated technical areas, training, costs, logistics, management, and past performance. Warrant Officer 1 Michael W. Risher, left, takes a fuel sample from the TH-67. Master Warrant Officer 4 Robert B. Murphy, top left, and Chief Warrant Officer 3 Howard L. Swan prop an access panel to examine the aircraft's hoses.

Reduced Costs

MG Robinson said the new fleet is expected to improve training and reduce costs. MG Robinson said the TH-67 will save the American taxpayers $29 million annually and more than half a billion over the lifetime of the program.

In a few short years, the $29 million a year savings will more than pay for the acquisition costs of the system alone.

"The aircraft before you is the winner of a very rigorous selection process. The TH-67 is an off-the-shelf procurement and a proven leader," the general said.

Remarking to his friends and neighbors in the "Wiregrass," the colloquial term in southeast Alabama where grass looks like wire, the general quipped, "That ain't peanuts."

Plans call for the TH-67 Creeks to phase out the aging UH-1 Huey fleet as the aircraft used for all primary and instrument training.

Improved Training

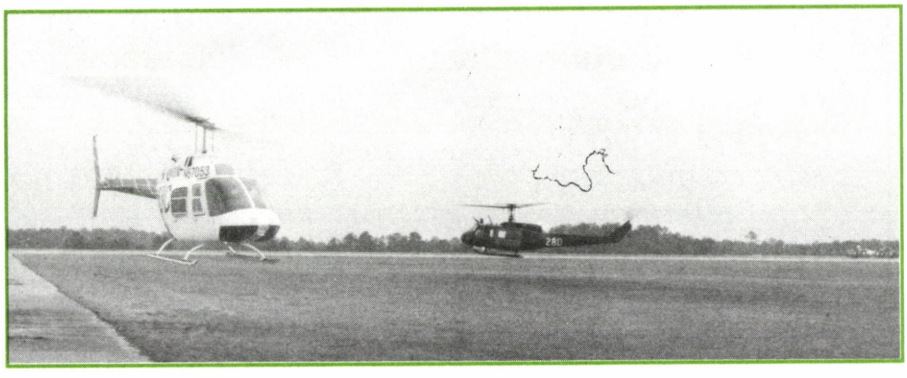
Mr. Joiner noted that once the TH-67 replaces the aging UH-1 Iroquois fleet of helicopters used for all primary and instrument training, "every single rotary-winged pilot trained by the U.S. military will be trained to fly on a Bell 206."

The U.S. Navy version of the 206, the TH-67, is used to train U.S. Marine Corps and Navy pilots at Whiting Field, FL.

As a training helicopter for the Navy, the 206 accumulated almost 1 million hours of flighttime with no Class I accidents and performed over 1 million safe full touchdown autorotations.

The old and the new...

The new TH-67 Creek hovers in the foreground as the outgoing UH-1 Huey hovers in the background.



"This is probably the first time ever that the pilots of all services have been trained on the same aircraft," Mr. Joiner stated.

Plans call for the first TH-67 Initial Entry Rotary-Wing (IERW) Class to begin 20 April of this year. In 2 years, the complete IERW core transition to the TH-67 will occur.

Once the TH-67 fleet replaces the UH-1 helicopters used for training, every U.S. military rotary-wing pilot will train on a similar aircraft.

During the 8-week training effectiveness user evaluation period, instructor pilots from Fort Rucker flew "realistic training profiles to evaluate both aircraft performance and training effectiveness."

Features

The TH-67 is a specially configured version of the Bell 206B-3, the safest single-engine aircraft in the world, according to figures compiled by the National Transportation Safety Board.

Also, the Bell model 206 is the most widely used helicopter in the civilian sector. Over 25 million flight hours have been recorded and 7,600 manufactured.

The TH-67 has a unique feature that truly enhances training effectiveness: an advanced cockpit display system embedded in the rear of the right seat provides the second student with a full view of the primary flight and navigation instruments.

In addition, the TH-67 includes crashworthy seats and commercial technology avionics with an advanced cockpit display system.

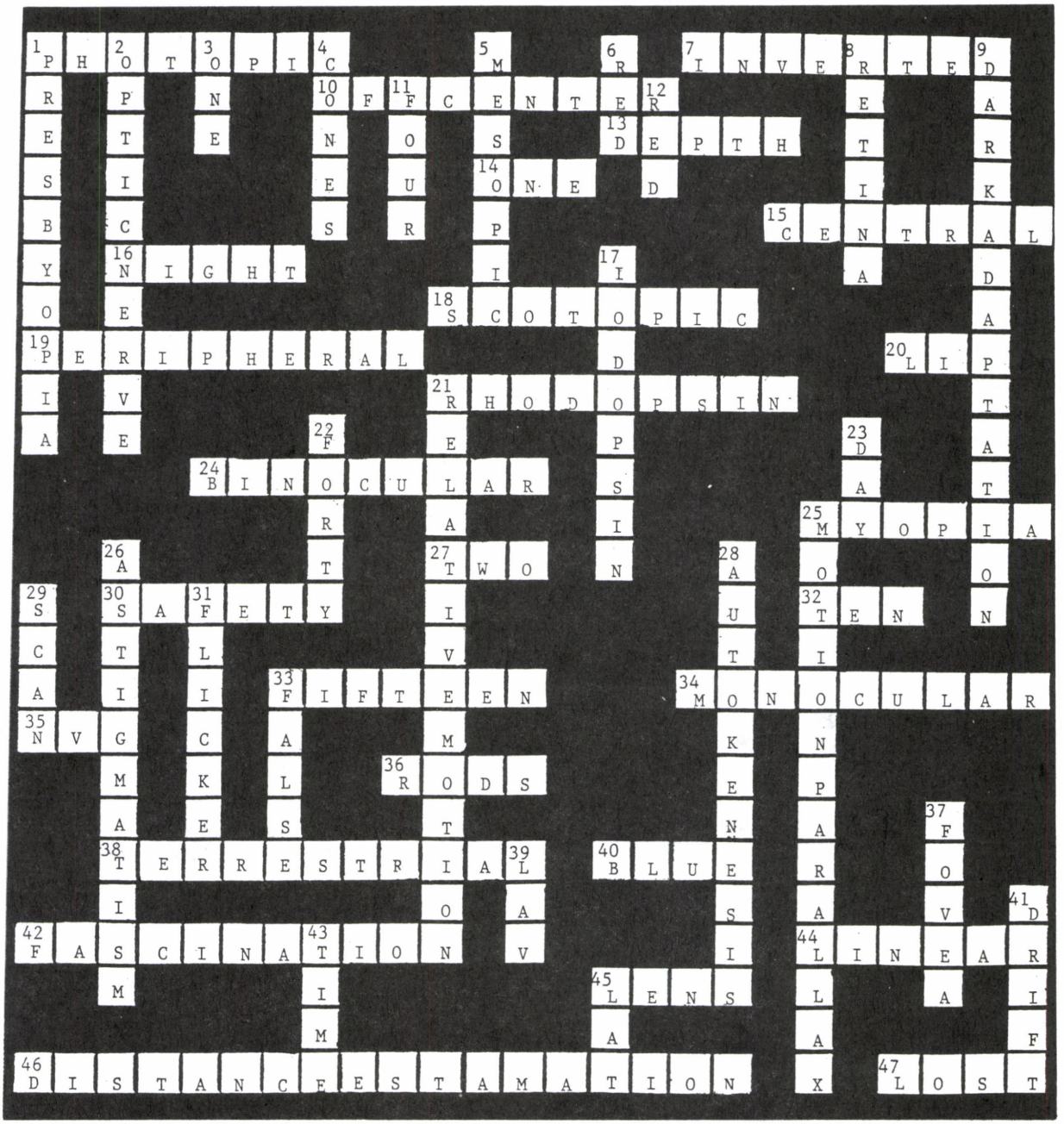
The TH-67 has state-of-the-art commercial avionics that provide dual pilot instrument flight rules capability, as well as crashworthy seats and fuel cells built into the airframe. Master Warrant Officer 4 Robert B. Murphy performs a preflight inspection.

TH-67 CREEK SPECIFICATIONS

Gross weight	3,200 pounds (1,451 kilograms)
Useful load	1,565 pounds (710 kilograms)
Hover-in-ground effect	12,800 feet (3,901 meters)
Hover-out-of-ground effect	8,800 feet (2,682 meters)
Service ceiling	13,500 feet (4,116 meters)
Maximum speed	140 miles per hour (225 kilometers/hertz)
Range with maximum fuel and maximum payload at sea level/no reserves	419 miles (675 kilometers)

Answers to the Unaided Night Operations Crossword Puzzle

Any recommendations, questions, or comments are greatly appreciated. For more information on this crossword puzzle, phone the author, CW3 James T. Chandler, DSN 238–8917 (Annville, PA).



(Puzzle on page 53)

Thirty years ago—the story of the move

This study of Army aviation was excerpted from a longer work in progress. Additional articles on the history of Army aviation will appear in future issues. The opinions expressed in this article are those of the author and do not necessarily reflect the views of any Department of Defense agency.

Henry Post Army Airfield, Fort Sill, Okla., was the home of Army aviation from 1942 to 1954.

Camp Rucker Selected As Home of Army Aviation

Dr. John Kitchens
Aviation Branch Command Historian
U.S. Army Aviation Center
Fort Rucker, Alabama

Thirty years ago, during the summer and fall of 1954, the Army Aviation School moved from Fort Sill, Okla., to Camp Rucker, Ala. This article begins the story of the move.

Modern Army aviation began on 6 June 1942 with a War Department directive establishing organic air observation for field artillery. During World War II (WW II) and the Korean conflict, the Department of Air Training of the Field Artillery School conducted organic Army aviation training at Fort Sill.

During these periods, the Army Air Forces/U.S. Air Force conducted primary training of Army pilots and basic training of Army aircraft mechanics at Pittsburg, Kan.; Sheppard Air Force Base, Tex.; Gary Air Force Base, Tex.; Keesler Field, Miss.; and some other sites. The Department of Air Training then provided Army–specific training at Fort Sill for both pilots and mechanics.

Organic Army aviation expanded during the latter part of WW II. As a result, the Department of Air Training briefly gained a somewhat higher status; it became a separate school in December 1945—the Army Ground Forces Air Training School. In November 1946, however, it reverted to its earlier departmental designation. Even during the period that air training had separate school status, the commandant of the Field Artillery School also served as commandant of the Air Training School.[1]

Growth of Army aviation during the Korean Conflict

Expansion of Army Aviation training during the Korean conflict led to creation of the Army Aviation School as a class I activity at Fort Sill. No longer a part of the Field Artillery School, the Aviation School was aligned directly under the commanding general of the Fourth Army. The effective date of the creation of the Aviation School was 1 January 1953, but the school was not activated until 1 July 1953, about three weeks before the armistice was signed.[2]

BG Carl I. Hutton became commandant of the Army Aviation School on the eve of the move to Camp Rucker, Ala.

The last director of the Department of Air Training, Colonel (COL) I.B. Washburn, became the first commandant of the Army Aviation School. He then was succeeded in July 1954 by Brigadier General (BG) Carl I. Hutton, who reported to Fort Sill on 1 June.[3]

The Korean conflict had provided such an impetus to the growth of Army aviation that air training requirements remained high after the armistice was signed. Not only did Army aviation retain its separate school status, but the Army air training program came to require additional space and facilities.

In August 1954, a year after the conflict ended, 300 faculty members, 800 students, and 500 aircraft were involved in Army aviation training. These numbers compared to 50, 100, and 125, respectively, when the hostilities began in Korea in June 1950. Consequently, there was a shortage of airspace, hangar space, maintenance space, classrooms, hardstands for aircraft parking, administrative space, and billets.[4]

The most serious of these problems was the competition between artillery and aviation for the use of the limited airspace over Fort Sill. The resulting aviation interference with artillery firing caused the commandant of the Field Artillery School to recommend that the Aviation School be moved to the inactive Air Force base at Frederick, Okla., which would become a subpost of Fort Sill.[5]

The search for a new home

Neither the G3 nor the G4 at the Pentagon considered taking over an Air Force base a suitable solution. Therefore, the Army Aviation Branch at the Headquarters, Department of the Army (HQDA), was instructed to look for a permanent Army post that would be an appropriate location for the school.

Major General (MG) Paul D. Adams, the deputy G3 in the Pentagon, called a meeting of representatives of all continental U.S. Army commanders and of the Army Aviation School. At this conference, held on 14 May 1954, it was decided that Fort Riley, Kan., would be the site of the Army Aviation School. Upon learning afterwards that the Army General School also would remain there, however, the Fifth Army commander vetoed the Kansas post on the grounds that it could not accommodate both schools.[6]

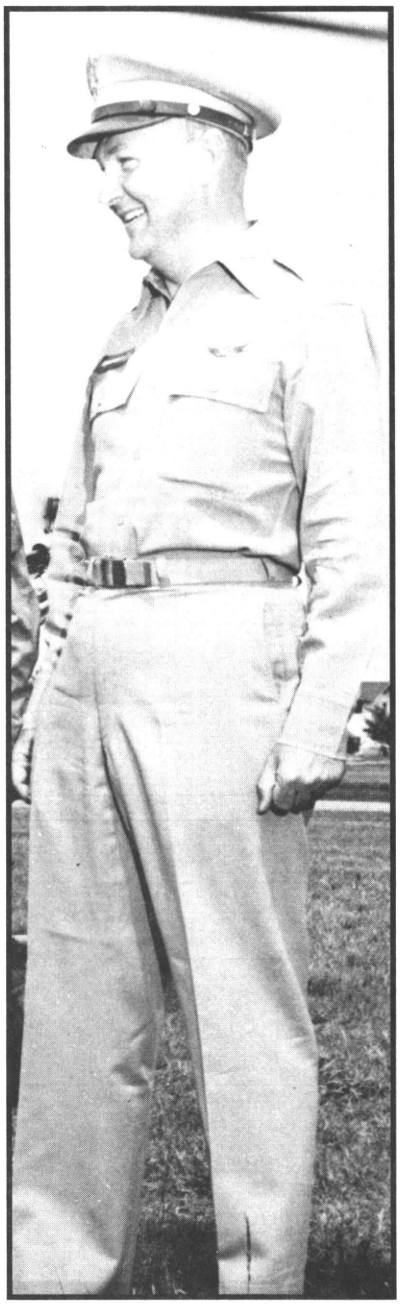
The commander of the Third Army, Lieutenant General (LTG) Alexander R. Bolling, told members of his staff he wanted the Aviation School to be located under Third

Army jurisdiction. He preferred Fort Benning, Ga., but the commander of Benning reported that his post could not accommodate the Aviation School. Bolling then sent a team headed by Lieutenant Colonel (LTC) Jack W. Hemingway to visit Camp Rucker. Hemingway was the deputy chief of the Facilities, Installations, and Services Division of the Third Army G4. His team inspected Ozark Army Airfield and the buildings and other facilities on the main post.

LTG Bolling then had the Third Army engineer to estimate the cost of restoring Camp Rucker to its Korean conflict–era condition, using input provided by Hemingway's team and by the Camp Rucker post engineer. Bolling sent this estimate to HQDA, along with a recommendation that Camp Rucker be considered as a site for the Aviation School.[7]

Meanwhile at HQDA, MG Adams had failed to identify an appropriate permanent post on which to locate the Aviation School. In late May, he instructed LTC Robert R. Williams, chief of the Aviation Branch in the Pentagon, to begin to consider temporary Army installations as possible sites. Earlier, while only permanent posts were being considered officially, Frank Hulse and Bevo Howard, presidents of Southern Airways and Hawthorne Flying Service, respectively, had recommended Camp Rucker to LTC Williams. Based on their experience of operating primary training fields for the Army Air Forces during WW II, they believed Camp Rucker would be particularly suitable for aviation training because of meteorological conditions in southeast Alabama.

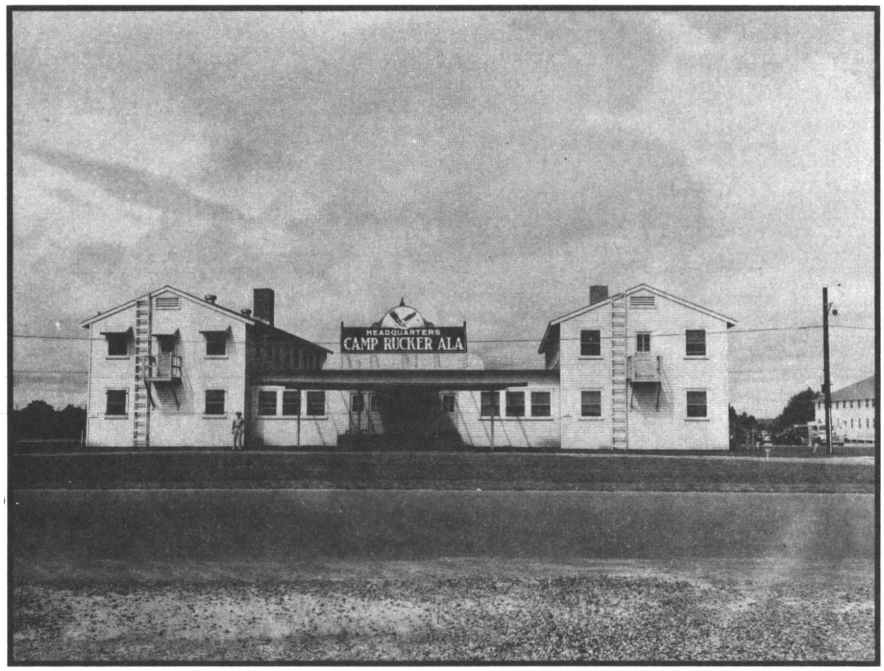
When temporary posts were opened officially for consideration in May, Williams already had conducted preliminary investigations into the feasibility of moving the school to Rucker; therefore, he immediately recommended the Alabama post to MG Adams. Because there was no good alternative at the time, Camp Rucker quickly became the prime candidate. Adams called the commander of the Third Army. Without telling him his purpose, he asked questions about Camp Rucker that clearly indicated Rucker was being considered as a site for the Army Aviation School.[8]



LTC Robert R. Williams (shown here as COL), chief of the Aviation Branch, investigated the move of the Army Aviation School to Camp Rucker, Ala., in 1954.

On 3 June, a few days after Adams called Bolling, a team, headed by MG Adams, and consisting of Hutton, Williams, and other officials from the Pentagon, Fort Sill, and Army Field Forces headquarters, visited Camp Rucker. BG Hutton and some other officials who made the trip learned of the destination and purpose of the flight only after boarding the plane for Rucker.[9] Secrecy and urgency were needed in evaluating possible sites and making a decision to prevent the choice of a site from becoming a political issue.

At Rucker, MG Adams' team determined that Ozark Army Air-



Camp Rucker headquarters: On 20 July 1954, the CSA approved the transfer of the Army Aviation School from Fort Sill to Camp Rucker.

field could accommodate fixed–wing training and other facilities could be converted for helicopter use. Also, the weather in the area was good for flying and aircraft protection. Finally, because the post was in the process of being closed, there was no immediate conflict with any other Army activity. In response to a direct question from Adams as to whether the school could be moved to Rucker, Hutton replied, "Yes, we can do it."[10]

A decision was made on the trip back to Washington to recommend to the Chief of Staff of the Army (CSA) that Camp Rucker be selected as the home of the Army Aviation School. A summary sheet was prepared and staffed. Then, still in draft form, it was briefed to the CSA the next day. The CSA approved the recommendation immediately, and it was presented to the Secretary of the Army (SA) the next day. The SA asked for information on funding, which was presented to him one day later. The secretary then approved the selection of Rucker and directed the move be coordinated with the Secretary of Defense (SECDEF) and interested members of Congress and then finalized as soon as practical.[11]

Notwithstanding the secrecy surrounding the trip to Camp Rucker in early June, word leaked to Senator John Sparkman (D) Alabama—apparently from LTG Bolling, the Third Army commander. Bolling had perceived the tentative plans from MG Adams' telephone call to him before the trip to Rucker. Sparkman called the SA and offered to assist in the move in any way possible.[12] Because Bolling very much wanted the school located in the Third Army area, he apparently was attempting to use mild political influence to ensure the selection of Rucker.

BG Hutton was almost certainly privy to the decision made on the plane from Rucker to Washington on 3 June to recommend Rucker be selected; however, he stated in his memoirs, written a few years later, that he did not receive official notice the decision to move to Rucker had been made until 20 July. In the meantime, he and COL Washburn had been instructed from Washington to visit a former Air Force facility near Childress, Tex. They were told to determine its suitability for aviation school use, but to make no commitment of any kind.[13]

Numerous people have claimed, or have been claimed, to have had influence on the selection of Camp Rucker as the new site for the Army Aviation School. These include the mayors of Ozark and Enterprise, Ala.; both Alabama senators; the congressman from southeast Alabama; the commanding general of the Third Army; and President Eisenhower.[14]

Apparently LTC Robert Williams, as chief of the Aviation Branch in the Pentagon, played a major role in the selection of Camp Rucker as did also MG Paul Adams, the deputy G3. Although possibly influenced in this direction by Williams, Adams seems to have been predisposed to favor Rucker because of its proximity to the Infantry Center at Fort Benning. Adams also seems to have been eager to get the matter settled in an acceptable fashion as quickly as possible. He may have been influenced by LTG Bolling and by the cost estimate of restoring Camp Rucker prepared by the Third Army, but this writer has no evidence of that.

Ozark Army Airfield, constructed in 1942 to support infantry training at Camp Rucker, was renamed Cairns Army Airfield in 1959.

LTG Alexander Bolling wanted the school to be located under Third Army jurisdiction and he appears to have attempted to use political influence for this purpose. There seems to be no evidence, however, that the decision would have been otherwise unless Bolling had actively opposed the move to Rucker.

BG Carl Hutton's contribution to the selection of Rucker appears to have been primarily in not vetoing it during the visit on 3 June. According to his memoirs, Hutton believed Fort Riley would have been a better selection. His memoirs also indicate he was not kept fully informed and current during the period between the trip to Rucker in early June and the announcement of the decision on 20 July.

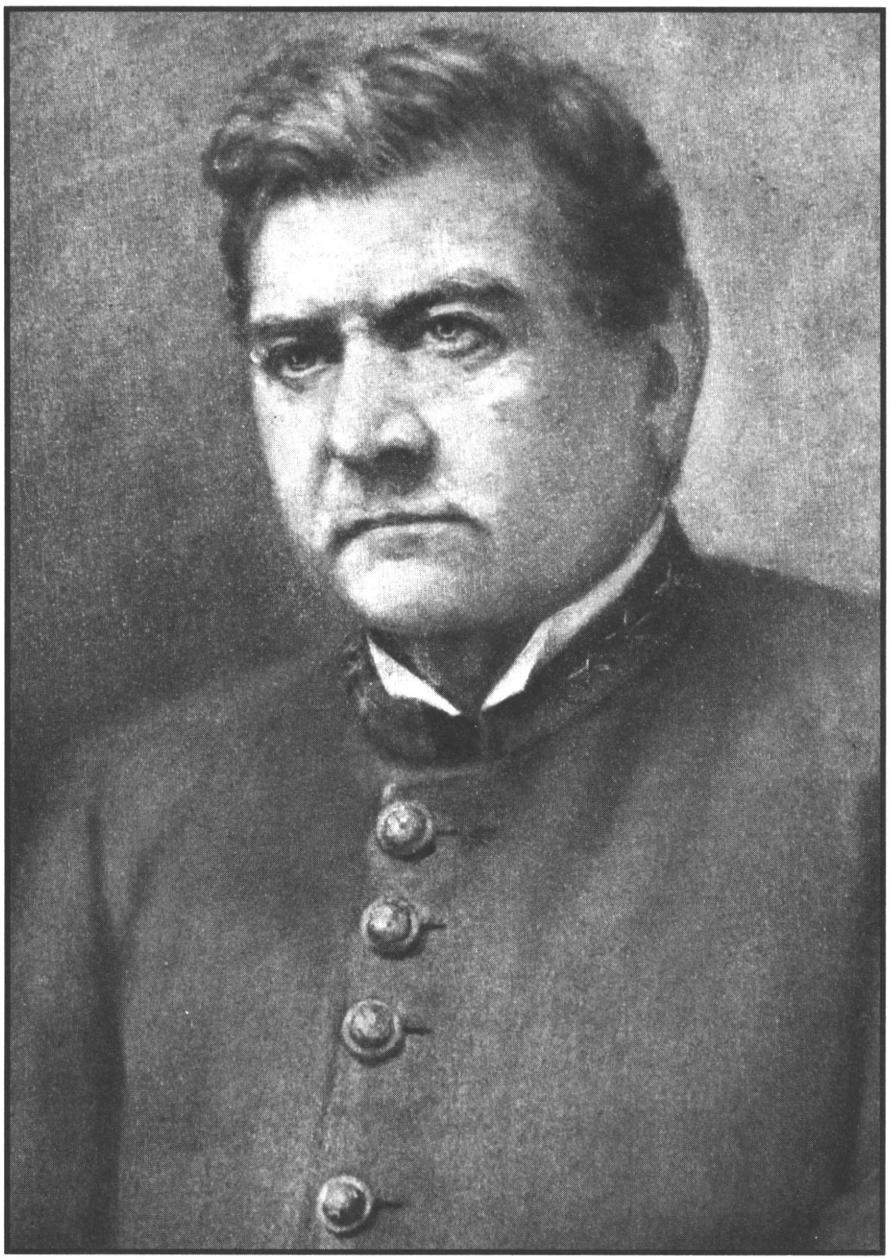
Alabama politicians were no doubt very eager to have Camp

Lake Tholocco: This 850–acre lake on Fort Rucker was created as part of the Pea River Land Use Project.

Rucker remain open; however, it is unlikely that political influence affected the decision because the CSA and SA decided so quickly. Senator Sparkman and other Alabama politicians certainly were in favor of the move to Rucker and doubtlessly lent their voices in support, but the evidence indicates the decision was made before they became involved. The Army apparently permitted them to take some credit after the fact for understandable political reasons. Also, the Pentagon's directing General Hutton to visit the former Air Force base in Texas was evidently nothing more than a gesture made for the benefit of Texas politicians between the time of the decision to move to Rucker and the announcement of that decision.

The origins of Camp Rucker

Camp Rucker, like Army Aviation, was a product of WW II. The United States entered the war on 8 December 1941, after the Japanese surprise attack on Hawaii, the Philippines, Guam, and Midway. On 15 December, Congress voted an appropriation of $10 billion to defend the United States and established a draft for military service for men from 20 to 44 years of age. America then began a manpower mobilization unprecedented in its history in terms of total numbers. Over 16 million men (one–sixth of the total male population) and about 333,000 women were put in uniform.[15] This mobilization called for the construction of many new



COL Edmund W. Rucker, a Civil War Confederate officer and later an industrial leader in Alabama, for whom Camp Rucker was named.

training camps and military bases, including Camp Rucker.

The southeast part of Alabama where Camp Rucker was established has traditionally been called the "Wiregrass," because of the wiry grass that once grew so profusely in the area. During the 1930s, as part of the New Deal program of the Franklin D. Roosevelt administration, the federal government purchased a 35,000–acre tract of land in Dale and Coffee counties in southeast Alabama. The land was withdrawn from cultivation and converted into a wildlife refuge—the Pea River Land Use Project. Owners were paid an average price of $7.46 per acre for their land. Many of them were, in turn, employed by the Works Progress Administration to plant tree seedlings and build lakes and game preserves on the new federal reservation. One of the more ambitious projects was constructing an earthen dam across Claybank Creek. This project created an 850–acre lake—later given the Muskogee or Creek Indian name "Tholocco."

In July 1941, as American involvement in WW II became increasingly probable, the War Department selected the lands of the Pea River Project to be used as an infantry training camp. The government also began the process of acquiring 30,000 additional acres of land. The new government acquisitions consisted mostly of adjacent land south of the existing federal property but also included the privately owned tracts within the boundaries of the Pea River Project reservation.

In January 1942, shortly after the Japanese attack, the U.S. Army Corps of Engineers completed construction plans for the 4,600–acre cantonment area of the camp. These plans called for buildings, streets, utilities, wells, railroad sidetracks, and other facilities. The principal contractor, J.A. Jones Construction Company of Charlotte, NC, constructed 1,500 buildings and developed streets and other facilities for the price of $24,620,160. This work was completed in fewer than the 120 days allotted by the contract.

The original name of the post was Ozark Triangular Division Camp; however, before the camp was officially opened on 1 May 1942, the War Department named it Camp Rucker. The post was named in honor of COL Edmund W. Rucker, a Civil War Confederate officer. COL Rucker, who was given the honorary title of "General," became an industrial leader in Birmingham after the Civil War. In September 1942, 1,259 additional acres south of the town of Daleville, Ala., were acquired to construct an airfield to support the training camp. The airfield was called Ozark Army Airfield until 1959, when the

Women's Army Corps (WAC) units were trained at Camp Rucker during World War II.

Soldiers lined up to receive their pay at Camp Rucker during World War II.

name was changed to Cairns Army Airfield.

During World War II, four infantry divisions—the 81st, the 35th, the 98th, and the 66th trained at Camp Rucker. The camp also was used to train dozens of units of less than division size; these included tank, infantry replacement, and Women's Army Corps units. During the latter part of WW II, several hundred German and a few Italian prisoners of war were housed in stockades near the railroad, on the southern edge of the post.

Camp Rucker was inactive from March 1946 until August 1950, following the outbreak of hostilities in Korea. The principal Army unit to train at Rucker during the Korean conflict was the 47th Infantry Division, which supplied replacement troops for combat in Korea. Other units that operated at Camp Rucker during that period included the 301st Logistical Command, the 406th Engineer Brigade, and the 3461st Army Service Unit.[16]

In June 1953, with the conflict in Korea coming to a close, the DA decided to inactivate Camp Rucker along with several other temporary and a few permanent Army posts; Camp Rucker was to be placed on inactive status effective 30 June 1954.[17] In May 1954, the 47th Division and other troops at Camp Rucker were transferred to Fort Benning or other posts. On 10 June the provost marshal announced that the gates of the post would be open only from 0600 to 1800; the post was effectively closed except for a caretaker staff.[18]

An article in the next issue of the Aviation Digest will describe the establishment of the Aviation School and Center at Rucker. Subsequent articles will continue the history of the consolidation of training and other Army Aviation activities at Fort Rucker.

Notes:

[1] John W. Kitchens, "*Army Aviation between World War II and the Korean Conflict, 1945–1950,*" ***U.S. Army Aviation Digest*** (hereinafter referred to as ***USAAD*** 1–92–5 (September/October 1992), pp. 18, 25–26.

[2] General Orders No. 9, 16 January 1953. In response to a request from the Army Aviation Center in 1960, the Secretary of the Army ordered that 6 June be made the birth date of the Army Aviation School—to coincide with the 6 June 1942 birth date of Army aviation (Richard K. Tierney, "*The Army Aviation Story: Part II—Academics and Training,*" ***USAAD,*** VIII, 7 (July 62), p. 16.

[3] BG Carl I. Hutton, "*Without Trumpets and Drums: Recollections of 36 Months with the Army Aviation School, June 1954–June 1957,*" (manuscript dated December 1957, from copy in Aviation Branch History Office [hereinafter referred to as ABHO)]), p.1.

[4] Richard Tierney and Fred Montgomery, **The Army Aviation Story** (Northport, Alabama: Colonial Press), p. 82.

[5] Ltr, LTG (Ret.)Robert R. Williams to author, 10 February 1993, ABHO files; Transcription of an oral interview by Dr. John Bell with LTG (Ret.) Robert R. Williams, 18 July 1989, copy in ABHO files.

[6] Williams' letter to author, 10 February 1993; Notes on telephone interview by author with LTG (Ret.) Robert R. Williams, 28 December 1993.

[7] Notes on telephone interview by author with BG (Ret.) Jack W. Hemingway, 29 December 1993. In a telephone interview on the same date, LTG (Ret.) Louis Truman, General Bolling's chief of staff in 1954, confirmed parts of the above account.

[8] Williams' interview with John Bell, 18 June 1989; Williams' telephone interview with author, 28 December 1993.

[9] Hutton, "*Without Trumpets and Drums,*" pp. 2–4.

[10] Ibid., pp. 5–6.

[11] Bell interview with Williams, 18 June 1989; Williams' letter to author, 10 February 1993.

[12] Author's telephone interview with Williams, 28 December 1993.

[13] Hutton, "*Without Trumpets and Drums,*" p. 8.

[14] Williams' interview with John Bell, 18 June 1989; Val L. McGee, **The Origins of Fort Rucker** (Ozark, AL: Dale County Historical Society), pp. 167–71. General Williams sat in this writer's office in 1989 and related, successively, seven different accounts of the decision to move the Aviation School to Camp Rucker.

[15] Allan R. Millett and Peter Maslowski, **For the Common Defense: A Military History of the United States of America** (New York & London: The Free Press), p. 408.

[16] McGee, **The Origins of Fort Rucker**, passim. See also, "*Fort Rucker History,*" a manuscript in History Office files dated January 1976; TRADOC Pam 210–1, July 1981, Chapter 21; Siinto S. Wessman, **The 66th Infantry Division in World War II** (Nashville: The Battery Press), passim; "*Wildcats Never Quit: A Brief History of the 81st U.S. Infantry Division*" (copy in ABHO files); **3461st Army Service Unit** (a unit pictorial yearbook of the Korean conflict era; and "*Fact Sheet, 47th Infantry Division,*" ABHO files.

[17] General Orders No. 56, Department of the Army, 30 June 1953.

[18] "*Fact Sheet 47th Infantry Division*"; McGee, **The Origins of Fort Rucker**, p. 167.

USAASA SEZ

Magnetic Variation in the National Airspace System

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When the magnetic compass was the primary means of navigation, the application of magnetic variation was a fairly simple process. The geographic (true) and magnetic north poles are not collocated. The old rhyme, "East is least and west is best," reminded navigators to apply the correction in the proper direction. Armed with map and compass, a navigator of land, sea, or air could plot a course as a true heading, apply the local magnetic variation, and find a magnetic course to follow.

The advent of radio navigation stations has not diminished the hold of the magnetic compass on navigation. Navigation stations, aligned with magnetic north, ensure that their plotted radials coincide with those of the magnetic compass. The magnetic north pole is not fixed, and variations for a given location change constantly. Navigators have taken this in stride until the recent advent of sophisticated navigation systems. This article addresses the application of magnetic variation within the National Airspace System (NAS). It examines the determination and application of magnetic variation, discusses rates of change and differences in variation, and recommends rules for making this ancient mariners' computation more relevant for modern navigators.

History

The discovery of the lodestone, along with the subsequent development of the magnetic compass, ranks with the discovery of fire and the wheel among man's great achievements. Though the Chinese knew its properties before 1000 A.D., the earliest evidence of using lodestone to locate magnetic north occurs in twelfth–century Europe. Early navigators observed that the location of true north indicated by compass magnets did not agree with the position of Polaris (the north star). Christopher Columbus pioneered the charting of magnetic variations during his early voyages. His logbooks aboard the *Santa Maria* frequently note the position of Polaris versus magnetic north. The magnetic compass is still used today as a valuable navigation tool, but magnetic variation must be measured and applied to determine a magnetic course.

Determining Magnetic Variations

Magnetic variation is determined by documented observation. Taken at thousands of locations worldwide, these observations establish a global model allowing the calculation of local variations. The National Oceanic and Atmospheric Administration, compiler of magnetic variation values and publisher of navigation charts for the U.S. Government, uses measurements made periodically and compiled every five (or *epoch*) years—for example, 1980 and 1985. These magnetic variations are commonly published in a format that includes value, direction (east or west), and epoch year.

If the magnetic north pole could be located at any given time and if the magnetic lines of flux traveled straight between the magnetic north and south poles, figuring variations would be a simple problem in spherical geometry. Yet magnetic lines wander an erratic path, and the poles are not separated by a neat 180 degrees. These vagaries tend to thwart any simple solution for deriving magnetic variations.

The magnetic north pole is currently located north of Hudson Bay, Canada, and west of Greenland. Constantly following an erratic path at an erratic speed, it has foiled attempts to predict

its position accurately beyond 25 years. Forecasters can predict the magnetic variation of any particular geographic area with reasonable accuracy—but no more then five years into the future. This ability led to the establishment of a formal process to predict magnetic variations. Actual or achieved values for two consecutive epoch years (1980 and 1985) were evaluated, and an agreed–upon international model was established, which forecasted the value for 1990. Once values for 1990 were compiled, the 1985 and 1990 values were used to develop a model for the 1995 values. Therefore, the most current or future values are those forecast based upon the previous two achieved epoch– year values.

Rate of Change

Changes in magnetic variation are a direct result of the movement of the magnetic north pole. The rate of change is not constant throughout the continental United States (CONUS) and Alaska but varies according to the distance from and proximity to the magnetic and true north poles. Achieved values for epoch years 1980 and 1985 are used to determine the approximate rate of change throughout this area. Miami, Fla., shows the fastest rate of change—one degree every six years. However, Bangor, Me., experiences only a one–degree change each century. The rate of change throughout CONUS is therefore less than one degree between epoch years. (Although one may interpolate an estimated value between two epoch years, considering the minuscule rate of change, this serves no useful purpose.)

Application

The Office of Aviation Systems Standards (AVN) of the Federal Aviation Administration (FAA) exercises sole authority to determine and assign magnetic variation values to elements of the NAS, according to FAA Order 8260.25B. AVN assigns values referenced to an epoch year and rounds off these values to the nearest whole degree. The rationale is that since all flight data is published in whole degrees, the rounding–off process takes place at some point during the development/publication of the item. Because the rate of change is generally less than one degree between epoch years, all references will be to those years. Although the dating of assigned magnetic variations is an ongoing process, specific facilities are not considered a priority until the update results in a change of three degrees or more.

Magnetic variation is applied to all components and airports within the aviation arena. Runway numbers are determined by applying the magnetic variation to each runway's true bearing and rounding it off to the nearest 10 degrees. This results in runway designations that correspond to magnetic bearings. Assigned airport values normally apply to all the airport's navigational facilities. Tactical air navigation stations, very high frequency omnidirectional ranges (VORs), and airport surveillance radars are actually aligned to magnetic north. Although nondirectional beacons (NDBs) and instrument landing systems are not aligned to magnetic north, published courses referenced to them are indicated to be magnetic. All bearings and radials that are published for use–whether en route or as part of a terminal procedure–are referenced to magnetic north.

In the publication of aeronautical charts, specific criteria are used to show VHF omnirange tactical navigation (VORTAC) facilities and the resulting compass rose. Sectional chart legends specify the epoch year used in their preparation; VORTAC compass roses depicted on those charts are oriented toward magnetic north based upon these epoch–year values. En route charts have the compass roses aligned to indicate the magnetic variation to which the facility is aligned. (This explains why a course between the VORs may not have reciprocal radials defining it.) Both en route and sectional charts have quoted epoch–year values depicting their isogonic lines.

Note that, regardless of the magnetic variation applied, a ground track never changes. To illustrate, take a runway with a true bearing of 093 degrees and a magnetic variation of 1 degree west/1965; the magnetic bearing of the runway becomes 094 degrees, and the designation is "Runway 09." When the runway is updated to the 1990 value, the new magnetic variation is 4 degrees west/1990. This now equates to a magnetic bearing of 097 degrees, and the runway is redesignated as "Runway 10." The designation changes, but the runway stays put. The only real difference between 1965 and 1990 is the reference of the runway bearing to a point on a magnetic compass.

Current Situation

This concept of applying a magnetic variation to a facility and publishing the procedural elements predicated on that facility has proved satisfactory with station–referenced systems. Courses are referenced to facilities aligned to magnetic north, and these electronic courses will now approximate the indication on a magnetic compass.

Difficulties arise as we lean more strongly towards earth–referenced systems. The advent of sophisticated navigation systems, such as global positioning systems and multisensor systems, can create confusion. Earth–referenced systems fix receiver positions by latitude and longitude. Straightforward geodetic calculations use a derived aircraft position and the next way point to provide true courses between sets of coordinates, The system modifies that true course by applying a magnetic variation from its own embedded model and displaying a magnetic course to follow. Whether systems use a 1980 epoch year or allow manually entered values, the determined magnetic course is unlikely to agree with the published course for the same route.

In all cases, the application of magnetic variation to navigation facilities and charts serves only to provide a reference for use with a magnetic compass. A magnetic course, whether used with an NDB or with a multisensor system, permits use of the magnetic compass as an independent, stand–alone, backup navigation aid. Remember that the compass as a sole navigation system is notoriously inaccurate. Magnetic storms and environmental conditions, such as

flying over an iron–rich coast, tend to degrade compass accuracy. Even if you were to maintain a magnetic course with great precision, you would not arrive at the intended destination, Because a magnetic course is a straight–line course and will not overlay a great circle course, the use of the magnetic compass as a sole means of navigation is not practical. A secondary input—be it celestial, station referenced, or earth referenced—must be used continuously to correct the magnetic course.

Suggestions for the Aviator/ Navigator

Though often misleading and confusing, magnetic variation applications can be made easier by applying some ground rules:

• Keep matters in perspective when you apply magnetic variation. Remember that the magnetic course you calculate only approximates the true course on your magnetic compass.

• Expect the published magnetic course to differ from a system–derived course. Disparity can occur because the same epoch–year models have not been used.

• To minimize disparities between system–derived courses and those predicated on VORs, you should apply the magnetic variation of record for each VOR where available.

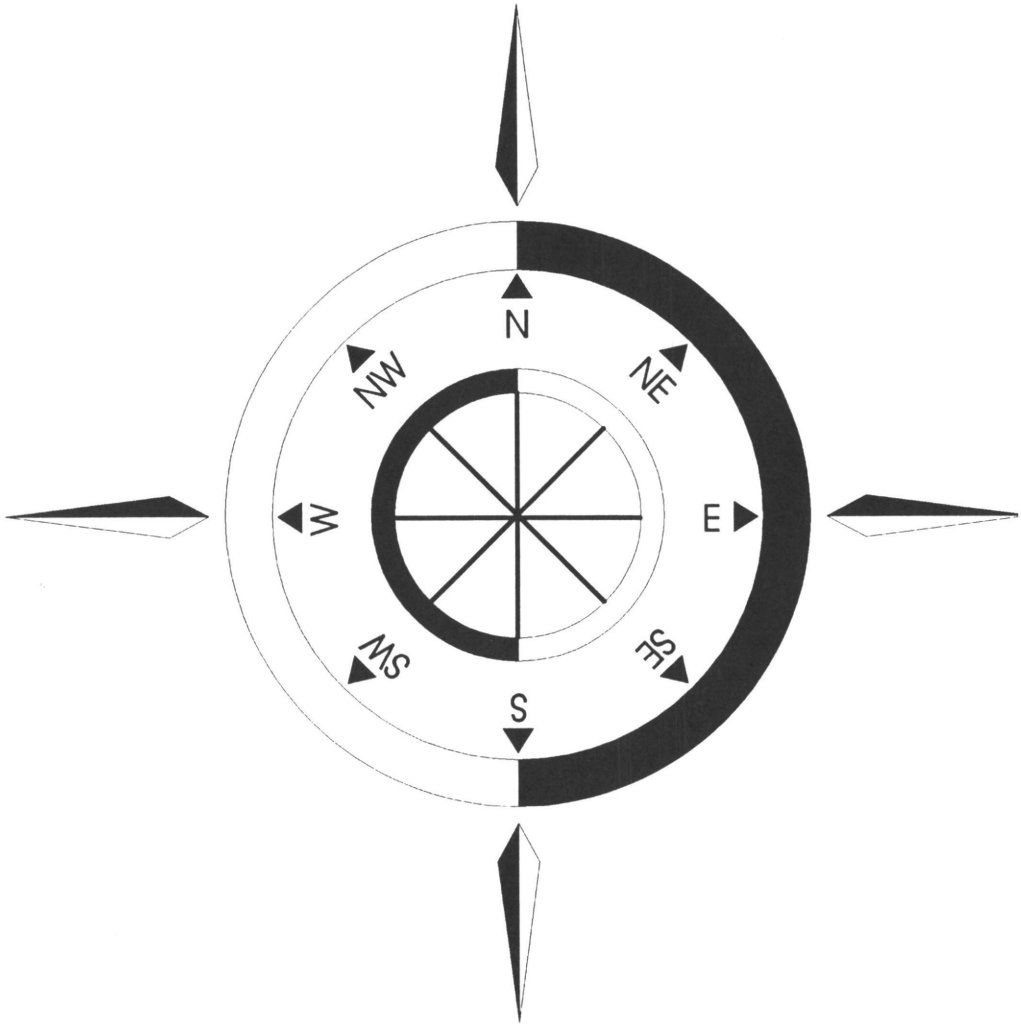
• To minimize disparities between approach procedures, you should apply the airport's magnetic variation of record.

Conclusions

The magnetic compass, as an aid to or in place of celestial navigation, has given man a means of navigating the earth's surface. When man defied gravity and took to the skies, he carried the magnetic compass along with him. The magnetic compass became the primary means of navigating the skies and remained so for many years. Today's radio navigation systems have pushed the magnetic compass into the background. Yet alignment and references to radio navigation systems are still expressed in terms that permit approximating indications on a magnetic compass.

Unless an aircraft travels a route overlaying or paralleling an isogonic line, the pilot will see wide changes in magnetic variation during the flight, An aircraft flying from Kennebunkport, Me., to Seattle, Wash., shows a 40–degree change; 1990 variation for Maine averages 20 degrees west—for Washington State, 20 degrees east. Even a relatively short flight (for example, Presque Isle, Me., to New York, N.Y.) shows a 7–degree change.

We are entering an age in which determining aircraft position and true course between way points can be refined with pinpoint accuracy. Inaccuracies fog the picture when we insist on relating these courses to points on a magnetic compass. A pilot who depends on the magnetic compass as a sole means of navigation can expect to stay on course within only five degrees. Sophisticated navigation systems perform at many times this level of accuracy. Remember that the magnetic course is but a wobbly approximation of the "as–the–crow–flies" true course. Determining the true course with a modern navigation system and then applying a magnetic variation is like measuring with a micrometer and cutting with a chain saw.



U.S. Army Aeronautical Services Agency

USAASA invites your questions and comments and may be contacted at DSN 284–7773/7894; or write to—Commander, U.S. Army Aeronautical Services Agency, ATTN: MOAS–AI, Cameron Station, Alexandria, VA 22304–5050.

Aviation Warrant Officer Fixed–Wing Career Update

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The Warrant Officer Leader Development Action Plan (WOLDAP) has been the catalyst for significant change in the accession and use of aviation warrant officer (AWO) fixed–wing aviators.

Fixed–wing areas of concentration (AOCs) of 155, Fixed Wing Aviator, and 156, OV–1 Aviator, have been restructured into a vertical, pyramidal career pattern . Positions have been coded from detachment through battalion for warrant officer (WO) through W5, with more WO than W5 positions.

Selecting chief warrant officer 3s (CW3s), CW4s, or CW5s for fixed–wing training is no longer feasible because all pilot positions are coded for WOs only. Under WOLDAP, all Aviation Branch AWO positions at the CW3 and higher levels require career tracking within a specific AOC. Career tracking means becoming qualified in one of the four AWO career tracks—aviation safety, tactical operations, aviation maintenance, or aviation training.

Formal fixed–wing selection boards will no longer be held. Warrant officers who apply for fixed–wing training must have no more than three years of warrant officer service, must not be qualified in a modernized aircraft, and should have attained pilot–in–command (PC) status. This means that selection for fixed–wing training will be limited to CW2s who have become a PC in a UH–1 Iroquois, an OH–58A/C Kiowa, or an AH–1 Cobra. Applicants for fixed–wing training will be selected by an informal U.S. Total Army Personnel Command (PERSCOM) board normally composed of the Warrant Officer Division Aviation and Leader Development branch chiefs and the losing and gaining military occupational specialty (MOS) career manager. This process ensures the infusion of young, junior AWOs into the fixed–wing career path, which will lead to improved promotion opportunity within fixed–wing AOCs and avoids the current situation of too many senior AWOs in the fixed–wing career field. Aviators selected for the fixed–wing career field should remain in that career field for their entire career.

With the Army National Guard assuming complete control of the continental U.S. Army (CONUS) operational support airlift (OSA) mission, about 81 Active Army AWO positions will remain for CONUS–based, fixed–wing aviators within the OSA Command. These positions have been coded into a pyramidal structure to provide an equitable outside continental United States to CONUS rotation base for fixed–wing warrants of all ranks. Some fixed–wing aviators may find themselves rotating into aerial exploitation battalions flying RU–21 Utes or RC–12 Hurons. These modification table of organization and equipment positions are coded for four CW5s for MOS 155A at each battalion, one in each AWO career track.

Fixed–wing instructor pilot (IP) course quotas will be increased, beginning in FY 95, to start building an IP force of senior CW2s. All fixed–wing IP special qualifications identifier (SQI) C positions throughout the branch are being coded for CW2s. Senior IP (SQI F) positions are being coded for CW3s with standardization instructor pilot (SQI H) positions being coded for CW4s and CW5s.

The MOS 156A, OV–1 Pilot, will be eliminated during the summer of 1994 because the OV–1 Mohawk is being removed from service.

An action is underway to create additional skill identifiers (ASIs) for positions and aviators requiring C–20, C–21, C–23, C–26, and DH–7 (special electronics mission aircraft) skills. This action should be approved by May and will allow accurate identification of positions and aviators requiring these skills.

Aviation Proponency

Readers may address matters concerning aviation personnel to — Chief, Aviation Proponency, ATTN: ATZQ–AP, Fort Rucker, AL 36362–5000; or call DSN 558–2359 or commercial 205–255–2359/3423.

Eight Steps to a Quality Airframe Mechanic

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U.S. Army Aviation Logistics School
Fort Eustis, Virginia

In February 1992, as I walked through the doors of the Structural and Pneudraulics Division as the new sergeant major, memories came back of my days as a private learning my first military occupational specialty (MOS). I was amazed at how little the place had changed. After weeks of observing how things were being taught, I found that as a training division we had our work cut out for us. Two 10–percent cuts in course length in previous years had eliminated tasks that I felt were necessary. Where should I start?

After spending a year gathering information, trying changes, rearranging hours, changing sequences of instruction, and monitoring student–to–instructor ratios, we—every instructor and training specialist, military and civilian—think we have made progress. The following is a short synopsis of the Structural Course, 68G10, as it stands now.

• ***Step 1, 72 hours of instruction. Introduction to Structural Repair.*** This block of instruction consists of shop and flight–line safety; aircraft publications, forms and records; aircraft metals; airframe shop and hand tools; corrosion control; and painting. This committee is packed full of classroom instruction, along with practical exercises and even a test or two.

• ***Step 2, 62 hours of instruction. Rivet Replacement and Special Purpose Fasteners.*** Learning how to install rivets, bucking them to the proper shop head, and removing them without damaging the structure require patience and practice. Identifying, installing, or repairing special–purpose fasteners is critical to the 68G10. A fastener installed improperly could allow a panel or cowling to open in flight. We all see the results of this too often in ***Flightfax***. In the newest change to the course, students manufacture a small section of a drive shaft cover with the hinge pin and fasteners, then install that to a tail boom.

• ***Step 3, 75 hours of instruction. Skin Repair.*** The student learns procedures for laying out rivet patterns, sealing patches, and applying corrosion control to dissimilar metal repairs. There are four practical exercises in this committee. At least one requires the students to work as a team installing a patch on a tail boom. This exercise teaches teamwork and communication and also instills confidence.

• ***Step 4, 80 hours of instruction. Parts Fabrication.*** This committee teaches procedures involved in hand–forming and machine–forming structural parts—to include layout techniques. This is a critical committee in which the student manufactures and forms aircraft parts with very close tolerances. Students are allowed 1/64th of an inch tolerance during this committee. Imagine spending 30, 40, or more hours to manufacture a part and going to the aircraft for installation—then finding that it doesn't fit. We don't allow big hammers or silly putty in airframe tool boxes.

• ***Step 5, 99 hours of instruction. Structural Repair.*** This committee is the culmination of all previous instruction. The student receives instruction on repair procedures for aircraft skin, stringers, longerons, formers, and bulkheads. The parts fabricated in earlier training are assembled using skills and

knowledge gained throughout the course. Once the instructor inspects the project, it is damaged to simulate bullet holes. The student then has a 25–hour performance evaluation in which he must select the proper repair materials and procedures and effect the repair.

• ***Step 6, 108 hours of instruction. Bonded Panels, Rotor Blades, and 230–Gallon External Fuel Tank Repair.*** This committee teaches the student metal–faced and fiberglass–faced bonded aircraft honeycomb panels. Repairs are on fiberglass–covered, honeycomb–structured rotor blades (CH–47D, AH–1S, and UH–60) and metal–covered honeycomb–structured rotor blades (UH–1 and AH–1G). Also, the student performs repairs on the Kevlar 230–gallon external fuel tanks. Environmental and safety precautions, with commitment to blade repair, are the biggest concerns throughout this committee. Under stock funding of depot–level reparables, the structural repair mechanic can save great sums of money for the unit by repairing rotor blades. Main rotor blades cost upwards of $40,000—while repair kits cost less than $300. Students also perform a day of repairs in mission–oriented protection posture level 4 while in this committee.

• ***Step 7, 60 hours of instruction. Shared Field Training Exercise (SFTX).*** This is the largest change in the 68G10 course within the last year. The students work 12–hour days under the watchful eyes of the instructor and the 68G30 Basic Noncommissioned Officer Course students. The advanced individual training student performs every function from getting the work order, determining the parts or repair requirements, and executing the steps necessary to make the repair on an actual aircraft. The repair is inspected by the technical inspector and signed off on and the work order closed out through the Production Control Office. This work is accomplished on Category B trainers and salvage aircraft used in other training departments. This committee allows the student to use all the skills learned throughout the course and is the largest confidence builder we have. After the SFTX, students are no longer worried about drilling or cutting on an aircraft because they have already done it on real aircraft.

The student must pass each step to go to the next one. We do have failures and recycle some students. For example, if a student failed Step 5, he would be recycled back to the training he was weakest in. This means he could be recycled back as far as Step 2. Students are allowed only one recycle. If they fail twice, they are eliminated from the course.

There are eight steps to becoming a successful aircraft structural mechanic. The final step belongs to you—the commander, the platoon sergeant, or the section sergeant.

• ***Step 8, field link.*** All new soldiers are given a pre–addressed, stamped post card to mail back to us when they reach their new unit. This card is important—it provides us a point of contact in the field, or a field link, and is used to monitor the soldier's progress. It is our test of ourselves. How well did we teach this soldier? What were his weak points or strong points? Is he safety conscious? Is he able to find the repair procedures in the applicable manuals? When I call or write you, I have only a few questions. I need your feedback. Also, students should arrive with their student progress report. Let us know if they don't. With the Army changing, courses may be cut even though we argue that we need more time. If the cuts do come, the information you provide allows us to train the student in the area you require and head off problems before they arise.

. . . *Rivet on.*

U.S. Army Aviation Logistics School

Readers may address matters about aviation logistics to—Assistant Commandant, U.S. Army Aviation Logistics School, ATTN: ATSQ–LAC, Fort Eustis, VA 23604.

Development of a Realistic Environment for Operational Testing

CW4 L.E. Weidell
Aviation Test Directorate
U.S. Army Test and Experimentation Command
Fort Hood, Texas

The development and integration of new technology are essential to enhance combat capability. So when the Army determined that the current AH–64A Apache needed a better detection and engagement capability to give helicopter pilots an edge over the enemy, the Longbow Weapon System was developed and tested under a proof–of–principle program. As a result of that program, further development was approved.

To determine the operational suitability and effectiveness of any new item to be used in combat, however, it must be tested in a realistic setting. Upon completion of the current development program, the Longbow Weapon System will require an initial operational test and evaluation (IOTE).

An IOTE can be compared to a full–up dress rehearsal. The IOTE is the final major test of an item before it goes to full–scale production. It is a test of the new equipment and the training plan, logistics, and personnel required to support the equipment. The IOTE validates its tactics and capability to interface and operate on the modern battlefield.

To ensure that the necessary data will be obtained during the IOTE, the Army establishes critical operational issues to verify and quantify the improvements. For the Longbow Apache, there are two issues:

- Does Longbow provide significant improvement in the warfighting capability?
- Can personnel be trained to operate and maintain the Longbow at a wartime readiness in a peacetime environment?

The data collected during the IOTE will be used to answer these two questions.

A total of 227 aircraft will be configured with the Longbow Weapons System. To complete the force modernization package, the remaining AH–64A–series aircraft are to be converted to AH–64C–series aircraft.

The AH–64D Longbow Apache and AH–64C Apache are designed to fight as an integrated system. On the battlefield, that system is an attack helicopter company with eight attack aircraft.

The AH–64D Longbow Apache equipped with the Longbow fire control radar (FCR) is designed to detect, classify, and prioritize targets of military significance. The targets are displayed on a multifunction display in the manpower– and personnel–integrated cockpit. Targets are engaged with a true fire–and–forget Longbow Hellfire missile or with the combat–proven Hellfire missile, 70–millimeter rocket, and 30–millimeter cannon weapon systems used by the AH–64A.

Other enhancements include improved avionics for navigation with the integration of a global–positioning system and digital communication capability with the improved data modem.

The AH–64C Apache is equipped the same as the AH–64D, minus the FCR and upgraded engines.

The AH–64C and the AH–64D will be formed into attack teams (AH–64C/D) and will be the new force multipliers on the battlefield.

The integration of Longbow on the AH–64 offers unique challenges in attempting to test the system in a realistic environment. The test concept is a force–on–force comparison of an AH–64C/D attack helicopter company with an AH–64A attack helicopter company as the baseline. Test events will be conducted

during day and night conditions, with and without countermeasures present.

A representative threat force of ground and air defense elements engaged by an AH–64C/D attack team must be present to test the system. The desired conditions are a battlefield that the AH–64C/D company will see and hear with its sensors when it unmasks for an engagement. That includes smoke and other battlefield obscurants, electronic jamming, and an active force that can shoot back. The IOTE will score the force–on–force engagements with real–time casualty assessment to determine who shot whom in the engagements.

The IOTE for the AH–64C/D Team is scheduled to be conducted in the second quarter of fiscal year 1995, with the results being used to support future procurement decisions.

The U.S. Army Test and Experimentation Command (TEXCOM) Aviation Test Directorate, Fort Hood, Tex., will plan, conduct, and document the IOTE. The Operational Evaluation Command (OEC) Aviation Directorate, Alexandria, Va., will evaluate the data collected. Both TEXCOM and OEC are part of the Operational Test and Evaluation Command, Alexandria, Va.

Obtaining a realistic environment for testing can be very complicated. Testing with representative users is the only sure way to determine if the planning for fielding new equipment is adequate. In the instance of the Longbow IOTE, testing requires innovative simulation and new data collection. When all is said and done, the battlefield will be realistically portrayed and provide an excellent opportunity to determine the suitability and capability of the AH–64C/D attack team.

U.S. Army Test and Experimentation Command

Readers may address matters concerning test and experimentation to—
Headquarters, TEXCOM, ATTN: CSTE–TCS–PAO, Fort Hood, TX 76544–5065.

U. S. Army Class A Aviation Flight Mishaps

Fiscal Year	Number	Flying Hours	Rate	Military Fatalities	Total Cost (in millions)
FY 93 (through 30 December)	8	317,153	2.52	8	33.6
FY 94 (through 30 December)	7	317,153 (estimated)	2.21	2	5.3

Air Traffic Control Support Is Not Free

Mr. Freddie G. Helton
Chief, Programs Management Office
U.S. Amy Air Traffic Control Activity
Fort Rucker, Alabama

The realignment of air traffic control to the Aviation Branch in 1986 also transferred the maintenance mission for the fixed–base equipment in the field. The U.S. Army Air Traffic Control Activity (USAATCA), Fort Rucker, Ala., was designated by Headquarters, Department of the Army (HQDA), to provide intermediate and limited depot–level support for fixed–base air traffic control (ATC) systems throughout the continental United States, Alaska, Hawaii, Japan, and Panama and selected sites in Korea. Under the ATC Transfer Plan, approved by the Army chief of staff, this maintenance support was to be on a reimbursable basis.

A program was developed and implemented by the USAATCA to comply with the HQDA directive covering, in detail, what services are available to commanders who operate ATC–unique systems and how to obtain and pay for these services. Fiscal year (FY) 1993 was the pilot year under the reimbursable concept, and several concessions were required because of the number of customers not budgeting for ATC equipment maintenance or not being aware of the established procedures. Major problems were encountered by facilities and the USAATCA at the beginning and end of the fiscal year because of the nonavailability of funding to support ATC equipment. These problems were overcome through concessions by the USAATCA, as mentioned earlier, necessitated by the impact that critical outages have on aviation safety.

During FY 1994, the chain of command must become more involved to reduce problems due primarily to noncompliance with the procedures established for this reimbursable maintenance program. Specifically, command involvement is greatly needed in ensuring that adequate funding is programmed and forwarded to the USAATCA to support ATC equipment maintenance, proper packing and crating of repairable components shipped to the USAATCA, and the timely return of defective components. Many times last year, facilities indicated funds were sent to Fort Rucker days or weeks earlier; when tracked down, the resource documents had been forwarded to the wrong address. Several components that could have been repaired when they were shipped were received in a state beyond our repair capability because of poor packing or crating. Also, many components are in the field that should have been forwarded for repair and reissue several months ago. The concessions made in 1993 put a tremendous strain on this program; therefore, in 1994, there will be dramatically fewer.

When the reimbursable program was implemented, accounts—similar to bank accounts—were established by the USAATCA for all customers serviced during FY 1993. As service (assistance, parts, or repair) was rendered to a customer, the total cost was charged and deducted from that customer's account. Quarterly status reports were forwarded to customers to document execution of funding and to provide an account balance. More often than not, the balance was a negative figure. Funds were solicited for those accounts, but normally an additional requirement for service, parts, or assistance was received first. The USAATCA's operating budget was relied upon heavily for these requirements until additional funds were received from the appropriate customer. It became the norm that these accounts were never brought out of the red for the remainder of the year.

USAATCA funding cuts for FY 1994 mean that USAATCA can no longer support customers. As funds are depleted from an account, service must be discontinued for that customer until additional funds are received by the USAATCA. Organizations that manage the funding to support ATC maintenance must provide the resource documents (Military Interdepartmental Purchase Request) directly to the USAATCA, preferably by facsimile. Further, the funding must be received before any service will be provided. Compliance with this requirement will preclude any interruption of service as critical outages occur.

A message dispatched to the field in August 1993 attempted to get a copy of the memorandum of instruction, fielded in October 1992, for obtaining maintenance support of fixed–base ATC systems in the hands of all maintenance chiefs, airfield commanders, and appropriate resource personnel. This document provides detailed guidance for all the above individuals in requesting, obtaining, and paying for this maintenance service. The USAATCA is trained and equipped to provide this unique service to the field, but a concerted effort is essential to keep fixed–base ATC equipment in an operational state at all times.

U.S. Army Air Traffic Control Activity

Readers may address matters concerning air traffic control to—Commander, USAAVNC, ATTN: ATZQ–ATC–MO, Fort Rucker, AL 36362–5265.

Command Sergeant Major Fredy Finch Jr

Aviation Branch Enlisted Initiatives

The Aviation Branch is in the midst of change! Initiatives are currently being worked that will affect virtually every aviation enlisted soldier.

The most far reaching of these is the Aviation Restructure Initiative. This bold and innovative action shifts the aviation organizational structure toward homogenous units with modernized aircraft systems as we phase out the older systems. While there are great opportunities, implementation of this action presents significant challenges that will affect the entire branch.

A second initiative that will have a significant impact on aviation enlisted soldiers is Stripes on the Flight Line. This program actually consists of several separate actions. First, we will upgrade crewchief positions. Highly technical and sophisticated aircraft systems demand experienced technicians to keep them flying. To make this a reality, our proposal is being staffed at the Department of Army (DA) and major Army command levels.

The second piece is in the final development stage—realigning the senior grades in aviation maintenance. It puts some of our most experienced soldiers back in table(s) of organization and equipment units working in aviation maintenance. Most of our 67Z master sergeants (MSGs) are in leadership positions, not maintenance, and most all of our 67Z sergeants major (SGMs) are in tables of distribution and allowances positions.

This proposal, and the leadership/technical tracking of our soldiers, will capitalize on the wealth of knowledge and experience that our senior noncommissioned officers (NCOs) possess. This action requires development of another career management field (CMF), CMF 15, to form a career pattern for those selected to the leadership track.

Under this concept, a soldier at the sergeant first class (SFC) level would be tracked into either leadership (CMF 15) or technical (CMF 67) positions. Those selected for the traditional leadership track would become platoon sergeants, first sergeants (1SGs), and SGMs. Soldiers selected for the technical track would perform or supervise maintenance and could progress to the higher enlisted level. Currently, about 80 percent of our most experienced soldiers are taken out of the technical side at the SFC/MSG level and put into leadership positions. Soldiers will be tracked initially by the SFC centralized promotion board. To support this, we will be asking DA for "stand–alone" aviation panels on future promotion boards.

Once tracked, these soldiers will remain in and compete for promotions within their track. The Stripes on the Flight Line package will improve aviation maintenance capabilities, increase the experience level of soldiers' performing maintenance, allow for progression of the technical track soldiers, and provide competent NCO leaders at all levels.

Another project being worked in the maintenance arena is the transfer of proponency for MOSs 68L (Avionic Communications Equipment Repairer), 68Q (Avionic Flight Systems Repairer), 68R (Avionic Radar Repairer), and 93D (Air Traffic Control Equipment Repairer) to the Ordnance Branch. This move will result in these low–density MOSs being managed with other bench repairers and enhance the career opportunities for these soldiers.

Consolidations of some MOSs are also being developed. For example, consolidating MOS 68J (Aircraft Armament/Missile Systems Repairer), 68F (Aircraft Electrician), and 68N (Avionic Mechanic) with additional skill identifiers (ASIs) W5 (OH–58D Qualification) and W6 (Aircraft Survivability Equipment) will result in an Armament and Electronics Avionic Mechanic for the Kiowa Warrior. In a similar vein, consolidating MOSs 68F and 68N with ASI W6 will result in an Avionic Electronic Mechanic for nonattack aircraft.

Work is in progress on revising MOS 67S (OH–58D Helicopter Repairer) to cap at the SFC level. This revision will provide a more logical career pattern for these soldiers.

On the aviation operations side of the branch, work is continuing on the merger of MOSs 93C (Air Traffic Control Operator) and 93P (Aviation Operations Specialist) at the MSG level. This merger will benefit the 93C by increasing their potential for promotion and the 93P by infusing some top–quality soldiers into aviation operations. A significant percentage of 93P MSG/SGM positions are filled by soldiers who have held MOS 93C at some point in their career.

A proposal to merge aviation life support equipment (ALSE) tasks into MOS 93P is also being developed. This action will eliminate an ASI and give commanders more flexibility in choosing their ALSE technician.

A lot of changes are in the process. However, change is necessary as we focus on the future of Army aviation and move into the next century.

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A Quiz on the Limitations of the Human Eye

UNAIDED NIGHT OPERATIONS

Flying safely at night demands that we understand the human eye and its limitations.

By learning to protect our vision and scan properly, we can avoid the gauntlet of illusions and traps that await us when we fly in the dark.

This puzzle is the third in a series and covers items asked on your APART oral evaluation from chapter 8, section 8, more specifically, Unaided Night Operations. There are no questions on night vision goggles.

If you have not completed one of these puzzles before, try it!

You will find all the answers in TC 1-204, ***Night Flight Techniques and Procedures***.

It is easy to do a crossword puzzle when you have the answers!

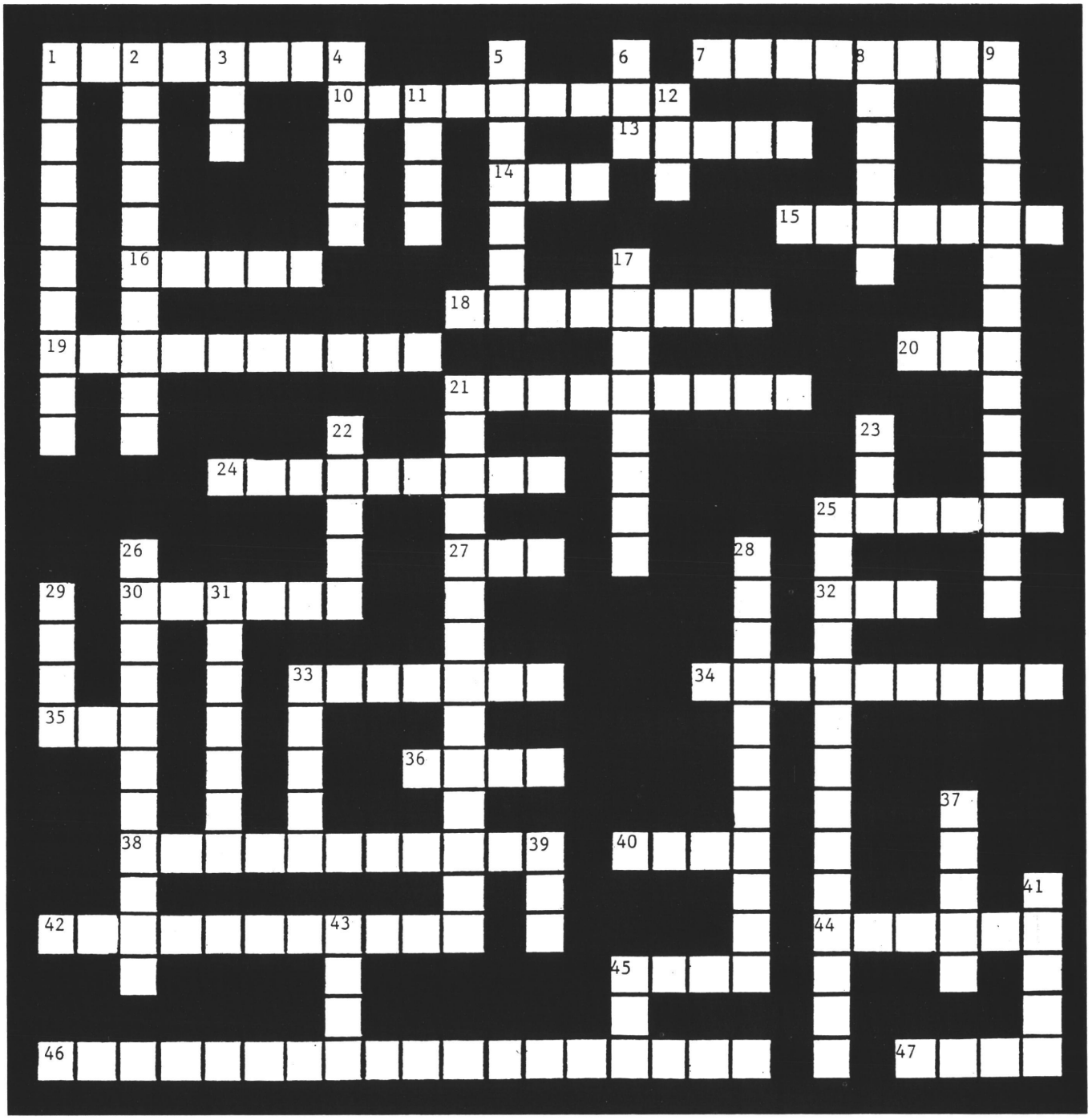
ACROSS

1. Vision characterized by color and detail.
7. Night approach "Y."
10. Viewing used with 18 across.
13. Perception lost at night.
14. VIS. required at night, uncontrolled airspace below 1,200 ft. (RW only)
15. Viewing used with 1 across.
16. Blindspot caused by fovea centralis.
18. Night vision.
19. Carbon monoxide affects this vision.
20. Authorized supplemental lighting.
21. Visual purple.
24. Vision normally compensating day blind spot.
25. Vision problem causing distant focusing difficulty.
27. 20/_____ (in hundreds) best visual acuity at night.
30. MUST be integral part of all mission planning!
32. Degrees offset using off–center viewings.
33. Approx. degrees moon moves per hour.
34. Cues used in depth perception and distance estimation.
35. Devices that improve night vision.
36. These cells use 21 across.
38. Associating one object with an object of known size to determine distance.
40. These wavelengths prevail at night, causing myopic individuals difficulty.
42. Illusion where aviator fixes on object ignoring other cues.
44. Perspective where parallel lines converge.
45. Part of eye that hardens with age.
46. Ability to judge this at night degrades as light levels decrease.
47. Aviators are never this!

DOWN

1. Visual problem described in 45 across.
2. Causes a blindspot.
3. Rods, _____–thousand times more sensitive than 4 down.
4. Concentrated in fovea centralis.
5. Dusk and dawn vision.
6. "_____ over red, you're dead," (VASI).
8. Home for rods and cones.
9. Takes 30 to 45 minutes.
11. PA where nonsmoker begins losing night vision (thousands of ft).
12. Illumination color troubling presbyopic eyes.
17. Cone chemical.
21. Illusion mistaking other aircraft's motion as your own.
22. Approximate age when presbyopia is noticed.
23. Blindspot caused by 2 down.
25. Apparent motion of stationary objects observed in aircraft.
26. NVD cannot correct for this visual problem.
28. A static light appearing to move.
29. Overcome illusions by doing this.
31. _____ vertigo can produce dangerous reactions.
33. Cloud formations can cause _____ horizons.
37. Concentration of cones.
39. Geometric perspective acronym.
41. Difficult to detect (especially during OGE check).
43. Crucial element when navigating at night.
45. _____/LONG.

CROSSWORD PUZZLE



(Answers on page 29)

1993
LTG ELLIS D. PARKER AWARD
WINNERS

OVERALL WINNER

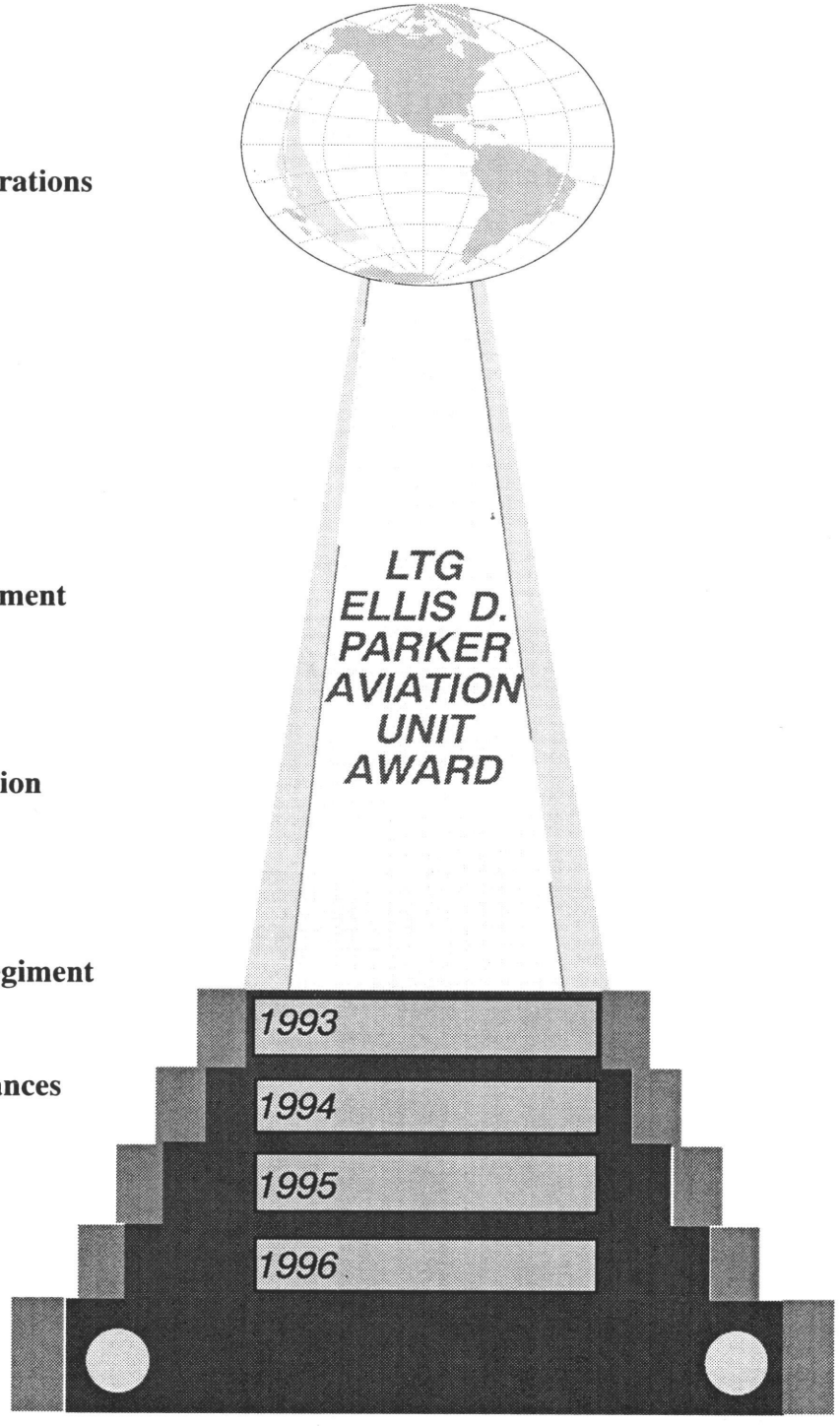
3d Battalion, 160th Special Operations Aviation Regiment (Airborne)
Hunter Army Airfield
Savannah, GA
Combat Support

RUNNERS UP
(Winners in their category)

2d Battalion, 25th Aviation Regiment
Fort Drum, NY
Combat

421st Medical Evacuation Battalion
Weisbaden, GE
Combat Service Support

1st Battalion, 212th Aviation Regiment
Aviation Training Brigade
Fort Rucker, AL
Table of Distribution and Allowances



TOP AVIATION BATTALION/SQUADRON IN THE ARMY

PIN: 072142–000