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July/August 1994

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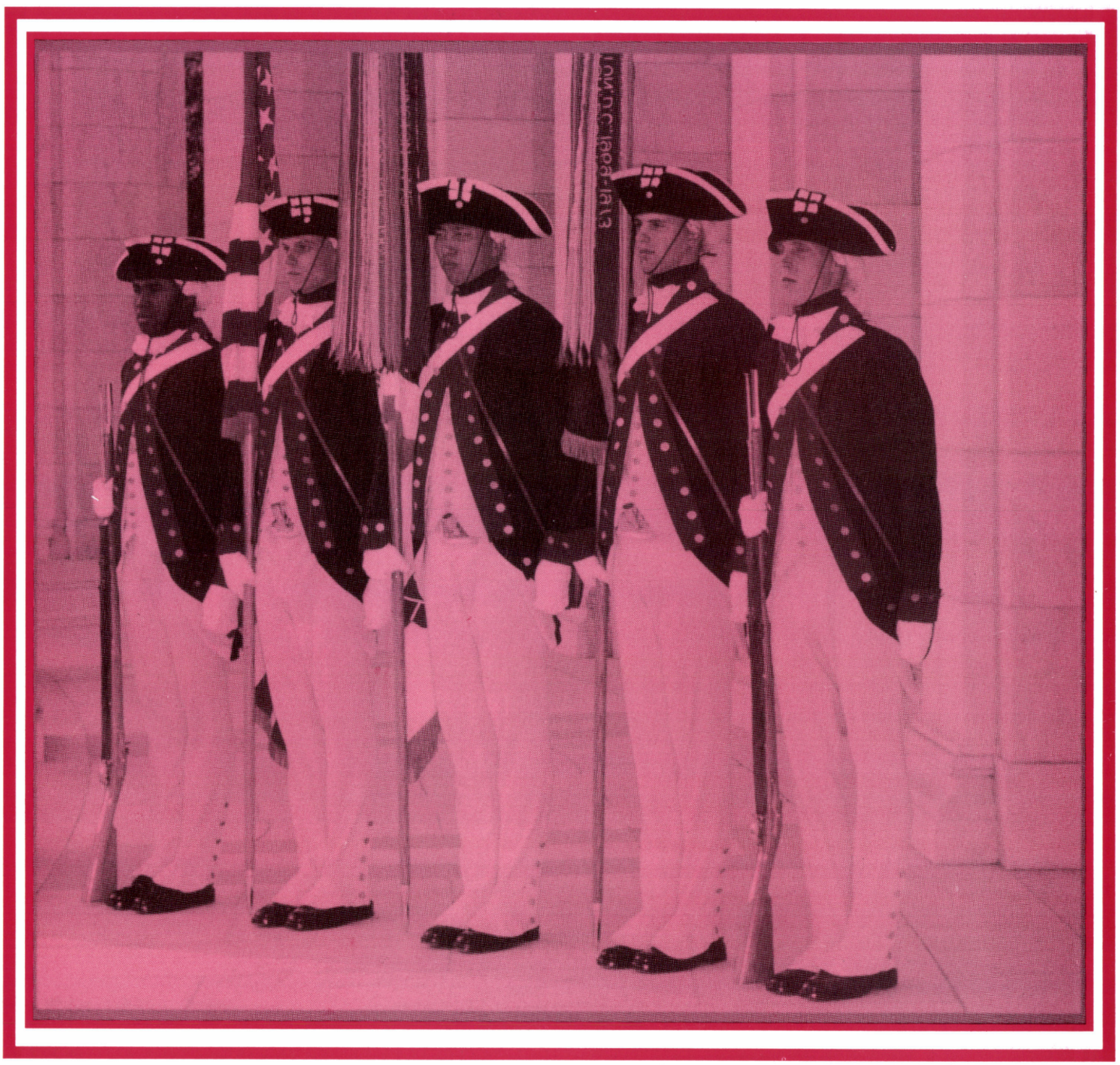

"America Must Lead "

Aviation Digest

Professional Bulletin

1 – 94 – 4 • JULY/AUGUST 1994

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Back cover: Grizzly Flight—a small detachment at Fort Greely, Alaska, home of the Cold Regions Test Center and the Northern Warfare Training Center—currently holds the longest period of accident–free flying in the U.S. Army. Depicted are its three UH–1 Huey aircraft that fly in the most challenging weather to maintain this record.

Cover: Just as the Old Guard soldier embodies the highest standards of professionalism and devotion of the U.S. Army of 1784—so must America's Army of 2020 continue to be both the core and the spearpoint of world leadership. Most assuredly, Army Aviation will be the sharp tip of that spearpoint. (Photo: U.S. Army, Military District of Washington)

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Army aviation welcomes one commander . . .

Focus on the Future

MG Ronald E. Adams

MG Ronald E. Adams

As the world prepares to enter the twenty–first century, so does America's Army. It is a different Army from any of its predecessors in that it is a modernized, technology–enhanced, peacetime Army, unequaled among contemporary armies in quality. It is an Army whose activities today are more demanding, more diverse, and more soldier–intensive than at any previous period during the Cold War. It is an Army that is in the midst of a transformation—a transformation guided by a vision of the twenty–first century. As our Chief of Staff, General Sullivan, has said, "The U.S. Army is a changed Army . . . changed to meet the challenges of the twenty–first century. But that change has not eclipsed the essential nature of your Army . . . service to the nation . . . selfless service . . . ." Our fundamental essence remains unchanged—we remain a force capable of successfully promoting and protecting American interests.

Army aviation has been at the leading edge of this transformation and is helping to lead the way into the twenty–first century. Our branch has advanced Army warfighting doctrine, improved simulation technology, modernized major portions of our aircraft fleets, consolidated aviation–related soldier skills, imbued a warrior spirit and ethics into the aviation training base, and initiated an Aviation Restructure Initiative to enhance warfighting.

MG Dave Robinson has been the architect and the driver of these advances, initiatives, and changes. He has provided a clear vision for Army aviation, caring leadership, and the dynamic energy that has propelled our branch on its azimuth for the new century. He and Bobbi have made Fort Rucker a special place to live and work and will be long remembered for their grace and warmth, their genuine concern, and their leadership. I know all of you join me in wishing them every success and happiness as they begin a new phase in their lives together.

As the new Branch Chief, I ask that aviation soldiers keep focused on the essence of our being—our essential core warfighting capabilities. Our watchwords must be standards, safety, dignity, respect, and future.

We must set, enforce, and maintain high standards, protect the force (safety), treat every member of the Army family—and for that matter, everyone—with dignity and respect, and keep our sights clearly on the future.

In looking to the future, it is important that we in Army aviation build on past successes and concentrate our efforts on retaining quality soldiers, developing competent leaders, providing challenging and realistic training, improving and modernizing our equipment, providing the best force mix, and continually improving our doctrine. These six imperatives are key to future success.

President Dwight D. Eisenhower once said, "We cannot face the future simply by walking into the past backwards." This statement is true now more than ever. As we head towards the twenty–first century, we must keep our eyes, ears, and our minds open and receptive to change. I look forward to facing the challenges alongside you. I am confident that together we in Army aviation will continue on the leading edge of transformation and achieve decisive victory—whenever and wherever we are called.

. . . and says farewell to another

Final Flight

MG Dave Robinson

MG Dave Robinson

As I roll the throttle to flight idle and wait for the two–minute cool down period after my last flight as Branch Chief, my thoughts are on what an incredible time the current age is for civilization and those who protect the peace. To say Army aviation has come a long way in the past three decades would be an understatement.

Unbelievable changes in world politics and economics have combined with previously unthinkable technological advances to propel us from the Industrial Age into the Information Age. The military services of our great nation are now faced with a variety of challenges. Much will be demanded. We will be required to fight very differently from the past. The potential for continued global tension and disorder is nearly assured. At the same time, we must be capable of handling crisis response, regional conflicts, peacekeeping operations, and disaster–relief missions.

To be effective in the twenty–first century, all components, active and reserve, must have a superior trained force and a flexible warfighting doctrine that is best described in the *spirit of cavalry*. Army aviation will be at the heart of the Army. Aviation is much more than the manipulation of flight controls—it is about fighting aviation platforms that are victorious in battle. To achieve victory, aviation warriors must understand warfighting and possess the soul of a warrior. As it has been in the past, soldiers, not their machines, must carry the victory.

Through remarkable teamwork and a positive vision for the future, Army aviation has attacked the challenges of the current age. We are now postured to lead the combined arms team onto uncertain future battlefields with competent warriors and high–technology modern equipment.

We have reengineered our forces; are modernizing our fighting fleet; and are focused on force projection doctrine, operations other than war, and joint, combined, and interagency dimensions of warfare. The Aviation Restructure Initiative (ARI) eliminates long–standing Army of Excellence deficiencies and makes Army aviation contingency ready, fightable, and affordable.

As our modernization strategy becomes a reality, we shall reduce the helicopter fleet from 10 systems to 4; the remarkable Comanche remains the centerpiece for the twenty–first century Army aviation—the digital battlefield quarterback.

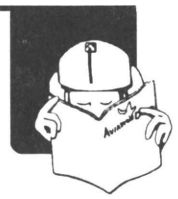
In the training base, we are committed to having a twenty–first century schoolhouse. Initial entry training has begun in the new TH–67 Creek; it will generate significant cost savings. We completely restructured helicopter gunnery to include a detailed master gunner program. We are running a top–notch schoolhouse, focused on the modern systems, for our soldiers. The aviation Officer Basic Course includes a combined arms warfighting phase at the conclusion of flight training. Our Officer Advanced Course and Warrant Officer Career Center are producing outstanding officers, and our Precommand Course is viewed as the best in TRADOC. Our NCO training programs provide critical leadership and technical training for the backbone of the branch. Aviation's "Stripes on the Flight Line" and technical career track for our noncommissioned officers are exactly on target. However, in this time of resource constraint, we must continue to fund the training base—training is the glue that holds the force together.

Our simulation environment is expanding dramatically, linking combined arms elements in real, constructive, and virtual environments. Simulations and simulators will give us a quantum leap in combat developments and training devices.

It has truly been a great personal privilege to serve at this time in history. I wish to thank the devoted soldiers and civilians with whom I have served throughout my career. Your personal sacrifices and hard work have been what was necessary to succeed. You are the reason Army aviation stands proud—ready to meet the challenges of the next century. You, unlike many, understand freedom isn't free.

I ask you to give the new Branch Chief, MG Ron Adams, your full support and energy. The future holds many challenges and uncertainties, and General Adams is a great soldier and well–chosen to be your leader. Keep the faith in yourselves, our Army, and our leadership. I wish you the very best. ***May God continue to bless you and our great Nation!***

Views From Readers



Feedback on aviator badge policy letter

Responses to letter in March/April 1994 issue, page 6.

Why, when I went to flight school we had to fly uphill to the stagefield—both ways. Boy oh boy! I believe we have finally become like a small number of our predecessors when we start moaning about how easy the people who are not counted as members of *our* generation have it these days. A monumental amount of useful time is spent worrying over trivial matters. Save it for retirement! Case in point—in CW4 Rowse's commentary on the awarding of the aviator badges, it seems he has let his emotions get the best of him and somewhat cloud his attention to detail. He would have been better served had he researched the information he so graciously quoted.

In stating the requirements for earning the *master aviator badge,* he omitted an important bit of information—the requirement for the aviator to *still* have 15 years of aviation service in addition to *one* of the following:

- 12 years as a senior Army aviator and 2,000 hours (of which simulator is included) *or*
- 120 months total operational flying duty credit (TOFDC) and 2,000 hours.

I personally take issue with his conjuring up images of professional pilots all across the world wearing what he calls a bolo badge and thereby shedding somewhat of a negative light on those now earning the emblem of Army aviation. Nothing could be further from the truth. The pilots today are sharp and educated and have a tremendous desire to be the best—just like when he went through (what must have been then) that torturous ordeal called flight school. Can it be the aviator of today does not need the additional time to be considered proficient enough to wear the "award?" I can give testimonial to the quality of aviators we produce here at the Warfighting Center. They are aviators, knowledge sponges. We are responsible for teaching them everything we know and eventually passing the torch to those who can carry it. Our future is in their very capable hands.

CW3 James E. Patrick III
U.S. Army Aviation Warfighting Center
Fort Rucker, AL 36362

Apparently CW4 Rowse has misinterpreted the change in requirements for aviator badges. Under Army Regulation 600–105, the senior and master Army aviator badges are awarded based on flying hours, total operational flying duty credit (TOFDC), and *years of rated service.* Department of the Army message 111345Z Jan 94 changes the flying–hour and TOFDC requirements, but it *does not* change or delete the years of rated service requirement.

For the senior army aviator badge, the new requirement is at least 7 years of rated aviation service with 4 years as an *Army* aviator, at least 84 months of TOFDC, and 1,000 hours of flying time. For the master aviator badge, the requirement is at least 15 years of rated aviation service; 12 years must be as an Army aviator or senior Army aviator with at least 120 months of TOFDC and 2,000 hours of flying time.

The only real effect of message 111345Z Jan 94 is to increase the TOFDC from 72 months to 84 months for the senior aviator badge, and from 108 to 120 months for the master aviator badge. This is actually an *increase* in the TOFDC requirement (17 percent for senior aviator and 11 percent for master aviator)—not the decrease CW4 Rowse indicated.

Aviators should also note that effective 1 Jan 94, time logged in synthetic flight training systems (SFTS) or a combat mission simulator (CMS) may be included to meet the flying–hour requirements for a senior or master Army aviator badge.

The intent was not to turn the senior and master army aviator badges into "easy–to–get 'bolo badges.'" The change was made to reduce the total flying hours from 1,500 to 1,000 for senior aviator, and from 3,000 to 2,000 hours for master aviator. In today's Army, this is a valid consideration. It's much more difficult to obtain 1,000 and 2,000 total flying hours than it was when CW4 Rowse and I were working on our senior and master Army aviator badges.

MW4 Robert G. Klase Jr.
Flight Standardization Division
Directorate of Evaluation and Standardization
Fort Rucker, AL 36362

A letter titled "Aviator badge policy—change for the better?," March/April 1994 edition, is in error. The requirement to have at least 7 years rated aviation service (4 as an Army aviator) for senior wings and at least 15 years of rated aviation service (12 as an Army aviator) for master wings *is still applicable*. HQDA message 111345Z Jan 94 changed *only* the requirements in the column of Table 2–2 titled "Flying Time and TOFDC," of Army Regulation 600–105. See HQDA message 212110Z Jan 94 clarifying the *changes*—which are requiring *84* months TOFDC and 1,000 hours for senior wings, now including SFTS time but *not* civilian time; and 120 months TOFDC and 2,000 hours for master wings, *again* including SFTS time but not civilian time, *along* with the 7/15 years rated service time, medical qualification, current Class–II physical, and military instrument qualification.

LTC Megan Jans
HQDA
ODCSPER
DAPE–MBI
Washington, DC 20310–0300

More feedback on camouflage face paint

Reference the letter (page 5) from CW2 George vonHilsheimer in the March/April issue of the *Digest*:

I hope those in positions of authority read and understand the concept he mentions. Aviators are intelligent, highly technical individuals who do not need to be like someone else.

CW4 Richard L. Miller
D Company, 1st Battalion, 228 Aviation Regiment
2625 Airport Boulevard
West Columbia, SC 29170

Combat Vehicle Survivability Symposium

A symposium on combat vehicle survivability will be 28–30 March 1995 at the Naval Postgraduate School, Monterey, Calif. The symposium will be under the auspices and sponsorship of the Survivability Technology Center, U.S. Army Tank Automotive Command (TACOM) Research, Development, and Engineering Center.

The conference will be classified up to and including *secret*. The TACOM Combat Vehicle Survivability Symposium provides an annual forum for the discussion, interchange, and debate of accomplishments, discoveries, and issues in all survivability avoidance areas. The conference is significant because of the recent progress made in critical survivability technologies and in the military use of these technologies. The conference will provide a setting for discussion of the implications of this technology on the modern battlefield, its relationship to the Army's tactics and doctrines, and the effects that these new technologies have on ground combat vehicle designs.

The organization will be similar to preceding conferences, consisting of contributed, as well as invited, overview papers. The following topic areas will be included:

- Signature management technology and integration into combat vehicles.
- Active and passive vehicle electro–optic countermeasure technologies.
- Active and energetic armor (heavy and lightweight) development and integration into combat and tactical vehicles.
- Damage–reduction technologies including ammunition compartmenting.
- Fire extinguishing.
- Spall liners.
- Nuclear, biological, and chemical detection/protection systems.
- Insensitive munitions.
- Nuclear survivability to crew and overall systems.
- Survivability testing and test methodologies.
- Signature/countermeasure/armor modeling of current and future vehicle systems.
- Survivability optimization modeling.
- Survivability systems analyses.

For more information, contact Sabeena Sharma at the American Defense Preparedness Association, 2101 Wilson Boulevard, Suite 400, Arlington, VA 22201–3061, or commercial telephone 703–522–1820, extension 574.

Aviation Electronic Combat Symposium

The Army Aviation Association of America's Aviation Electronic Combat Symposium will be 8–9 November at the Adam's Mark Hotel in Charlotte, N.C. The symposium will explore "Electronics for the 21st Century."

For more information, contact—
AAAA
49 Richmondville Avenue
Westport, CT 06880–2000,
or commercial telephone number
203–226–8184 or fax number
203–222–9863.

Workshop on stand–off detection

The U.S. Army Edgewood Research, Development and Engineering Center (ERDEC), Aberdeen Proving Ground, Md., is sponsoring the Third Workshop on Stand–Off Detection for Chemical and Biological Defense. This workshop is being sponsored in cooperation with the U.S. Navy, U.S. Air Force, and U.S. Marines. The workshop will be at the Holiday Inn 1776, Williamsburg, Va., 17–21 October.

For more workshop information, contact Sonya Herrin, meetings coordinator, Science and Technology Corporation, P.O. Box 7390, Hampton, VA, 23666–0390 or commercial telephone 804–865–7604 or fax 804–865–8721.

Natick Technology Symposium

The Natick Technology Symposium will be held at the Sheraton Tara Hotel in Framingham, Mass., 15–17 August. This symposium is being sponsored by "Natick Labs," which includes the Natick Research, Development and Engineering Center; the U.S. Army Institute of Environmental Medicine (USARIEM); and the Navy Clothing and Textile Research Facility. The theme of the symposium is "Into the Next Generation: Military Technologies." The Natick Technology Symposium is unclassified.

The Natick Technology Symposium will provide an arena for Natick Labs to host prominent military, industry, and academic representatives. The forum will allow an open discussion of technology and its reinvestment and the fostering of commercial innovation impacting the individual service member with a thrust towards expanding and exploiting dual–use technologies and the teaming of unique capabilities. The symposium will also give the opportunity for viewing exhibits that will show technology advances over the past 40 years while highlighting current and future dual–use technologies and capabilities. For more information, contact Ms. Sonya Herrin or Mr. Keith Hicks, Science and Technology Corporation, commercial telephone 804–865–7604 or facsimile 804–865–8721.

Smoke/Obscurants Symposium XVIII

Smoke/Obscurants Symposium XVIII will be 22–26 August at the Eglin Air Force Base Conference Center, Eglin Air Force Base, Fla. The symposium is cosponsored by the U.S. Army Edgewood Research, Development and Engineering Center, Aberdeen Proving Ground, Md., and the U.S. Air Force Aeronautical Systems Center, Eglin Air Force Base.

The theme of the symposium is "Obscurants: The Smart Countermeasure." Topics include—

- Camouflage.
- Concealment and deception.
- Countermeasures.
- Data analysis, assessment, and evaluation.
- Electromagnetic systems performance.
- Health or environmental effects.
- Modeling.
- Natural and man–made obscurants applications.
- New and novel materials/system capabilities.
- Nonmilitary applications.
- Smoke systems.
- Validation, verification, and accreditation.

For more information, contact Lisa H. McCormick, symposium coordinator, commercial telephone 804–864–7604 or telefax 804–865–8721. Or call Van R. Jones, technical coordinator, at 410–671–3668 or DSN 584–3668.

"AMERICA MUST LEAD"

Lieutenant Colonel Jack A. Kingston, USAR
U.S. Army War College, Class 1994/DCS
Chairman, National Security Advisory Board
Washington, D.C.
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"A ship cannot cross the sea without a helmsman...nor can one defeat an enemy without tactics and strategy. With these, and the aid of God, it is possible to overcome...an enemy of superior numbers... wars are not decided by courage and superior numbers...but, by Generalship. If the leader of the Army fails, his fall can open the way to complete disorder."

Emperor Maurice - ***"Strategikon"***
Byzantium, (582-602 AD)

In his ancient Strategikon, Emperor and battlefield commander Maurice also described strategy as, ***"the points which a General must consider, before the day of the battle."*** True. However, one of the primary responsibilities of strategic leadership also is to look ahead—10 to 20 (or more) years—and determine what the Armed Forces must do to achieve national goals and protect vital interests.

Accordingly, a strategic vision for the U.S. Armed Forces in the year 2020 should encompass three critical elements: a guiding statement of national military strategy, an identification of the three most important challenges confronting the Army, and the nature of conflict to be expected between 1993 to 2020 AD.

The New Era

To begin with, America is no longer on the verge of a new era; it is here. We live in a fundamentally different world than a mere decade ago. The change to be expected in the next three decades will be even more dramatic, principally as a result of the information age paradigm in conjunction with the NOVUS ORDO SECLORUM.

Geopolitical Triangles: Economic/Military

As Mr. Thomas H Etzold described in ***Strategic Review***, Strategic Studies Institute, U.S. Army War College, in the spring of 1990—in effect, two geopolitical triangles will emerge—one primarily economic and the other primarily military. Economically, the United States, Japan, and a combined Europe (dominated by Germany) will stand out internationally. Militarily, the most powerful states will be the United States, Russia, and probably China.

Worthy of note, only America will rank in both; however, modern technology will be increasingly available to all nations. Technology will proliferate while superpower influence diminishes. In addition, worldwide population growth of 30 percent by 2010—coupled with massive immigration from South to North America and from Africa to Europe, along with rapid liberalization—will further increase political unrest and economic instability among nations.

Therefore, for the next several decades, it will be possible to be an economic power without being a military power; possible to wield great political influence without the traditional corresponding military power; and difficult to be economically weak, yet militarily strong and politically influential.

American Strengths/Interests

With that in mind, as Dr. Colin Gray has so simply pointed out, any statement of national strategy must play to American strengths.

In short, U.S. militarily significant, vital national interests are to—

. Protect America's territory, borders, and airspace;

. Prevent a hostile hegemonic power from rising (in Asia, Europe, the Persian Gulf or Latin America);

. Defend access to foreign trade;

. Protect individual Americans abroad and at home; and

. Maintain access to resources.

Challenges Confronting America's Army

Generally, according to the 1993 Joint Military Net Assessment, the U.S. Armed Forces currently programmed are adequate to accomplish these national

security objectives with low–to–moderate risk, at least through 1994. However, given the postulated national strategy above as a beacon, and reflecting on the "cone of plausibility" with regard to the past, present, and future, it is not difficult to forecast the prime challenges confronting America's Army during this period.

First, as a precondition, is the realization that the Army must cope with a slice of a radically reduced resources pie; the $305 billion fiscal 1989 DOD budget may be cut to as low as $220 billion by 1997. Under that "umbrella" challenge will be the foremost challenge to man and maintain a combat–ready force; this challenge has been easier to accommodate in the short–term as simultaneous, massive force reductions created the ability to retain only the best troops. However, it will become a double–edged sword. The declining standards of America's supporting institutions (schools, family, society, etc.) and the liberalization of combat qualification standards will combine synergistically to yield a recruit/officer pool of lower intellectual, physical, and moral caliber.

The **second** challenge will be to adequately equip the force so as to provide force enhancements, combat/operations multipliers, and cost effectiveness in an austere funding environment. As before, the current economic status of the nation, combined with decreasing public confidence in all of our institutions, is making it very difficult to maintain the standards of Operation Desert Storm in the quality and performance in military affairs.

In fact, each and every one of the services' Chiefs of Staff testified before Congress, in early 1993, that they, individually and collectively, feared the imminent development of a "hollow force." For example, our Army was the seventh largest in the world in 1990. Today it is only the eleventh. The Army's budget for modernization based on requirements identified during Operation Desert Storm (ODS) is underfunded by $1 billion. Naval forces that support the Army have a budget shortfall of some $750 million and Naval Aviation maintenance backlogs are accumulating (150 aircraft, 250 engines), while Air Force resources are curtailed.

Consequently, the Army leadership must be concerned that the National Command Authorities (NCA) and Congress establish the framework for a prosperous economy to support adequate budget requirements as well as preserve a viable industrial production base (including international leadership in research–development and technology).

Third, and closely related to maintaining and equipping the force, will be the challenge to improve the capability for power projection; that is, to organize, deploy, and employ the right force and win decisively, worldwide, on a timely basis. To be sure, the very improbable prospect of an unlimited, general, or nuclear war certainly has already unburdened Army strategists and logisticians. However, since the fall of the Soviet Empire in 1990, the still snow–balling democratic/free market/social "revolution" can be expected to affect virtually every notable country in the world by the year 2000, or sooner.

Consequently, the corresponding uncertainty and resultant increase in the frequency of smaller major regional conflicts (MRCs), United Nations/peacekeeping, counternarcotics, humanitarian, and environmental missions will continue to result in serious challenges to Army resources. These challenges will continue on an unprecedented scale of increasing magnitude, out to the year 2020 and beyond. The nature of conflict during this period will equal or eclipse the previous historical leaps: from man and horse—to bullet and machine; from ground and ocean surface—to air and ocean subsurface; from line–of–sight and dumb—to laser–guided and smart; and from manual/voice to electronic/digital.

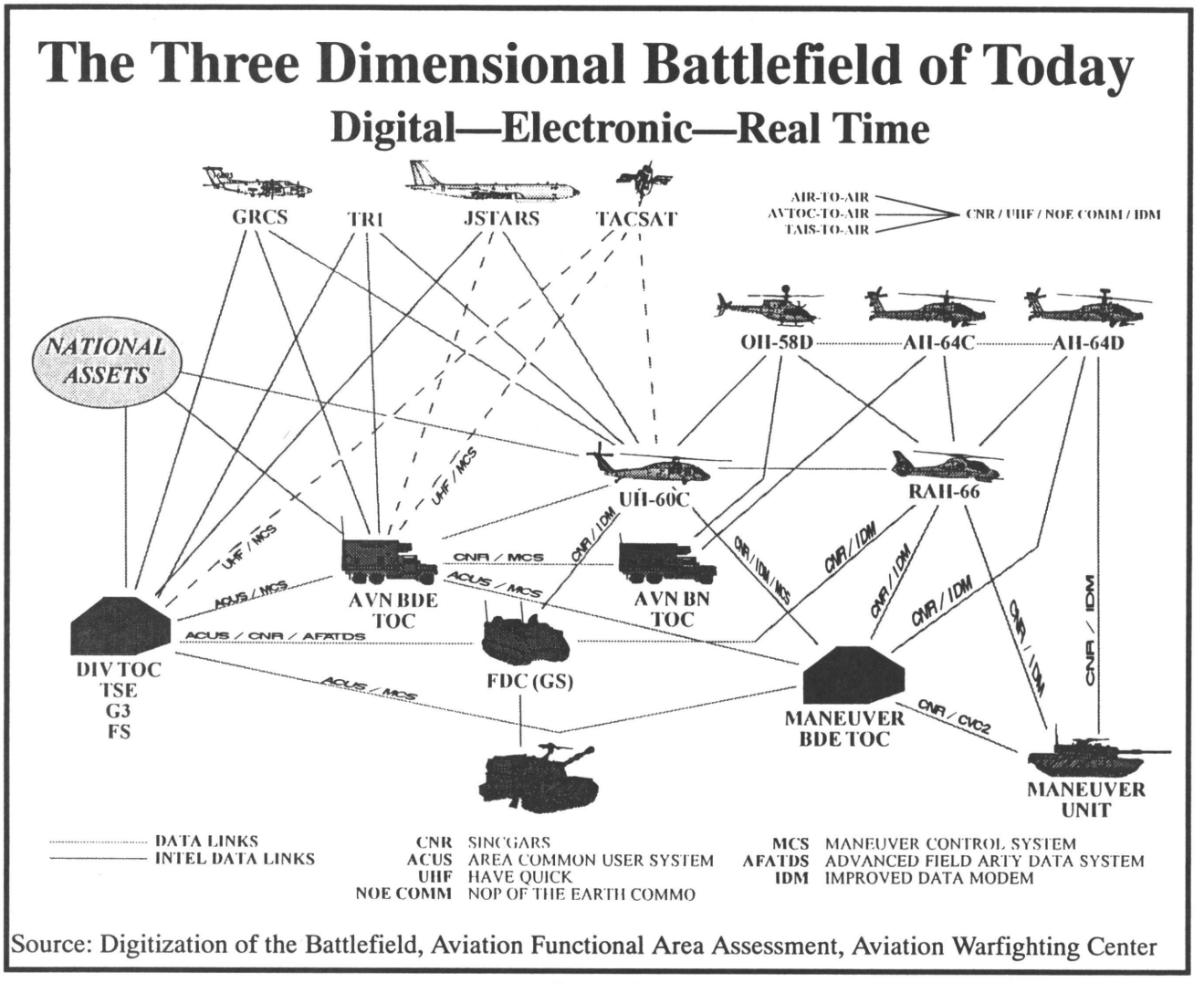
New Technologies/Weapons Systems

The Army will be smaller by half, but will generate geometrically more combat power and strive to deny the enemy traditional forms of ground combat. This will be achieved by leveraging key technologies to produce the integration and synchronization necessary to develop a "digital battlefield"(see figure 1). On this battlefield smart weapons are linked and unified through smart people via a maneuver control system whose operations are largely invisible to the naked eye.

The coming revolution will not be in weapons of greater destruction per se. It will be in command of the battlespace (C^4I) and in processing information to dispel or enable the commander and his individual soldiers to see through the "fog of war."

These capabilities are primarily derived from what General Gordon R. Sullivan, Army Chief of Staff (CSA), has called a "weapon"—the microchip/microprocessor. That particular technology is already improving training and weapons, and will open the door to new levels of electronic warfare.

Beyond that example, a host of other technologies also are important. Some are existing and pervasive like: data fusion, robotics and machine intelligence, simulation, composite materials, passive sensors, and fiber and integrated optics. These have enabled the development of small, fast, lethal, and pilot–friendly attack/scout helicopters that can reliably achieve kill ratios of 18 to one against tanks/fighting vehicles. Oth-



Source: Digitization of the Battlefield, Aviation Functional Area Assessment, Aviation Warfighting Center

Figure 1.

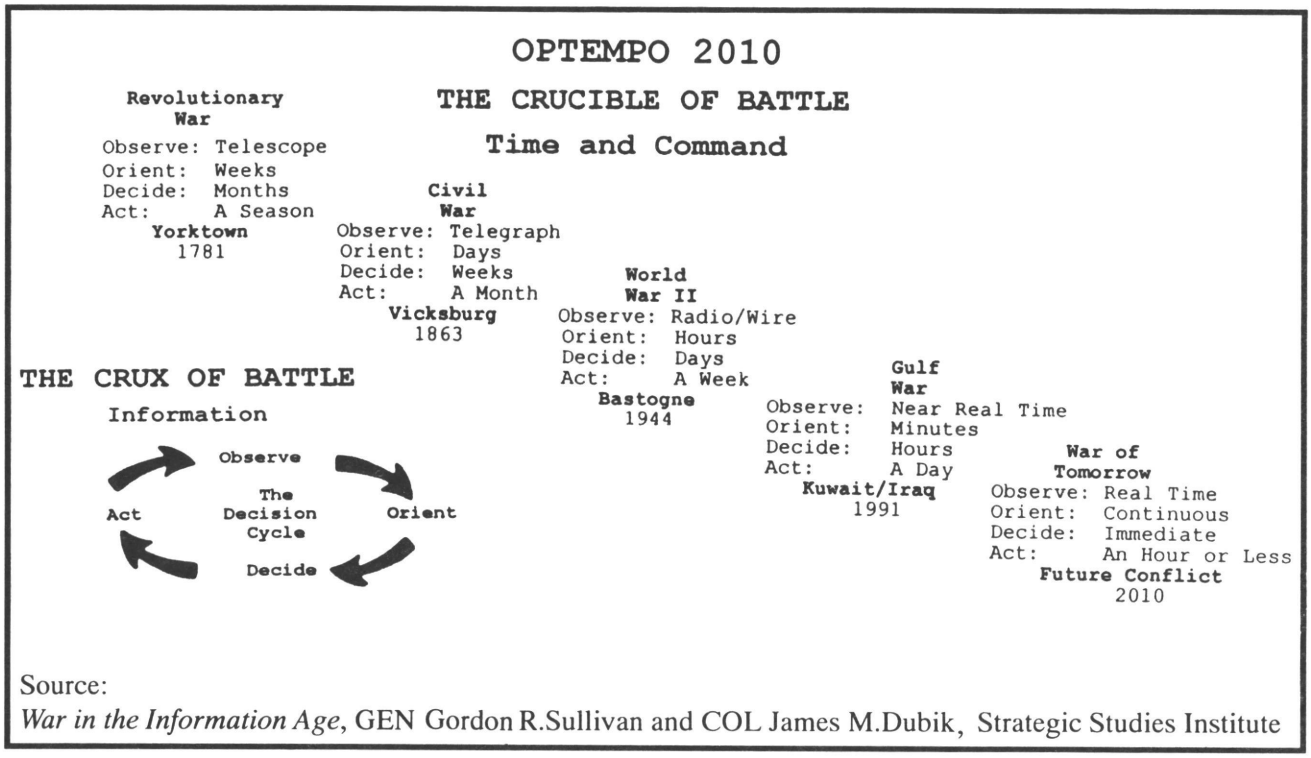
ers are emerging and will not impact until fielded; biotechnology materials; high–energy density explosives and propellants; hyper–velocity projectiles; superconductors and pulsed power microwave, just to name a few.

In my opinion, such advances combined with the development of radically new power/lift/thrust concepts, may result in a quantum leap in fighting vehicles and weapons systems integration by the year 2020; the merging of the fighter, the helicopter, and the tank. In fact, Harrier jump–jets and the USAF X–31 fighter/attack prototype flying now indicate this trend.

The Battle, Circa 2020

With that in mind, it is conceivable the first battle, circa 2020 AD, will (as postulated by Professor David Clark, U.S. Army War College) take place in the atmospheric ether as countersynchronous lasers seek out, pinpoint, and neutralize C^4I links. Next an electromagnetic attack by rigidly controlled, low–atmospheric nuclear weapons could fry radios and satellites, while only marginally affecting troops. Then friendly, robotic sensors will probe 360 degrees, as vertical take–off/landing (VTOL) combat vehicles operate at 250 miles an hour in the nap–of–earth or Mach 8–20 on the fringes of the stratosphere.

Naval forces will operate subsurface or be prohibitively vulnerable. OPTEMPO will be too fast for humans to comprehend (see figure 2). The operational level of war may then be conducted by computers, under one general staff, with unified forces commanded by officers qualified in one of four broad categories: Air combat, ground combat, naval surface, and naval subsurface warfare. But, war will still be a continuation of politics by other means—to defeat the will of the enemy; only by the year 2020 those means will have changed dramatically.



Source:
War in the Information Age, GEN Gordon R.Sullivan and COL James M.Dubik, Strategic Studies Institute

Figure 2.

Conclusion

In closing and in summation, it is an indisputable fact that America won the Cold War. But, that's not the whole picture. America also has lost wars and will, with great certainty, lose again. Colonel Trevor Dupuy (USA, Ret.) accredits America's Army with seven victories, three losses, and one draw in a total of 10 wars.

With that in mind, America has been "luckier" and more durable in her losses, than many other nations in their victories. By any measure, this persistent long-term success, despite episodic and catastrophic failure, is the result of the uniquely American "dream" (read, vision) and certain enduring, core institutions. Historically, it has been the American people—their troops, arms, industry, power, values, and vision—that established American leadership in the past, and pre–eminence in the present. In the future, America cannot fear losses, nor abdicate to lesser threats than she has already defeated.

America must lead, and America's Army must continue to be both the core, and the spearpoint, of that leadership through 2020 AD and beyond. The results of recent combat operations and trends suggest that Army Aviation will be the sharp tip of that spearpoint.

> *"...What America expects from guys like me, and people like you...is to protect and defend the Constitution. There is no wiggle room...forget it! If you think for one minute...they will tolerate guys like me talking about, I couldn't do this...forget it! What they want from us is: IN YOUR FACE, WIN! WIN!"*
>
> *"That's what America expects from us. Did we win? Did we succeed ... without a lot of excuses? This we'll defend...that's been the Army motto since 1775...I don't know what we'll be asked to defend...I don't know where...but, the institution will be here. Part of our vision for the future is a process to focus...control, direct, and understand change—a concept to provide leadership, on the way to our Vision of the future of the Army."*
>
> General Gordon R. Sullivan, CSA
> USAWC, Strategic Leadership Conference, 1991

The Vision Is Clear

CPT R. Keith Lembke
Assistant S3, 4th Aviation Brigade
4th Infantry Division (Mechanized) and Fort Carson
Fort Carson, Colorado

"I believe that the hardest thing for an organization to do is change its intellectual focus."

General Frederick M. Franks, Jr.[1]

As we approach the twenty–first century, Army aviation is in the enviable position of becoming the premier maneuver arm of modern armies. However, we in Army aviation still have a way to go to prepare ourselves for the future. We still have not fully grasped all of the realities of today's technology on the modern battlefield. Technology will continue to mold the nature of the battlefield into an environment that will further complement the agility inherent in helicopters.

We in Army aviation have an obligation, if not a duty, to ensure that we are prepared for the future battlefield. Today we must establish the foundation that will serve as the bedrock for Army aviation's dominant role on the battlefield. Three ingredients make up the foundation that we, as the aviation leadership, must build to nurture aviation into the next century:

- A firm understanding and application of the principles of war.
- An intuition and imagination that give a vision of the potential of the technology available to us now and in the future.
- A passion for the art and science of war.[2]

A vision of tomorrow's battlefield greatly enhances our understanding of the revolutionary role helicopters will play in it. Paddy Griffith, in his ***Forward Into Battle***,[3] describes an "empty" battlefield characterized by dispersed units, spread throughout the battlefield, fighting from mutually supporting positions. The units essentially come together at the critical place and time to mass effects.

At the risk of oversimplifying a complex subject, the dangerously deceptive "empty" battlefield has developed through an evolution of tactics in response to the increasing lethality of modernized weapons. In effect, large massed units have had to break apart into smaller subunits to move throughout the battlefield to escape the devastating effects of technology applied in all of the battlefield operating systems. The results of the Gulf War—in which a U.S. "fifth–generation" army destroyed an Iraqi "fourth–generation" army[4] with an array of sophisticated weapons from unheard–of distances—indicate that this trend towards an "emptier" battlefield will likely continue.

At the same time, the U.S. is planning on using smaller quantities of forces to fight its battles, depending on quality of force and technological advantages to offset numerical disadvantages.[5] Success on the future "empty battlefield" with smaller forces will not be possible without strategic and tactical agility—the greatest attribute of the

helicopter. Tomorrow's empty battlefield will be the perfect environment to take advantage of the advanced technology helicopter, if our doctrine takes advantage of the available technology.

The nature of the future enemy will also demand that we use all of our systems efficiently and to their potential. It is no secret that the world arms trade is flooding the market with sophisticated weapons systems for relatively cheap prices. It is also no secret that we have delayed acquisition cycles of new weapons systems for 5 to 10 years.

Although we have saved the research and development for most systems, we will not be able to field new systems and develop the tactics/doctrine for the systems in the field within the next decade. The result is that in 10 to 15 years we will have several potential enemies throughout the world that will have sophisticated weapons systems and will be in the process of refining the appropriate doctrine to use the technology.[6]

Meanwhile, we will be starting to field a generation of systems with revolutionary technology; but, we will be lacking a field–tested doctrine that uses the technology to its fullest potential. In other words, our danger is that we will be a sixth–generation army with fifth–generation doctrine/tactics fighting a fifth–generation army with refined fifth–generation doctrine/tactics.

Success on the future "empty battlefield" with smaller forces will not be possible without strategic and tactical agility—the greatest attribute of the helicopter.

The inherent danger is that we will fight a sophisticated enemy—while limiting ourselves to the same level of sophistication as the enemy because our doctrinal life cycle will lag behind our technological life cycle. The implication is that we will be vulnerable 10 to 12 years from now because we could easily fight an enemy without having a distinct operational advantage. If we are prepared for the future and keep our doctrine aligned with our technology, MG (retired) Vladimir I. Slipchenko, the chief of the research department of the General Staff Academy of the Russian armed forces, believes that we will be the first and only nation to become a full sixth–generation army within the next 10 to 12 years.[7] Army aviation will be a critical part of that U.S. sixth–generation army.

As the battlefield becomes "emptier" and technology improves the battlefield operating systems, the traditional definitions of the principles of war will become inadequate. The truths of warfare have not changed, nor will they ever change; however, our comprehension of the truths must change. The nine principles of war are the "timeless bedrock of army doctrine" according to Field Manual (FM) 100–5, *Operations*, pages 2 through 4.[8] The challenge to us, as the aviation leadership, is the sound application of our available forces—forces = equipment (technology) + personnel + training—to operations within the true intent of the principles of war.

Specifically, we must look closer at the potential effects of our systems when analyzing a potential tactic using a principle of war as a

criterion. If we do not, we will inadvertently place self–imposed constraints on ourselves. A classic example of this phenomenon of self–imposing a constraint on ourselves because of a preconceived interpretation of principles of war is happening within the attack community of the Aviation Branch today. In the search for achieving the effects of maneuver, massed fires, and security on the battlefield, we have inadvertently significantly reduced the potential lethality and use of the AH–64 Apache. In fact, we have essentially reduced its role to one of holding it back for the "big punch."

We have even further reduced the attack battalion's potential value by adapting a "FLOT (forward line of own troops) syndrome." The FLOT syndrome is a doctrinally accepted attitude that implies that any actions near or through the FLOT, day or night, demand the same vast quantities of resources and energy as a ground maneuver brigade or division penetration.

Admittedly, areas adjacent to the FLOT are lethal, but we are ingrained with the notion that the forward line of own troops is an invincible solid wall that must be "blown" through. All too often, it is nothing more than a line on a map. The FLOT syndrome, a fear that may or may not be based on fact, tends to limit the mobility and agility of our helicopters to that of the speed of displacing artillery, the timeliness of the deep–battle staffs, and the timeliness of "other than organic" intelligence systems.

We have limited the aviation commander's capability to take advantage of the dynamics of the battlefield and audaciously maneuver his attack battalion to capitalize on acquired opportunities. The final result is that we hold the attack battalions in reserve until a suitable target has been found and fixed that we believe is worth the risk of committing our AH–64s.Therefore, our most technologically advanced aviation systems, the AH–64s, are committed only a few hours a day. In the long run, we—

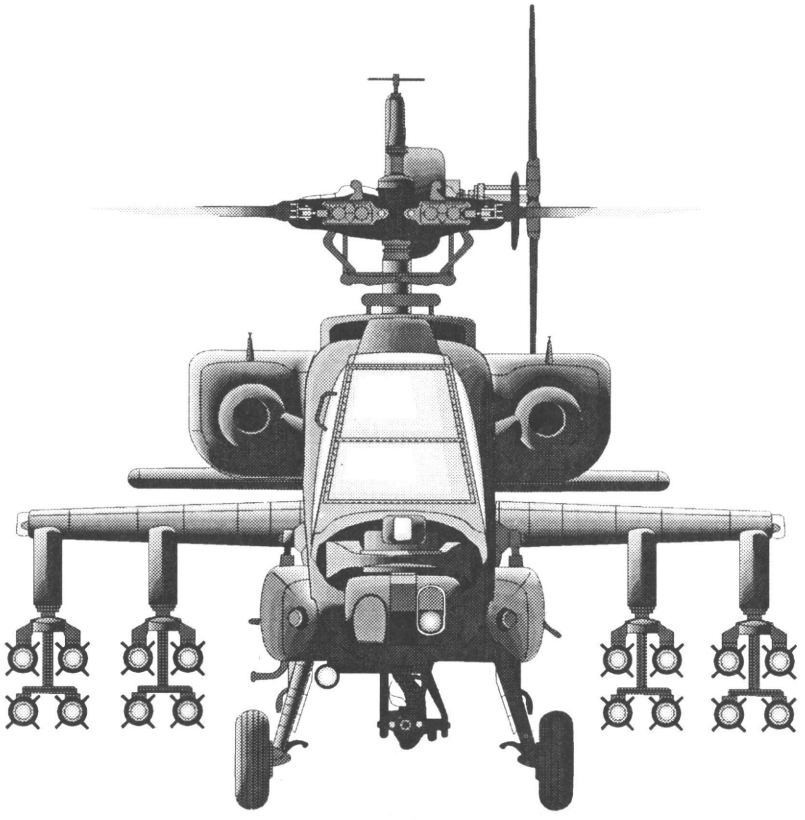
- Don't destroy as much as we could.
- Lose the use of priceless reconnaissance.
- Lose the initiative with our most potent and mobile systems on the battlefield.

Some aviation units are already preparing for the future. The 2d Infantry Division (ID) in Korea[9] and the 1st ID at Ft Riley, Kan., have experimented with different ways to employ attack battalions other than the doctrinally accepted deep massed attacks. Technology and the "empty battlefield" actually complement the tactics that have been tried by both units.

The 2d ID aviation brigade did an aviation covering force during Team Spirit 1992 with several (U.S. and Korean) attack battalions performing reconnaissance–in–force missions.[10] The attack battalions, with a multiple launch rocket system (MLRS) battalion supporting, created a moving screen line of interlocking fields of observation through the depth of the covering–force area across a 20–kilometer front. The agility of the helicopters allowed the brigade commander to selectively pull systems off the screen line to perform hasty attacks to mass fires anywhere in the covering–force area. Division artillery (DIVARTY) maneuvered the MLRS to provide continuous fires throughout the area. Because of the terrain and geographical constraints, the depth of the covering–force area was only 15 kilometers.

Because the brigade had only AH–l Cobras with the limited accompanying tube–launched, optically tracked, wire–guided (TOW) missile system, it was to their advantage that they were geographically constrained because their helicopters were always within reasonable supporting distance to each other. With AH–64s and—more importantly—the accompanying Hellfire missile system and optics, the covering–force area could have been as great as 60 kilometers by 30 kilometers (30 kilometers being the range of the MLRS). (For more information on this topic, see the sidebar on correlation of fires on pages 16 and 17.)

The Korean experience also taught us that by having attack helicopters engaging targets throughout a zone/area for a long period of time, the total battle damage assessment (BDA) increased substantially. Because the brigade was continually wearing down formations by attrition throughout the depth of the battlefield, it had the same effects as massed fires. Incidentally, the



In the seach for achieving the effects of manuever, massed fires, and security on the battlefield, we have inadvertently significantly reduced the potential lethality and use of the AH–64 Apache. In fact, we have essentially reduced its role to one of holding it back for the "big punch."

brigade also became the division's most dependable and often the only real–time reconnaissance source.

The 2d ID Aviation Brigade used all of the technology available to find, fix, and destroy the enemy. It was a true maneuver force. It is an example of the doctrinal cycle being in synchronization with the technological cycle.

Another example is the 1st ID's success at the National Training Center (NTC), at Fort Irwin, Calif., using AH–64s in covering–force operations. The 1st ID built a web of aircraft that could quickly detect, fix, and destroy the enemy in zone with a correlation of fires from other helicopters, artillery, and close air support. In summary, we can—

- Achieve the effects of massed fires without physically massing helicopters.
- Use our own helicopters to conduct reconnaissance and surveillance over a large area.
- Disrupt the enemy's correlation of forces using space, time, and the correlation of fires.
- Get across a FLOT without using an overwhelming amount of resources by finding and capitalizing on the enemy's weaknesses—especially if we accept the premise that a FLOT is dynamic in nature.

We have a responsibility to our branch and profession to study and apply the principles of warfare in our operations. We must be careful not to allow narrow conventional interpretations of the principles to artificially constrain our technology. The vision of the future of Army aviation must be broad enough and progressive enough to encompass the integration of technology into our Army for at least the next 10 years. We cannot afford any false constraints to hold us back.

A clear vision for the future of aviation is an imperative for the successful growth and development of aviation. Technology will bring aviation into the forefront of the maneuver arms. To understand why, it must be explained how the Army and the battlefield will evolve.

- The technological improvements in weapons systems and command,

control, and communication (C^3) systems will cause the battlefield to become even more "empty" than it is now. Commanders will be able to disperse their units and still be able to mass effects anywhere. In fact, the lethality of weapons will force commanders to disperse their units as much as possible. The Paladin and the accompanying doctrine of "maneuvering fires" is an example of the field artillery adjusting to the new technology and its implications.[11]

• Technology in weapons and C^3 will allow the roles of headquarters to shift. Divisions will be able to do what corps now do; brigades will be capable of doing what divisions do. This phenomena is already happening in the Republic of Korea. The 2d (U.S.) ID presently works for a Korean corps. In the Korean Army, deep battle is planned and coordinated at army level and executed at corps level. The 2d (U.S.) ID, without the support usually provided by a U.S. corps, has been augmented with an Air support operations center and direct link to national intelligence systems to give it a deep–battle capability normally associated with a corps. The result is that the 2d (U.S.) ID is capable of doing almost as much as a U.S. corps. One should expect this trend to continue because—

♦Technology reduces the personnel requirements of Assistant Chiefs of Staff, G2 (Intelligence) and G3 (Operations and Plans). Division staffs will be able to handle the work load. Divisions and brigades will get instruments that will send them processed data—as opposed to raw data, which won't need a corps staff to process before dissemination.

♦The United States will be working more and more in combined operations.[12] Very few foreign nations are capable of fighting with our doctrine, especially in deep operations. Deployed U.S. forces will have to be capable of using our doctrine of simultaneous complementary operations through the depth of the battlefield to get the results they need with the equipment we will have. If they don't, they will not have synchronized technological and doctrinal life cycles.

♦The United States, with only two corps and with the expanded foreign policy regarding use of military forces, will tend to deploy divisions, brigades, and even task–force–size units. Very rarely will a corps be deployed. Divisions and brigades will have to be able to fight deep, close, and rear to survive. They won't have a higher U.S. headquarters to do it for them. The new technology will give divisions the firepower and command/control capabilities of corps and brigades the firepower and command/control capabilities of divisions.

♦Successful deep operations are based upon a system of deciding, detecting, and delivering. A horizontal command and control structure will greatly enhance the flexibility and speed of the system. As more and more technology is pushed to divisions and brigades, the tendency will be to streamline the command and control system to take maximum advantage of the responsiveness the technology gives to us.

Aviation's future will parallel that of the Army. We can expect small, highly task–organized aviation units of task–force size performing the role of aviation brigades. We can expect attack battalions being task organized to perform true maneuver operations. We will be given the opportunity to fight the deep battle as a ground brigade combat team fights the close battle now. The vision is both exciting and potentially revolutionary.

The nature of the battlefield will accommodate the advantages that helicopters offer. In fact, the more dispersed (empty) the battlefield, the greater the helicopter advantage. In addition, the smaller a unit becomes, the more important it is to have equipment that can expeditiously reorient the effects of its fires from one area to another—once again, an advantage of the helicopter. The vision leads quickly to Army aviation—as a key member of the combined arms team—becoming the dominant maneuver arm on the battlefield.

The most important quality that aviation leaders will be required to have to keep up with the rapidly evolving technology is a passion for the study of the art and science of war.[13] Only with a passion for excellence can we have the courage to stray from the "normal" methods of doing business. Without a passion for the profession, we can never rationalize the risks that accompany change. Without a passionate search for the truths of war, we will never question the traditional definitions of the age–old principles of war and expand the accepted concepts of the principles to a higher plane. Without the passion for excellence, aviation will never begin to reach its full potential.

General Frederick M. Franks Jr., in a speech to the United States Army Training and Doctrine Command (TRADOC) technical directors/advisors at Fort Monroe, Va., in 1991 said, "In the Army we do a pretty good job in accommodating material changes. We also do a pretty good job accommodating training and organizational changes. But, when you change intellectual directions, that's a challenge."

I have described two examples of how we are already overcoming resistance in intellectual change; but this can be only a start. We have preserved our technology, and we have worked hard to preserve the quality of our force; now we must work hard to change intellectual directions and pull aviation into the next century.

We, as Army aviators, will be prepared for the future if we—

- Pursue a deep conceptual understanding of the truths of war.
- Dedicate ourselves to the alignment of technology and doctrine.
- Passionately pursue excellence in our profession.

These three pillars of growth will arm the branch with adequate doctrine, adequate equipment, competent soldiers, and a will to win. We will have answered General Franks' challenge to use our "collective wisdom to look at old things in new ways" and find "new ways of doing things better."[14]

Notes:

1. Franks, Frederick M., General, U.S. Army, from speech given to the TRADOC technical directors/advisors at Fort Monroe, Va., 7 Nov 1991.

2. Wansley, William J., Major, U.S. Army, ***American Spirit: A Leadership Philosophy for U.S. Tactical Forces, a monograph for the School of Advanced Military Studies***, United States Army Command and General Staff College, pages 1–7. The author expounds on Clausewitz's paradoxical trinity of enmity, chance, and policy as applied to the implications of leadership in the U.S. Army. His model of the trinity is a three–dimensional model based on technology's impact on reason, vision, and the passion of excellence. I have further refined his model to reflect the foundation for change and growth. The enmity, or blind natural force, is the technological and doctrinal vision for the future. Reason, or policy, is the interpretation of the truths of war, or commonly referred to as the principles of war. The "Play of Chance and Probability within which the creative spirit is free to roam" is the passion for excellence that gives us the courage to change.

3. Griffith, Paddy, ***Forward Into Battle, Fighting Tactics From Waterloo To The Near Future***, Presidio Press, 1991. The author introduces the concept of the "empty battlefield" and the many reasons that caused the phenomenon. In this comprehensive look at the battlefield from the Napoleonic Wars to Vietnam, lethality and technology are only a few of many reasons that have caused the battlefield to become "empty."

4. Slipchenko, Vladimir I., Major General (retired), Federation of Russia, ***Field Artillery***, *A Russian Analysis of Warfare Leading to a Sixth Generation*, October 1993, pages 38–39. The author classifies armies by generation: first generation—armies that fought with infantry and cavalry without firearms; second generation—appearance of gunpowder and smoothbore weapons; third generation—rifled small arms, tube artillery, faster rates of fire, more accuracy; fourth generation—armies with automatic weapons, aircraft, general improvements in all battlefield operating systems (BOSs); fifth generation—armies with nuclear weapons; sixth generation—smart and brilliant weapons, high technology in all BOSs, use of space, development in lasers and microelectronics.Though this method of classifying armies is not doctrinal, it does give a simple method of classifying armies with technology as a criterion.

5. Sullivan, Gordon R., General, U.S. Army, and Lieutenant Colonel James M. Dubik, U.S. Army, ***Land Warfare in the 2Ist Century***, Strategic Studies Institute, U.S. Army War College, Study Prepared for the U.S. Army War College, February 1993, page 19. The natural consequence of the "military–technical revolution" is the capability of smaller units creating decisive effects.

6. Given that doctrine is a function of national education, ethics, politics, industrialization, and social values—we can assume that it changes more often through evolution than revolution. Technology—as a function of education, science, and economics—tends to change through revolution. Doctrine normally will lag behind technology. A nation seems to have, at any given period of time, a capacity to work comfortably with a certain level of technology. I call this a doctrinal life cycle. A nation will have, at any given time, a certain generation of technology integrated into its society. I call this a technological life cycle.

Theoretically, for any given technological life cycle, there is a corresponding doctrinal life cycle that produces a harmony in application of the technology. However, if the two life cycles are not in synchronization, there will be a waste and ineffectiveness because the population is not intellectually capable of applying the technology to its potential.

7. Slipchenko, ***Field Artillery,*** page 39.

8. Field Manual 100–5, *Operations*, June 1993, pages 2–4.

9. Schmitt, John K., Colonel, U.S. Army, and Major Oren L. Hunsaker, U.S. Army, ***Aviation Digest***, *Aviation Operations In Korea*, July–August 1993, pages 17–21.

10. Schmitt and Hunsaker, ***Aviation Digest***, pages 17–21.

11. Boice, William M., Major General, U.S. Army, ***Field Artillery***, *Fires and Maneuver—One and the Same*, August 1992, page 24.

12. Sullivan and Dubik, ***Land Warfare in the 2Ist Century***, pages 2–8.

13. It is my belief that an understanding of the science of war protects the force and that the understanding of the art of war facilitates the domination of the battlefield.

14. Franks, speech given to TRADOC technical directors/advisors at Fort Monroe, Va., 7 November 1991.

Correlation of fire effects

Legend: Each ring = 4 km radius field of fire/observation.

= AH–64
Each AH–64 carries 8 Hellfire missiles.

A Company = 6 AH–64s
B Company = 6 AH–64s
C Company = 4 AH–64s

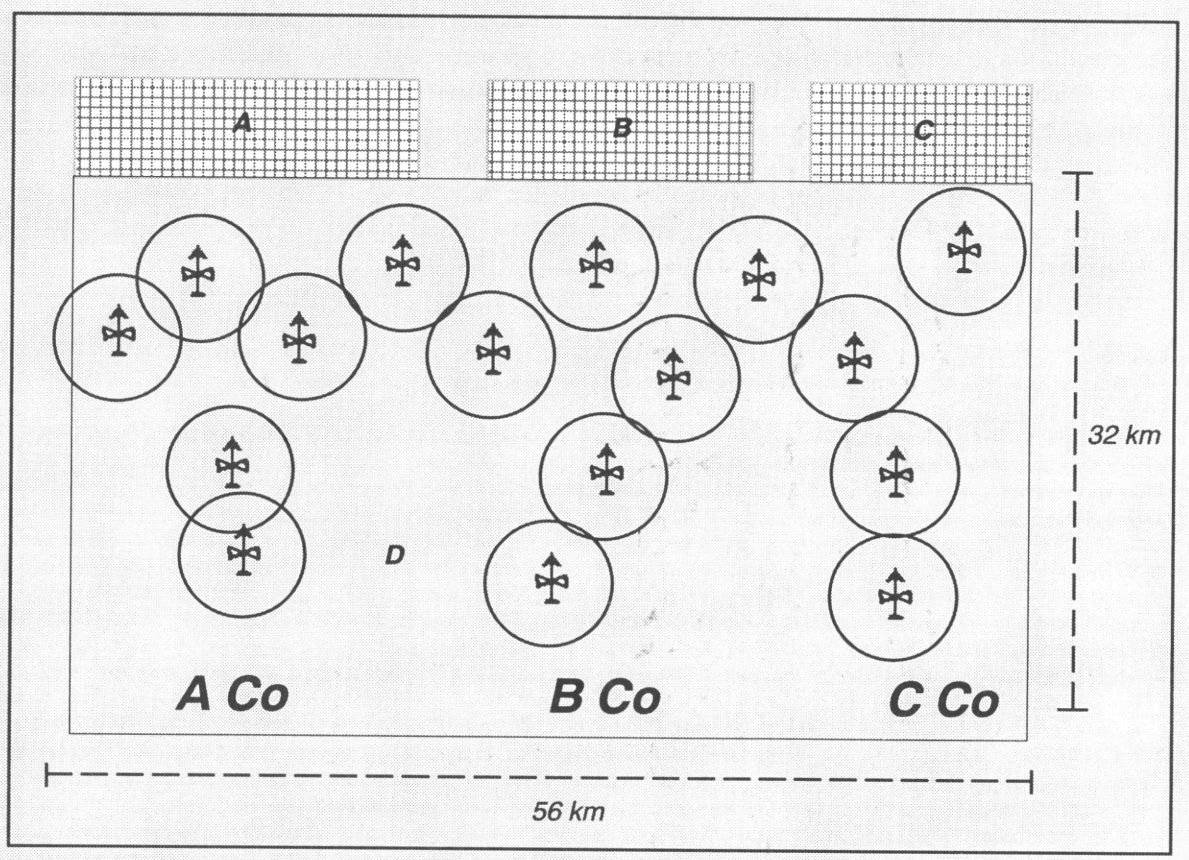


Figure 1

Quantitatively, spreading our advanced helicopters throughout the width and depth of a zone/sector will generate a correlation of fires that will produce the same effect as massing weapons platforms at a certain time and at certain places (Figure 1). One benefit is that we can get the same effects against a dispersed enemy over a long period of time as against a massed enemy in a short time. Another benefit to this technique is that we can rapidly change the point of massed fires over tens of kilometers within several minutes. The third benefit to operating like this is that we always have technologically superior night and day systems employed for reconnaissance and attacking. We can locate, fix, and mass fires organically and accurately.

Figure 1 depicts an attack battalion spread 60 kilometers wide and 24 kilometers in depth. For 24–hour operations, we would have to use two or more attack battalions. The rings around the helicopter symbols represent a 4–kilometer radius field of view/fire around each helicopter. Four kilometers is used because the night systems and weapons systems of the AH–64 are very accurate up to that range at night. In the day, we could expand the radius to 8 kilometers apart. Assume that each helicopter has eight Hellfire missiles on it and that the helicopters can laser designate for each other. The attack battalion can operate anywhere in the covering force area and still mass fires by moving helicopters close enough to engagements to fire missiles for a few lasing helicopters. Security is inherent in the formation because the helicopters form a series of mutually supporting battle positions/observation points (BPs/OPs). Because the BPs/OPs are dynamic in nature, a zone or sector would have to be assigned to each team of helicopters, facilitating movement.

The tactic described above has been used. Some people call variances of the tactic armed reconnaissance, while others consider it a covering force. Immaterial of the definition we give it, it proves we can achieve mass and security while not holding our most capable assets in reserve.

Potential number of missiles available in an area in x amount of time

Areas where targets are engaged								
A	16 A Co	32 A Co	48 A Co	48 A Co 16 B Co	48 A Co 48 B Co	48 A Co 48 B Co 16 C Co	48 A Co 48 B Co 32 C Co	
B	16 B Co	32 B Co	48 B Co 16 A Co 16 C Co	48 B Co 32 C Co 40 A Co	48 B Co 48 A Co 32 C Co			
C	16 C Co	32 C Co	32 C Co 16 B Co	32 C Co 32 B Co	32 C Co 40 B Co	32 C Co 48 B Co 16 A Co	32 C Co 48 B Co 32 A Co	32 C Co 48 B Co 48 A Co
D	*48 total*		*96 total*			*128 total*		
Time	5 minutes	10 minutes	15 minutes	20 minutes	25 minutes	30 minutes	35 minutes	40 minutes

Figure 2

By using the formation shown in Figure 1, we can achieve a correlation of fires by manuevering units from throughout the sector to provide missiles to those that are engaged. The number of missiles that can be realistically be delivered into each area (A, B, C, and D) within a certain time are indicated.

Figuring an 80 to 90 percent chance of kill per round, the effects are equal to those of a deployed tank brigade.

Grizzly Flight—We Do It Right 30 Years of Safety Excellence

Major James A. Bell
Commander
U.S. Army Garrison Aviation Detachment
Fort Greely, Alaska

Fort Greely, Alaska, is a small TDA [table of distribution and allowances] post located 110 miles east of Fairbanks and about 350 miles northeast of Anchorage. Synonymous with cold weather operations and testing, it is home to the U.S. Army Garrison Flight Detachment "Grizzly Flight" and Allen Army Airfield.

History

Allen Army Airfield used to be Station 17, Alaska Wing, Air Transport Command, Big Delta, Alaska. Established on 22 June 1942 by the Army Air Corps, Big Delta provided an intermediate rest and refuel point for "Lend Lease" aircraft being transferred to Russian control during World War II.

On 1 May 1947, the War Department transferred the base to the Department of the Army and designated it as the Arctic Training Center. On 6 August 1955, the post was redesignated Fort Greely in honor of Major General Adolphus Washington Greely, arctic explorer, Medal of Honor recipient, and founder of the Alaska Communications System. The airfield was designated Allen Army Airfield on 30 May 1965. Lieutenant Robert L. Allen was Chief of the Aviation Division of the Arctic Test Center.

Home for test/training centers and support units

Today, Fort Greely is home to the Cold Regions Test Center (CRTC), Northern Warfare Training Center (NWTC), and various support units. Unless they have been here to train, most people don't even know Fort Greely exists. Those who have trained here know that normal operations in an arctic environment are difficult to say the least. Survival is a strong motivational factor in such an unforgiving environment.

Mission

The Aviation Detachment supports Fort Greely, CRTC, NWTC, and the 6th Infantry Division (Light) with general aviation support. Support also extends to transient DOD units conducting arctic training. Petroleum, oil, lubricants (POL) operations are conducted on a 24–hour basis. The unit flies a variety of mission support that challenges even the most experienced aviators.

Support of the Alaska Fish and Game Department with wildlife surveys, cold weather testing of the OH–58D Kiowa Warrior and AH–64 Apache aircraft, VIP transport, high–altitude glacier operations, paradrops, search and rescue, and slingload operations are some examples.

Detachment personnel also help in the cold weather testing of aviation related equipment such as the electrically heated handwear (EHH). CRTC has a cold weather chamber capable of producing such extremes to temperatures as low as –60 degrees Fahrenheit (F).

Safety standard

Over the past 30 years, the professionalism of assigned aviators and support personnel has established a standard of safety unparallelled by any other Active Army aviation unit. Considering the harsh arctic environment during winter, with temperatures of –40 degrees F, winds in excess of 80 miles per hour, and the seasonal changes in the summer, with temperatures up to 90 degrees F, it is remarkable that this small detachment currently holds the longest period of accident-free flying in the U.S. Army.

The detachment is assigned three UH-l Huey aircraft and 25 personnel. Within this small unit, *esprit de corps* and morale is high. It has to be, or a unit this small is dysfunctional. Safety is the preeminent concern in all that the unit does and is factored into all mission-related tasks—ground operations as well as flying. Cold weather injuries in the command are not tolerated because they can be prevented with proper countermeasures and supervision.

Preventing potential disasters

POL operations in the dry arctic environment can produce disastrous results and expose personnel to extremely harmful conditions. The wind chill beneath a CH–47 Chinook aircraft in 0 degrees F can be as much as –50 degrees F below zero. Individuals with exposed skin can experience instant frostbite. The incorrect grounding of an aircraft in POL can produce enough static electricity to ignite and burn an aircraft to the ground in a matter of minutes.

To prevent such disasters, a hot

refueling is prohibited when temperatures are below –18 degrees Centigrade. Meticulous attention to detail is imperative and safety must be a 24–hour state of mind. It is the firm belief of the collective leadership in the unit that, if young soldiers are taught safety first and mission second in peacetime, during time of war the unnecessary loss of life will be reduced. Safety must be considered initially through instinct and repetition.

Anyone flying into the "Last Frontier," a state twice the size of Texas, must be prepared for the worst. Flight following is mandatory but difficult because of the largely unpopulated areas. An aircraft accident during winter or summer is an immediate survival situation.

ALSE operations

Aviation life support equipment (ALSE) operations are critically important to all crewmembers. Survival kits are specifically tailored to summer and winter operations and must be carried aboard aircraft for all passengers. Kits include such items as mosquito nets, rations, shovels, ice cutting tools, fishing gear, arctic survival tent, compressed sleeping bags, and 5 gallons of water. For a each crewmember, an average of 70 pounds of survival gear is carried during the winter.

USAF school

Unit members often attend the USAF "Cool School" at Eielson Air Force Base near Fairbanks. Arctic survival skills are taught there by USAF experts. The course focuses on immediate and improvised arctic shelters, aircraft signaling techniques, sustenance, firebuilding, and the maintenance of a 98.6 degrees F body temperature. Building snowcaves, trapping techniques, as well as numerous other survival skills are put to the test—most importantly, the will to survive in a harsh arctic environment.

Situational training exercises

The unit routinely practices mountain flying and high–altitude glacier operations in terrain ranging from 2,000 to 13,000 feet conditions. The standardization officer schedules one crew each week for a situational training exercise (STX). STXs are designed to allow for crewmember rotation and require the flight crew to perform various types of training scenerios and aircraft conditions. STXs instill pilot confidence in decisionmaking while increasing pilot proficiency and technique. Knowledge of aircraft performance capabilities, human factors, and weather phenomenon are essential to the successful completion of each STX. Crewmembers debrief and share their learned experiences during informal feedback sessions.

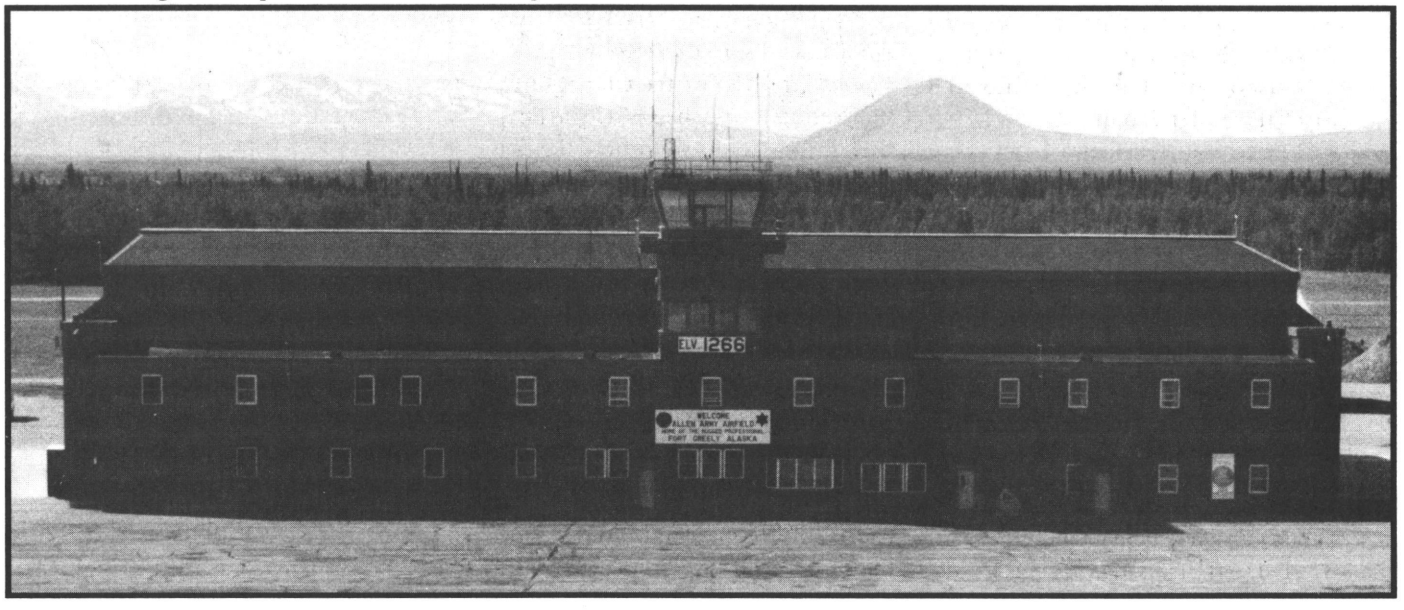
Maintaining safety record

No one wants to be the one who ends our safety record. The commander and the safety officer continuously evaluate the status of safety programs and countermeasures as well as the experience level of assigned personnel. The unit safety officer and first sergeant recently developed a new risk assessment worksheet for unit drivers, similar to those used for crewmembers.

Driving 120 miles to Fort Wainwright in January with temperatures of –30 degrees F requires careful planning and experience, the same as flying. The safety officer also inspects privately owned vehicles (POVs) quarterly for essential survival equipment.

Conclusion

The aviators and soldiers of "Grizzly Flight" take extreme pride in all they do. They hope that, with continued emphasis, safety will be the trademark of this unit and the U.S. Army for many years to come.



Aerial Recovery of a Historical Aircraft

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Fort Carson and 4th Infantry Division (M)
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In February 1993 some soldiers from F Company (Co.), 4th Aviation (Avn) Brigade (Bde), took a 2-day trip down to the International B–24 Liberator Bomber Memorial Museum in Pueblo, Colo. This trip was not for pleasure, but to prepare a CH–21 Shawnee helicopter for recovery from the Pueblo Memorial Airport. A CH–47 Chinook helicopter then transported the Shawnee to the Pikes Peak Community College (PPCC), aviation maintenance section, on Fort Carson, where it being restored.

"One of our wartime missions is the recovery of downed aircraft by aerial means, so this was a unique opportunity for the forward support platoon to receive some hands–on training," said SGT Arthur Hottin of F Co., 4th Avn Bde. "The purpose of the mission was two-fold. First, it gave us a chance to prove that our training in the past was effective, since this was an actual mission with real consequences if it did not go correctly." "Second, it gave us a chance to help out the community and Fort Carson. The CH–21 aircraft is a valuable part of our military heritage. With the restoration of the helicopter, it will serve as an example of what soldiers and community members working together can accomplish," said Hottin.

"This was great training for me," said Specialist Valentine of F Co., 4th Avn Bde, "because it gave me the chance to do actual hands–on training instead of training out of a textbook in a classroom environment. This aircraft was my first slingload operation, so the hands–on training was more successful and rewarding to me because I saw the results of our work right then and there."

"One of the obstacles we faced was that, because of the age of the Shawnee, there was no published information on how to rig this particular aircraft," said Hottin. "We had contacted Fort Eustis, Va., but Fort Eustis was unable to assist us on this matter, which meant we were unable to plan on a certain way to rig the aircraft. So we had to plan the operation very carefully."

"The soldiers' input was critical to all aspects of the mission. Their knowledge of aircraft was extremely valuable in designing a method of rigging the CH–21 so it would "fly" as a stable load, under the CH–47."

The morning of 3 February 1993 was the big day for the soldiers of F Co., 4th Avn Bde. They would now get to see if their design would "fly," or plummet to the ground, as a CH–47 from the 158th Avn Co. took the CH–21 for a 40–minute flight to PPCC aviation maintenance section on Fort Carson.

Art Thompson said that seeing the CH–21 approaching Fort Carson brought back a lot of memories because he was a gunner/mechanic on that type of aircraft for 8 years in the Army. Thompson, who is now a PPCC University specialist and an aviation maintenance instructor, will supervise the students in restoring the CH–21.

"This will give the students a chance to see history; this helicopter is the grandfather of the CH–47 Chinook," said Art Thompson. "The CH–21 was brought into service in 1950 and was replaced in 1965 by the Chinook. The students restoring the CH–21 helicopter will be able to see where the concept for the Chinook came from."

"It will take about 3 years to restore the helicopter," Thompson said. "Once the helicopter is restored, it will be returned to the International B–24 Memorial Museum in Pueblo, where it will be back on static display."

To update the status of the project, on 20 July 1994, Don Malcom, PPCC Fort Carson Coordinator, said work is ongoing at a very slow pace. The aircraft had been sitting at the Museum a long time and needed a great deal of work.

SGT Drew Todd of F Co., 4th Avn Bde, tapes the windshield of the CH–21.

The CH–47 from the 158th Avn Co. starts to lift the CH–21.

PREGNANCY AND FLYING DUTIES

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Pregnancy and flying duty is a subject of controversy, balanced by evolving knowledge and policies. This article shares my current perspective on its issues and policies.

Joy of New Life

One of my greatest joys has been delivering babies for aircrewmembers and their families. I was lucky even to have one delivery room with a window facing east. It seemed most kids like to come into this world between 0300 and 0700 hours. So I have many memorable moments holding up a worried–looking newborn, eyes blinking and pupils constricting, with the first rays of morning sun flooding the room. As I said, a joyful time. However, there have been some sad moments—delivering miscarriages and stillborn infants. These latter events remind us of our inevitable mortality and that not all pregnancies are free from problems.

A Look Over Our Shoulder

In this century, women have gradually entered certain occupations previously thought to be exclusively in the male domain; i.e., aviation, law enforcement, construction, and auto racing. Despite the accomplishments of pioneer aviatrixes in the 1910s through the 1930s, the bias against women entering aviation is reflected in the comments of others of the time. For example, Claude Graham–White said in 1911, "Women are temperamentally unfit to fly and prone to panic in any calamity." In the 1930s, Amelia Earhart said, "Men do not believe us capable." In 1939, women were barred from air traffic control school in the United States. School administrators said, "No woman could keep her head in heavy traffic." American women proved their capabilities as instructor and transport pilots in World War II. Even after that, not until the early

1970s did we see our first female airline command pilot and modern military pilot in the United States. Today women are just now entering combat mission training in U.S. military aviation.

Until the last two decades, considerable mystique surrounded the female reproductive cycle, even in the medical community. This was due largely to the lack of knowledge and the inaccurate belief that women were fragile, especially while pregnant. Standard medical care in developed countries, into the early 1960s, placed women on 10 days of strict bed rest after delivery. Maternal mortality remained a significant problem well into this century. Perhaps these precautions were warranted at the time, though not well supported by fact.

Since the 1960s, the veil of this mystique has gradually lifted. Analysis of hormones and other key biochemical processes, ultrasonic and fiberoptic imaging of the fetus, and other fetal monitoring devices are improving our understanding. Still, the effects of the workplace on the developing fetus are not well known. Our scope of knowledge is limited by the small number of women in certain occupations and the medico–legal ethics against exposing humans, especially pregnant humans, to an environment with potential harmful effects.

Current Issues and Concerns

While the physiologic effects of flying are very well known, the specific effects of the aviation environment on pregnancy are not well known, but are considered potentially harmful. Although pregnancy is a natural process, it is accompanied by psychophysiologic changes influencing all major body systems. Pregnancy may be unpredictably complicated by acute changes in health at any time, even when the pregnancy appears to be progressing normally with low risk for complications. Multiple social and legal issues encircle pregnancy—some conflicting with flying or the study of pregnant women while flying. The rights of the spouses of pregnant women and those of the unborn child are argued in today's courtrooms, often in favor of the spouse and fetus. Many new national and international standards advocate the protection of the unborn child, regardless of the mother's or attending doctor's willingness to assume certain occupational risks.

A search of the U.S. Army Aviation Epidemiology Data Register shows about 480 female aviators were in our peak aviator workforce in 1989. From 1988 to 1992 about 25 per year were restricted from flying duties because of pregnancy.

The U.S. Army Aeromedical Consultant Advisory Panel (ACAP) regularly has reviewed the issue of pregnancy in aircrewmembers since young women first entered the Army aviation force. Dozens of consultants have been involved to include aircrewmembers, flight surgeons, aerospace medicine specialists, and obstetricians of both genders. The medical literature has been continuously reviewed. This aeromedical review process has provided a basis for updating aeromedical policy.

Table 1 (see next page) summarizes the major issues and concerns the ACAP addressed. The key aviation stressors involve hypoxia, noise, whole–body vibrations, acceleration forces, high–environmental temperatures, and toxins.

We are sure fetuses can tolerate moderate levels of hypoxia up to physiologic equivalents of 10,000 feet altitude above mean sea level (MSL). Fetuses have been monitored in airline cabins with cabin altitudes up to 8,000 feet without adverse effects. For an altitude of above 10,000 feet above MSL, some studies show increased risk for infant morbidity and mortality. More caution is required since anemia is common in pregnancy. Anemia increases the physiologic altitude, which increases the degree of fetal hypoxia at a given exposure altitude. Women who smoke while pregnant, besides enduring the direct harmful effects of chemicals in the smoke, also experience increased physiologic altitude.

Our aviation environment, especially rotary–wing cockpits, is rich with high decibel, low– and high–frequency sounds that damage hearing. The uterus and amniotic fluid may accentuate low–frequency sounds, and only weakly, attenuate, high–frequency sounds, perhaps by no more than 10 decibels as determined with direct measurement inside the uterus in the third trimester of pregnancy. The unborn child is more susceptible to hearing damage than adults for a given sound pressure exposure. Since children are developing language and listening skills, they cannot tolerate the same degree of hearing loss as adults and still function normally. The effects of high decibel noise on the fetus are not completely known; however, studies in Scandinavian countries and Canada link a three–fold increase in infant hearing loss to occupational noise exposure of the mother during pregnancy as low as 90 decibels. We must assume the fetus is exposed to harmful sound levels in Army aviation, and the fetus is without the benefit of hearing protection available to the mother.

Rotary–wing aircrewmembers are exposed to significant levels of whole–body vibrations. Whole–body vibrations damage fetal animals, causing developmental failures and birth defects. Whether the suspension systems of the human uterus and amniotic fluid protect or accentuate whole–body vibrations is unknown.

Table 1.

Issues and concerns in pregnancy and flying

General military duties	Limited deployability Restricted physical training and environmental exposure Restricted wearing of military equipment
Aviation duties	Hypoxia High decibel noise Whole-body vibration, significant in rotary-wing aircraft Acceleration forces and restraint system issues in mishap Increased heat exposure Aviation toxins
Social and legal issues	Spouse rights when objecting to flying duties Fetus rights to protection from harmful environments Tort liability in event of adverse pregnancy outcome Restrictive guidelines in the conduct of human research
Common complications in the first trimester, 0 to 12 weeks' gestation	Morning sickness, 1 per 2 pregnancies Miscarriage and/or acute bleeding, 1 per 5 to 10 pregnancies Fetal malformations Fainting and fatigue Decreased heat tolerance
Common complications in the second trimester, 13 to 24 weeks' gestation	Ectopic (outside womb) pregnancy, 1 per 50 to 130 pregnancies Miscarriage and/or acute bleeding, 1 per 5 to 10 pregnancies Diabetes of pregnancy, 1 per 120 to 300 pregnancies Anemia Fainting and fatigue Decreased heat tolerance
Common complications in the third trimester, 25 weeks' gestation to delivery	High blood pressure Pretoxemia or toxemia of pregnancy, 1 per 10 to 50 pregnancies Premature labor and/or acute bleeding Rupture of placenta, 1 per 200 to 500 pregnancies Decreased respiratory capacity Anemia Fainting and fatigue Decreased heat tolerance Blood clots in veins Heartburn (gastritis, esophagitis) Backaches
Other complications	Kidney and gall bladder stones Genitourinary tract infections, 1 per 3 to 10 pregnancies Twins, increased complication rates

The effects of whole–body vibration on the development of the human fetus are unknown; however, some studies have shown women with occupational exposure to whole-body vibrations are at increased risk for miscarriage and birth defects. Some caution is even warranted in synthetic flight training simulators with the "seat shaker ON" mode.

The fetus is thought to be protected partially from injury when exposed to acceleration forces in the first trimester. But in the second and third trimester, there is an increased risk for uterine rupture, separation of the placenta from the uterine wall, and fetal mortality. These notions were developed from a study of pregnant women and animal models in X–axis forces (forward–backward) found in motor vehicle accidents. The effects of high Z–axis (up–down) acceleration forces and seat and restraint systems on pregnancy are unknown in aviation mission profiles and mishaps. Theoretically, with Z–axis forces, the uterus would be forced downward into inflexible pelvic bones, increasing intrauterine pressures and accentuating the risk for injury. The highest risk for injury might be in the third trimester when the restraint system would ride over the uterus at different angles than designed. As with X–axis forces, uterine rupture and placental separation from the uterine wall, with exposure to otherwise minor Z–axis forces, are possible.

High environmental temperatures are common in Army aviation. Women have decreased tolerance to heat in all stages of pregnancy. Body temperatures greater than 101 degrees Fahrenheit may cause structural or functional damage to the fetus. It is suspected that heat exposure may cause certain major central nervous system defects.

The effects of aviation toxins, like hydrocarbons, carbon monoxide, and other combustion byproducts, on pregnancy are unknown. Theoretically, the greatest harm would occur during the first trimester when the fetus is at greatest risk for toxic injury.

Potential electromagnetic hazards in our operational environment may harm the developing fetus. While it is thought the levels of electromagnetic radiation exposure in aviation and the workplace are safe, studies on this potential hazard are ongoing and controversial.

Other aviation concerns related to the health of the mother include common medical complications of pregnancy: fatigue, nausea, vomiting, frequent urination, fluid retention, weight gain and change in body habitus, acute bleeding, and anemia. The main concern is some of these complications can occur unpredictably with acute incapacitation, even during an otherwise normal or low–risk pregnancy. For example, 1 in 5 to 10 pregnancies ends in miscarriage, generally with the acute onset of pain and heavy bleeding.

Policy, Old and New

The old policy prohibited flying duties of any kind for the woman while she was pregnant. The status of "Duties not to include flying" for greater than 180 days, in the old policy, resulted in medical termination from aviation service. This required requalification at the waiver authority level after recovery from the pregnancy.

Based upon an ongoing and thorough review of the issues and concerns of flying while pregnant, a new policy has been issued to manage pregnant Army aircrewmembers. Tables 2 and 3 (see next page) summarize the old and the new policy for U.S. Army aircrewmember pregnancy and flying duties policy.

The new policy minimizes the administrative burdens of medical termination from aviation service. This policy also gives the commander greater flexibility in keeping pregnant aircrewmembers at higher levels of training and proficiency; speeds the return to unrestricted aviation service after delivery; and still meets the intent of protecting the mother and unborn child, based on current medical knowledge and ethical/legal constraints.

The absolute pregnancy success rate among Army aircrewmembers is unknown. One reason is that our aircrewmember health database mostly contains reports of pregnancies that went past 28 weeks' gestation. Even then, the information often provided is limited to dates of delivery. The new policy requires flight surgeons to report the outcomes of all pregnancies and pregnancy complications involving cockpit aircrewmembers. This is one step to help answer many questions the aviation line and medical community posed concerning pregnancy outcomes in the aviation and military environment. The new policy also will help formulate future policy.

Departure

The issues and concerns of pregnancy and flying are complex. Knowledge about the effects of physical forces and toxins found in the aviation environment on pregnancy is not complete. But the potential for fetal injury and death is real. Pregnant women cannot be used as "guinea pigs" in Army aircraft to deny or verify these effects. It is difficult to balance the conflicting requirements for, and recommendations of, the patient, family, unborn child, command, and medical community. Legal and ethical considerations conflict as well. Despite these hurdles, the ACAP believes that a better balance has been achieved by the new policy.

Table 2.

Past policy for pregnant U.S. Army aircrewmembers before 27 January 1993

Time line->	Date of diagnosis to 4 to 6 weeks after delivery
Class 1/1A	Disqualified
Class 2/2F/2S/3	DNIF. For Class 2/2F, DNIF with termination from aviation service (permanent medical suspension) since DNIF is for greater than 180 days (AR 600-105 and DOD Pay Manual). Requalification 6 weeks after delivery.
Class 4 (ATC)	FFD unless medical complications or hospitalization will prohibit/interfere with ATC duties

* DNIF is "duties not to include flying."
** FFD is "full flying duties," with or without restrictions.

Table 3.

New policy for pregnant U.S. Army aircrewmembers effective 27 January 1993

Time line->	Date of diagnosis to 12 weeks' gestation	13 weeks' gestation to 25 weeks' gestation	26 weeks' gestation to delivery	Delivery to 4 to 6 weeks after delivery
Class 1/1A	Disqualified			
Class 2/2F/2S/3	**Uncomplicated pregnancy:** Temporary FFD with restriction to SFTS; an exception is from 13 weeks' to 25 weeks' gestation may fly FFD with restriction to multiengined, nonejection seat, fixed-wing aircraft with dual pilot status and cabin altitude ≤10,000 feet			DNIF
	Complicated pregnancy: DNIF with termination from aviation service (permanent medical suspension) if DNIF is for greater than 180 days (AR 600-105 and DOD Pay Manual) Requalification, with or without waiver, upon resolution of condition			
Class 4 (ATC)	FFD unless medical complications will prohibit or interfere with ATC duties			

* DNIF is "duties not to include flying."
** FFD is "full flying duties," with or without restrictions.

Bibliography

Ales, K. L., 1989, Functional status in pregnancy, ***American Journal of Medical Science***, 297: 355–360.

Andersen, H. T., 1991, Pregnancy—a cause for grounding of female aircrew, ***Recruiting, Selection, Training and Military Operations of Female Aircrew***, Neuilly Sur Seine, France: Advisory Group for Aerospace Research and Development, AGARD–CP–491.

Bentur, Y., 1991, The three most common occupational exposures reported by pregnant women, ***American Journal of Obstetrics and Gynecology***, 165: 429–37.

Bia, F. J., 1992, Medical considerations for the pregnant traveler, ***Infectious Disease of Clinics of North America***, 6: 371–388.

Blackwell, R., 1988, Video display terminals and pregnancy, ***British Journal of Obstetrics and Gynecology***, 95: 446–453.

Cameron, R. G., 1973, Should air hostesses continue flight during the first trimester of pregnancy?, ***Aerospace Medicine***, 44: 552–556.

Cotton, E. K., 1980, Study of babies born to mothers living at an altitude of 3,100 meters, ***American Journal of Obstetrics and Gynecology***, 138: 220–22.

Council on Scientific Affairs, 1984, Effects of physical forces on the reproductive cycle, ***Journal of the American Medical Association***, 251: 247–50.

Crosby, W. M., 1971, Safety of lap–belt restraint for pregnant victims of automobile collisions, ***New England Journal of Medicine***, 284: 632–636.

Culver, C. C., 1990, Anthropometry of seated women during pregnancy: Defining a fetal region for crash protection research, ***Human Factors***, 32: 625–636.

Daniell, W. E., 1990, Pregnancy outcomes among female flight attendants, ***Aviation, Space, and Environmental Medicine***, 61: 840–4.

Department of the Army, 1988, Memorandum for all flight surgeons, Subject: Aeromedical policy letter 12–88, Pregnancy.

Department of the Army, 1993, Memorandum for all flight surgeons, Subject: Aeromedical policy letter 12–93, Pregnancy.

Flournoy, A. C., 1990, Selected legal issues related to sound and vibration in pregnancy, ***Seminars in Perinatology***, 14: 334–339.

Fort, A. J., 1970, Pregnancy outcome after noncatastrophic maternal trauma, ***Obstetrics and Gynecology***, 35: 912–15.

Gerhardt, K. J., 1990, Prenatal and perinatal risks of hearing loss, ***Seminars in Perinatology***, 14: 299–304.

Goodlin, R. C., 1984, Fetal malformations associated with maternal hypoxia, ***American Journal of Obstetrics and Gynecology***, 149: 228–229.

Hartikainen–Sorri, A., 1988, Occupational noise exposure during pregnancy: A case control study, ***Occupational and Environmental Health***, 60: 279–283.

Huch, R., 1986, Physiologic changes in pregnant women and their fetuses during jet travel, ***American Journal of Obstetrics and Gynecology***, 154: 996–1000.

Lalande, N. M., 1986, Is occupational noise exposure during pregnancy a risk factor of damage to the auditory system of the fetus?, ***American Journal of Industrial Medicine***, 10: 427–435.

Lidstrom, I., 1990, Pregnant women in the workplace, ***Seminars in Perinatology***, 14: 329–333.

Kissinger, D. P., 1991, Trauma in pregnancy, ***Archives of Surgery***, 126: 1079–1086.

Magann, E. F., 1991, Pregnancy outcome in an active–duty population, ***Obstetrics and Gynecology***, 78: 391-393.

Mason, K. T., 1989, History of the female aviator, Paper presented at the 7th Medcom Operational Aeromedical Problems Course, 1989, Santhoffen, West Germany.

Mason, K. T., 1990, Waiver and suspensions in female Army aviators from 1986 to 1990, Paper presented at the U.S. Army Operational Problems Course, 1990, Fort Rucker, Alabama.

Mayhew, T. M., 1991, Scaling placental oxygen diffusion to birthweight: Studies on placentae from low– and high–altitude pregnancies, ***Journal of Anatomy***, 175: 187–94.

McMurray, R. G., 1990, Thermoregulation in pregnancy, ***Sports Medicine***, 10: 146–158.

Moore, L. G., 1987, Altitude–aggravated illness: pregnancy and prenatal life, ***Annals of Emergency Medicine***, 16: 965–973.

Nurminen, T., 1989, Shift work, fetal development and course of pregnancy, ***Scandinavian Journal of Work and Environmental Health***, 15: 395–403.

Parker, J. T., 1982, Effects of hypoxia on the mother and fetus with emphasis on maternal air transport, ***American Journal of Obstetrics and Gynecology***, 147: 957–60.

Pearlman, M. D., 1990, Blunt trauma during pregnancy, ***Current Concepts***, 323: 1609–1613.

Pelmear, P. L., 1990, Low frequency noise and vibration: Role of government in occupational disease, ***Seminars in Perinatology***, 14: 322–328.

Pries, C. N., 1981, Reproductive effects of occupational exposures, ***American Family Physician***, 24: 161–165.

Ramirez, G., 1990, Occupational physical activity and the other risk factors for preterm birth among U.S. Army primigravidas, ***American Journal of Public Health***, 80: 728–730.

Richards, D. S., 1992, Sound levels in the human uterus, ***Obstetrics and Gynecology***, 80: 187–190.

Rubovits, F. E., 1964, Traumatic rupture of the pregnant uterus from seat–belt injury, ***American Journal of Obstetrics and Gynecology***, 90: 828–29.

Scholten, P., 1976, Pregnant stewardess—Should she fly?, ***Aviation, Space and Environmental Medicine***, 47: 77–81.

Schorr, T. M., 1990, The NIOSH study of reproductive outcomes among video display terminal operations, ***Reproductive Toxicology***, 4: 61–65.

Scorpio, R. J., 1992, Blunt trauma during pregnancy: Factors affecting fetal outcome, ***Journal of Trauma***, 32: 213–216.

Stewart, W., and Ouellet–Hellstrom, R., 1991, ***Adverse Reproductive Events and Electromagnetic Radiation***, National Institute of Occupational Safety and Health, Cincinnati, Ohio, National Institute of Occupational Safety and Health Report No. PB 92–145796.

Snyder, R. G., 1968, ***Impact Injury to the Pregnant Female and Fetus in Lap–Belt Restraint***, Washington, D.C.: Federal Aviation Administration, Report No. AM–68–24.

Wilson, R. J., 1992, ***Obstetrics and Gynecology***, St. Louis: C.V. Mosby Company.

World Health Organization, 1982, ***Women and Occupational Health Risks***, Copenhagen: World Health Organization, EURO Report and studies 76.

Zhang, J., 1992, Occupational hazards and pregnancy outcomes, ***American Journal of Industrial Medicine***, 21: 397–408.

AND THEN THERE WERE NONE!

CW4 James T. Chandler
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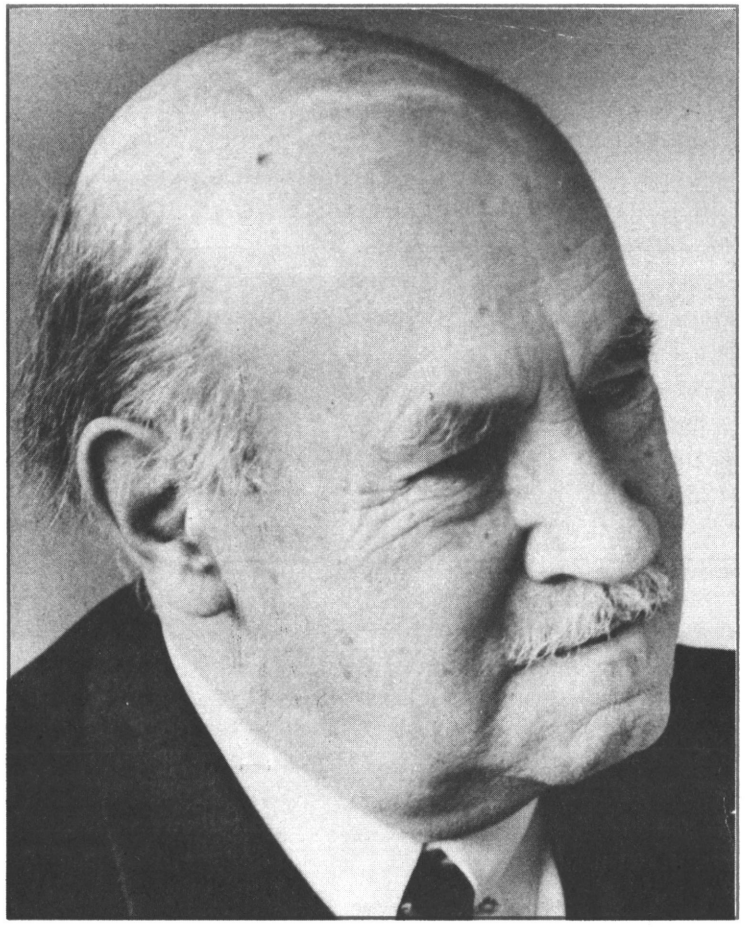
Annville, Pennsylvania



Igor I. Sikorsky

Something historical happened in Army aviation recently, and many never knew what it was. The CH–54 Skycrane was retired from Army aviation service. It happened quietly with no fanfare or ceremony. The big heavy lift workhorse was taken out of service because it was too costly to maintain and another aircraft could "out lift" it now; therefore, it was retired into obscurity.

To honor this magnificent helicopter, and the men and women who flew them and worked on them, I offer this brief history, hoping the CH–54 Tarhe is not forgotten.

LAST MISSION

The CH–54 flew its last mission with the Nevada Army National Guard on 10 January 1993. After that date, the National Guard Bureau told all units to stop flying the mammoth helicopters and park them. The Skycrane's illustrious military career had ended.

DESIGN BY SIKORSKY

Introduction. After the Korean War, the U.S. Army was looking for a replacement for the CH–37 Mojave helicopter. A need for a heavy lift helicopter was determined. Sikorsky proceeded to fill that need. Sikorsky was working on the S–64 helicop-

ter, designed specifically for carrying loads externally.

Turbine engine. Sikorsky wanted the S–64 to be powered by turbine engines because of the many advantages turbine engines provided. However, there were none at that time, so Sikorsky worked with Pratt and Whitney to modify the JT12 jet engine to add a power takeoff turbine. The expanding/exploding hot gases passed through a free turbine wheel, which had a shaft attached to it. In effect, the front half of the turbine engine was separate from the rear half of the engine. By doing this, one stage of gearing was no longer needed, which resulted in a lighter engine and a higher lift capability.

Automatic flight control system. The Skycrane was a helicopter way ahead of its time. It had an automatic flight control system and altitude hold that made it a dream to fly instruments. It was equipped with kneeling landing gear to facilitate easier loading and help during steep slope operations. The Skycrane had a fly–by–wire system back in 1962! The aft facing crew position had a side arm control that controlled pitch, roll, and yaw with 10–percent control authority. The cyclic grip controlled pitch and roll by normal fore, aft, and lateral movement. Yaw inputs were made by twisting the cyclic grip left and right. The collective control for the aft seat was connected mechanically to the front collective by direct linkage. You could always tell an old Skycrane flight engineer if he could fly a complete traffic pattern from the aft seat facing backwards.

Fuselage. Another innovative idea was the fuselage designed to reduce basic aircraft weight. The traditional cowlings were not used to reduce weight and facilitated easier inspection and maintenance operations. A system was even designed to tow barges. When it was necessary to transport troops, a multipurpose "people pod" was available. The pod was designed for a mobile hospital, troops, cargo, and even paradrop operations.

FIRST PROTOTYPES

The first of three prototypes flew on 9 May 1962 and was tested by the U.S. Army at Fort Benning, Ga. The other two prototypes were delivered to the Federal Republic of Germany for testing and evaluation there. In June 1963, the U.S. Army announced it had ordered six S–64As and would be designating them the CH–54A. On 30 June 1963, the U.S. Army accepted the first CH–54A Skycrane at a ceremony in Stratford, Conn.[1]

THE FIRST SKYCRANES

The 478th Flying Crane Company, 44th Air Transportation Battalion, which was later changed to the 478th Aviation Company (Heavy Helicopter), received the first Skycranes. After undergoing testing and training, the unit was deployed to Vietnam, providing support to the 1st Cavalry Division, Airmobile. The "Cyclones" transported bulldozers, road graders, armored vehicles, and downed aircraft. They retrieved over 380 aircraft, which resulted in savings of several hundred million dollars worth of equipment.[2]

PREREQUISITES FOR TRAINING

To become qualified in the Skycrane then, an army aviator had to meet the following prerequisites:

- Be assigned to a Skycrane unit.
- Be a rotary–wing aviator.
- Be current in annual flying minimums.
- Have a minimum of 500 hours rotary–wing time.
- Have a current instrument ticket.

• Have a current instrument ticket.
• Be turbine engine qualified.
• Have 250 hours as pilot or instructor pilot (IP) time in cargo or utility helicopters.

You must remember not every pilot going through initial entry rotary–wing training at that time received some of the training stated above. The Army was picky about who was trained to fly these new heavy helicopters. [3]

WORLD RECORDS

The Skycrane performed admirably in Vietnam and back home when it returned. The CH–54 held many world records for a long time. On 29 April 1965, a CH–54A of the 478th Aviation Company lifted 90 people. The Skycrane carried a crew of 3 and, with a "people pod," lifted an additional 87 combat troops. This was the largest number of people ever lifted by a helicopter at one time.[4]

Other records include four altitude records verified with the National Aeronautic Association! That's right, a helicopter held altitude records over any other aircraft for quite a while until the F4 Phantom came along.

On 30 December 1968, Chief Warrant Officer (CWO) James P. Ervin and CWO William T. Lamb climbed to over 30,000 feet in their CH–54A. [5] The two Skycrane pilots, using a standard CH–54A with the hoist and four–point system removed, broke the previous altitude records held by the Soviet Union.

Ervin flew the aircraft straight up with vertical speeds exceeding 6,500 feet per minute with zero forward speed until 20,000 feet. When the Skycrane passed through 30,000 feet, it was still climbing at 995 feet per minute. The flight had to be terminated because of darkness and the absolute record for the Skycrane will never be known.[6]

During the record flight, air traffic control (ATC) tapes were notably affected. One ATC controller notified a commercial airliner flying at 17,000 feet about traffic stating, "be advised there's a helicopter at your 9 o'clock position descending out of 27,000 feet at a rate of 4,000 feet per minute." The pilot of the commercial airliner responded with, "Good Lord, you mean they're up here now?" Another pilot according to ATC tapes asked, "What kind of helicopter is that?" [7]

ANOTHER RECORD

A record for Skycranes I personally flew in was with Company H, 104th Aviation, Pennsylvania Army National Guard. Thirteen CH–54A helicopters were assigned to Fort Indiantown Gap, Pa. All 13 were fully mission capable at one time and an attempt was made to fly all 13 in one formation. Thirteen fully trained Skycrane crews were not available, so only 12 were manned. One aircraft had a caution segment light when the flight was lining up and had to be left behind. However, 11 CH–54A Skycrane helicopters took off in formation on 6 August 1988 and flew for about one hour. The flight was led by the commander Major Paul Almer, who regrettably died in a civilian helicopter accident one year later, which resulted in a nine–ship, missing–man formation over his funeral service.

ONE–OF–A–KIND HELICOPTER

A total of 88 CH–54 Skycranes were built. The CH–54 was originally produced with a short cabin. Then after serial number 66–18413, Sikorsky went with an extended cab model. The CH–54B was later developed with an increased maximum gross weight and higher payload capability. What made the CH–54 a one–of–a–kind helicopter was the hoist on it equipped with 100 feet of cable. With the hook being further away from the load, less rotor wash was noticeable when picking up the load. Also the hook could be lowered down through trees to retrieve downed aircraft.

VIETNAM—COMBAT TRAP

The CH–54A had an additional interesting history in Vietnam. It was tested and used to drop 10,000 pound bombs to clear landing zones (LZs). This program was called Combat Trap. The CH–54A would drop an M–121 bomb from 6,000 feet to clear helicopter LZs. The bomb was rigged to drop from under the helicopter and detonate at about 3 feet and clear a useful area of 100 feet in diameter. [8]

WORKING FOR THE NATIONAL GUARD

After serving faithfully on active duty, the CH–54 Skycrane went to work for the Army National Guard, and work it did! The Skycrane had a multitude of missions both military and civilian. The "Flying Crane" carried aircraft to and from museums and air conditioners to the top of the Pentagon. Whole antenna towers were lifted at one time and set in place. One mission the Pennsylvania Army National Guard completed annually was to drop telephone poles with baskets at the top from 100 feet into marshes. This was done to provide nesting sites for eagles.

Humanitarian missions were always being conducted with this beautiful beast. An attempt to save a whale in Alaska was tried in the late 1980s. An aircraft fuselage was placed in Long Island Bay just off John F. Kennedy Airport to conduct a simulated airline disaster. A historic log cabin was moved in one piece onto the Appalachian Trail and the list goes on and on.

SAFETY RECORD

The Skycrane's safety record was very good. The U.S. Army

Safety Center (USASC), Fort Rucker, Ala., records go back only to January 1972. They show the CH–54 experienced only six Class A accidents during this time.[9] This is a testament to the dedication of the people who flew and worked on the famous "Flying Crane."

CONTINUING TO SERVE

All Skycranes are out of the Army inventory now, but they are far from dead. Some Skycranes have found a new life with civilian companies and are hard at work again in the external loading and logging industry. Many are in museums now. One is proudly on display at the U.S. Army Aviation Museum at Fort Rucker, Ala. The museum now owns many of them and uses them to trade for other aircraft for their displays. Many were purchased for rebuild and have been sold overseas.

With a gallant history behind it, the Skycrane continues to serve this nation. Everyone watched on national/world TV this year when a Skycrane was used to lift the statue off the capitol building in Washington, D.C. for repairs. The Skycrane also was used to replace the statue. The massive helicopter was always a favorite at airshows. It probably burned more fuel than any helicopter ever will (500 gallons per hour)! Though the helicopter was over 88 feet long and weighed well over 40,000 pounds, it was the easiest helicopter to fly I have ever flown. The CH–54 Skycrane has earned a place in, not only Army aviation history, but all aviation history as a workhorse, a phenomenal aircraft, and a tribute to Igor Sikorsky and his abilities to develop an amazing machine!

Endnotes:

[1]*Vertiflite*, November 1964, p. 5.

[2]*Jane's All the World's Aircraft,* 1969—1970, pp. 424—436.

[3]*U.S. Army Aviation Digest*, February 1968.

[4]*Aviation Daily*, 3 May 1969, p. 9.

[5]*U.S. Army Aviation Digest*, June 1969, p. 10.

[6]Ibid.

[7]Ibid.

[8]*Air Force Review*, 1969, pp. 69–71.

[9]USASC data base. Aviation Mishaps involving CH–54—1 January 1972 through 4 May 1993.

U.S. Army photo

Operation Pershing—A search and destroy operation about 50 kilometers northeast of An Khe in Binh Dinh Province, Vietnam. Members of Company A, 1st Battalion, 7th Cavalry Regiment, 3d Brigade, 1st Cavalry Division (Airmobile), guide a UH-1D helicopter into a landing during a re-supply mission for the company, 28 May 1967.

The Role of the Helicopter in the Vietnam War

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Setting the Stage

To many Americans, the Vietnam War was one of the most divisive wars ever fought in our nation's history. Most of us old enough either to remember it, or to have fought in it, reflect on how the war tore at the very core of the nation's political, sociological, educational, and moral fiber. Through the television (TV) media, Americans had a front–row seat to view the death, destruction, and suffering emanating from that war. During our almost ceaseless TV exposure to the war, the presence of a machine not heretofore seen often on TV was etched indelibly in our visual imagery and psyche. That machine was the military helicopter.

True, American troops had used the helicopter in the Korean War; however, use of the helicopter in the war was limited primarily to medical evacuation (MEDEVAC), transportation, and logistical support. TV coverage of the Korean War was minuscule as opposed to the later Vietnam War so not much was known about the helicopter.

All American armed forces had helicopters in the Korean War; however, the Army provided the most significant use of the somewhat nascent helicopter. The Army used it mostly for MEDEVAC of over 21,000 wounded American fighting men to mobile army surgical hospitals (MASHs). The Korean War was unique in that, by the extensive use of the helicopter for aerial MEDEVAC of seriously wounded fighting men, a new dimension of saving lives ironically was added to the art of war.[1]

From the end of the Korean War in 1953 to 1962, adaptability of the helicopter to military doctrine was seriously discussed and evaluated. The U.S. Army and the U.S. Marine Corps (USMC) tested helicopters for transporting troops during the 1950s and early 1960s. During the late 1950s, the Army secretly placed guns on helicopters and test-fired them at Fort Rucker, Ala., for possible use as aerial weapons platforms.

The reasons for the secrecy were as follows: Other Army combat arms—infantry, artillery, and armor—believed the use of ordnance and armaments was restricted doctrinally to them; therefore, they thought the helicopter should not be given to an interloper like the organic Army Aviation element.

The Army also was involved in an ongoing dispute about close air support (CAS) with the U.S. Air Force (USAF). The USAF abhorred the very notion that the Army should have any aircraft armed and capable of providing some degree of CAS to ground units. That function ostensibly was delegated to the USAF because of the Key West Agreement of 1947. But, by the late 1950s, the Army was allowed to field the aerial combat reconnaissance platoon, which used armed helicopters. However, by the end of the 1950s, ac-

ceptance of the armed helicopter was still inchoate in most military circles. Not until the 1960s were armed helicopters accepted totally within the Department of Defense (DOD).[2]

Preparation of the Helicopter for War

The accession of John F. Kennedy to the Office of President of the United States, in 1960, brought about profound changes that affected Army Aviation—particularly as far as using the helicopter. The military and political doctrine of "massive retaliation," espoused during the 1950s, no longer was a viable option.

This doctrine asserted that, if the then existent Soviet Union attacked the United States, and/or its allies, the United States would retaliate with a massive nuclear strike against the Soviets. Supposedly, the massive retaliation was to have been a nuclear quid pro quo.

Thus, the possibility of a nuclear strike was enough to serve as a deterrent. Actually, what happened was that the two superpowers realized the use of strategic nuclear weapons would serve no purpose other than mutual annihilation. So massive retaliation, if not extinct, was at best somewhat extant.

Another reason for the diminishing influence of massive retaliation was the nascence of "brushfire wars." These were small wars fought with conventional weapons in Third World or nonaligned regions and involved using guerilla and/or paramilitary forces. Such a war was already taking place in Southeast Asia at the time of John F. Kennedy's inauguration. As we know, the region was Indo–China and was comprised of two countries: North and South Vietnam. The former was aligned with the Soviet Union; the latter, with the United States.[3]

In the late 1950s and early 1960s, the United States and the Soviet Union were caught up in a mutual frenzy of supplying arms, advisers, and equipment to support their respective allies in Indo–China. In 1961 the U.S. Army sent its first helicopter and fixed–wing aircraft to support South Vietnam. By 1963, the United States had 21,000 military advisers (the equivalent of a reinforced division) in South Vietnam.

General Hamilton Howze established a board to study the use of the helicopter to transport troops.

As an aside, one of the most significant fixed–wing aircraft in the Army's inventory in South Vietnam was the CV–2 Caribou, a twin–engine, medium transport. It served the Army well and had a short field landing and takeoff capability; therefore, it was suitable for incountry use. However, in April 1966, the Caribou was relinquished to the USAF as part of a memorandum of agreement (MOA) which, in turn, no longer claimed any suzerainty over tactical helicopters in South Vietnam.[4]

The military and political activity taking place in South Vietnam in the 1960–1962 timeframe showed the need for the Army to examine its helicopter requirements and tactics—particularly as far as South Vietnam.

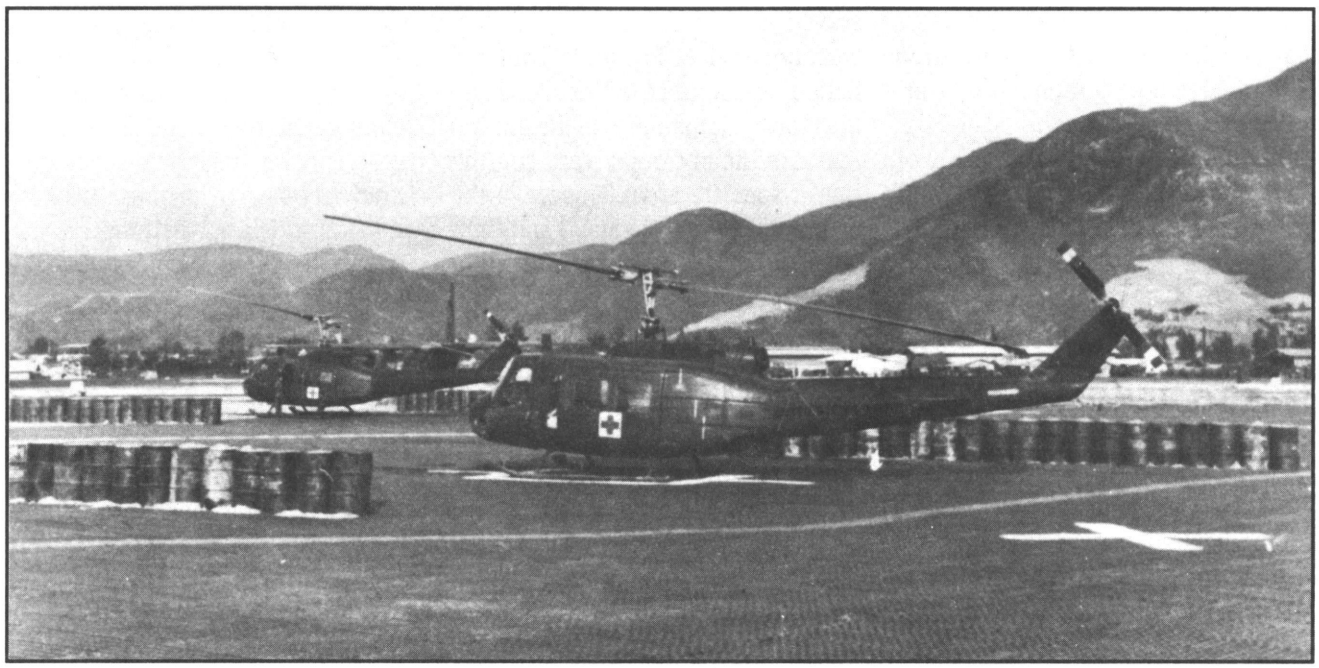
Lieutenant General Gordon B. Rogers, U.S. Army, in 1960 chaired a Board with the primary mission of upgrading Army Aviation to meet any tactical contingencies like brushfire wars or what would later be referred to as low– or mid–intensity level conflicts.

Akin to the upgrading was the Board's recommendation that the soon to be ubiquitous UH–1 Huey helicopter become the primary helicopter in the Army's active aircraft inventory. The Rogers Board also recommended procurement of the CH–47 Chinook cargo helicopter. Both of these aircraft acquitted themselves well in the ensuing Vietnam War.[5]

In 1962 the Secretary of Defense, Robert McNamara, decided to conduct a study on the tactical mobility of the Army ground forces, particularly airmobility—the use of helicopters to transport troops to a given area and as a means of CAS.

Mr. McNamara later instructed General Hamilton H. Howze, the Army's first Director of Aviation, to establish and chair a board to implement this study. The Howze Board, as it was known, convened at Fort Bragg, No. Car., in 1962.

The Board members performed numerous tests and studies, and posited the thesis that Army aircraft,



UH-1 Hueys used in MEDEVAC, known as dustoff missions.

particularly helicopters, could provide airmobile assets needed to enhance the combat effectiveness of ground forces. The Board also recommended fielding a cavalry combat brigade to fight brushfire wars.

The DOD, however, deferred the action on this recommendation. But DOD decided to create and test an air assault division replete with an organic helicopter battalion.

The 11th Air Assault Division was established at Fort Benning, Ga., to test all facets of airmobility. The Division passed its airmobility tests by the end of 1964. On 1 July 1965, it assumed operational status as a tactical division and was renamed the 1st Cavalry Division (Airmobile). "The 1st Cav," as it became known, had its own organic aircraft; it could provide its own tactical and logistical support. The Division's activation was none too soon.

Because of the military and political disturbances in South Vietnam in the spring of 1965, President Lyndon B. Johnson decided to deploy tactical units to South Vietnam. In July 1965 the 1st Cavalry Division received its orders for deployment. It deployed in August 1965, arrived in South Vietnam in September 1965, and became the Army's first division–size unit to engage the enemy.

This Division spent more than 2,000 days in South Vietnam—thus making it the longest serving Army unit incountry during the war. It received numerous citations and awards for its combat activity. The Marines, however, were the first to be sent to South Vietnam with the deployment of the Third Marine Division in April 1965.[6]

Army Aviation at War in Vietnam

South Vietnam was a country conducive to the use of the helicopter in both a tactical and nontactical environment. The country was bereft of an extensive road and highway system. The roads in existence often came under attack by the Viet Cong and/or North Vietnamese Army (NVA), which precluded or attenuated their use.

Besides this situation, the varied topography of South Vietnam, which included an extensive canopy of jungle, mountainous terrain, swamps, and an expansive delta should be considered; therefore, the helicopter was used for lift and support purposes.

Throughout the period of active U.S. participation in the Vietnam War (1965–1973), the Army and Marine divisions incountry had organic helicopter units, as did a number of Army brigades that served in South Vietnam. American combat units normally were not incountry very long before they were in the field, sometimes called the "bush," engaging the enemy.

Three things favored American ground forces: tactical mobility, firepower, and logistical support. All three were achieved with the helicopter.[7]

The use of the helicopter in the Vietnam conflict was to change forever the American doctrine of tactical warfare. Helicopters were found to be multidimensional. American combat units conducted tactical airmobile missions that included: insertion and extraction of ground forces; rescue of downed aviators; CAS with the UH–1 and AH–1 Cobra helicopter gunships; aerial reconnaissance; and MEDEVAC missions, known as "dustoff" missions.

The MEDEVAC helicopter crews saved about 390,000 wounded American fighting men's lives during the Vietnam War. This figure was more than 10 times the number of American lives saved by helicopters in the Korean War.

Two reasons for this seemingly disparate statistic were that helicopters in the Vietnam War were able to carry more litter cases than the small H–13 helicopters (precursor of the OH–13E (MEDEVAC)) used during the Korean War. In addition, the Vietnam War itself was a longer war.

Finally, helicopters provided the majority of logistical support to troops in the field, fire bases, and isolated outposts throughout South Vietnam. Unique to this war was the fact that light and medium artillery could be lifted and moved, as needed, by helicopter from one fire base to another with reasonable alacrity. This capability saved American lives and was instrumental in thwarting enemy attacks.

However, the helicopter was not without its detractors. It seemed unit commanders often used the helicopter as an aerial command, control, and communications (C^3) platform from which they surveyed the battlefield and communicated by radio to guide subordinate unit commanders on the ground. Many tacticians believed the commander's place was on the ground with his troops.

Another criticism directed against airmobility was that it reduced the ability or desire of ground units to move on the ground against the enemy, fix him, and destroy him. Apparently, in the mindset of infantry commanders, it was easier to insert troops quickly; engage and defeat the enemy; extract the American troops; and eventually repeat the same tactical process.

Some commanders posited the complaint that the extensive use of the helicopter in Vietnam, coupled with the noise of the aircraft, had served as nothing more than a timely warning device. The noise from the helicopter alerted the Viet Cong and the North Vietnamese on the ground that American troops were coming into a specific area. This gave the enemy time either to stand and fight or disengage and withdraw to fight somewhere else at his time and choosing. The helicopter also was assailed as being too lightly armored to withstand ground fire.

Though there is merit to these criticisms, or what might be considered by some as cavils, it should be noted that: The terrain, along with the tactical and political dictums of the war, precluded the use of large numbers of American troops to occupy a position on the ground for an extended period of time. The enclave or fortress mentality, which troubled the French and brought about their defeat in the earlier Indo–China War, was not a desirable option.

As was previously mentioned, the terrain and surfeit of roads favored the defender, not the attacker. Movement on the ground, even with armored and artillery support, often was hazardous and time–consuming. The argument certainly can be made that tactical unit commanders should be on the ground with their troops. However, the tactical fluidity of the situation often necessitated having a unit commander airborne where he could make the proper decisions based on his aerial observations of what was happening on the ground.

Finally, it was true that the helicopter was lightly armored, noisy, and could, and sometimes did, compromise tactical situations by these shortcomings. Yet, it must be remembered, this war was an unconventional war in many ways, and as mentioned earlier, favored not the attacker, but the defender. The use of the helicopter by the U.S. Army and USMC reduced markedly this defender advantage of the Viet Cong and North Vietnamese.[8]

With the implementation of the helicopter as an instrument of war during the Vietnam conflict, the new Army had to have a means whereby it could maintain tactical and administrative control of all of its divisional and nondivisional helicopters and fixed–wing aircraft in Vietnam. The Army did this with the creation and use of the 1st Aviation Brigade, which served in Vietnam from May 1966 to March 1973. After that time, the 1st Aviation Brigade was sent to Fort Rucker, Ala., as a training brigade, until 1988 when it became a combat aviation regiment. While in Vietnam, the Brigade had under its suzerainty 4,000 rotary–wing and fixed–wing aircraft and 24,000 troops. During the war, the Aviation Brigade and its support units became involved in four significant tactical operations that warrant examination.[9]

The **first** noteworthy tactical operation in which the Brigade and its units became involved was the Tet Offensive from January to March 1968. In this operation the Brigade and its units responded to the precarious tactical situation wrought by the North Vietnamese and Viet Cong armies' sudden incursions into major cities throughout South Vietnam.

The 1st Aviation Brigade established an airborne command and control (C^2) operation. At the same time, successful counterinsurgency operations began that eventually drove the enemy out of the urban areas and restored the tactical status quo.

The **second** important operation involving Army Aviation units, in April 1968, was the relief operation by the 1st Cavalry Division (Airmobile) to lift the North Vietnamese Army seize of the embattled USMC base at Khe Sanh. Dubbed PEGASUS, the operation successfully combined airmobile operations and a sustained road march by 1st Cavalry "Sky Troopers" and Marine

Corps units to lift the seize.

The **third** significant Army helicopter operation in South Vietnam was the incursion of the American and South Vietnamese Armies into neighboring Cambodia in May 1970 to ferret out and destroy North Vietnamese units and their supply depots. The Armies were allowed to advance only 30 kilometers (km) into Cambodia because of a presidential order. However, the deployment into Cambodia was successful. The Armies uncovered a number of large North Vietnamese ammunition and food caches. These caches were later transferred back to South Vietnam where they were either destroyed or, as far as food, given to local villagers.

The **fourth** and final important large–scale operation involving mass use of Army helicopters in South Vietnam was LAMSOM 719, which took place from January to April 1971. This mid–intensity–level operation had as its mission the coordinated insertion of South Vietnamese troops by air and armored units into Laos to drive North Vietnamese regulars out of areas contiguous to the South Vietnamese border. American lift helicopters ferried South Vietnamese troops into Laos. Helicopter gunships provided CAS for the South Vietnamese and destroyed a number of North Vietnamese P–76 tanks. The Army suffered the loss of about 100 helicopters, most of which were shot down by Soviet–built 37 millimeter (mm), radar–directed, antiaircraft guns. Some helicopters were lost because of the pervasive inclement weather resulting from the monsoon season in Southeast Asia.

During LAMSOM 719, Army helicopter pilots often were forced to fly in what at best could be discerned as marginal weather. Helicopters serving in the Vietnam War did not have tactical radar on board, so pilots had a difficult time flying during inclement weather. The fact that more helicopters were not lost during this operation was due, in large measure, to the flying skills and bravery of these pilots. LAMSON 719 itself incurred a great deal of controversy within and without military circles as to its efficacy and results. The operation served as a lessons learned report for the Army. It also brought out the need for the Army to have more heavily armed helicopters in such operations, and attendant and better close air coordination with the USAF.[10]

OH-6 Cayuse used for observation

During the Vietnam War, the Army had a number of helicopters in its inventory that played important roles during the conflict. The UH–1 Huey was a multifaceted aircraft serving as a troop carrier, gunship, MEDEVAC helicopter, and cargo carrier. The CH–47 Chinook and the CH–54 Sky Crane Tarhe were primarily supply, lift, and transport helicopters.

The Army also had two observation helicopters that acquitted themselves well in South Vietnam. They were the OH–6 Cayuse (Loach) and the OH–58 Kiowa. However, the most formidable helicopter to serve in Vietnam was the AH–1 Cobra gunship, which first arrived incountry in 1967. The Cobra carried wing–mounted 7.62mm machineguns, 2.75–inch rocket launchers, a 40mm M75 grenade launcher, and an XM 134 minigun. It caused much havoc upon enemy units, equipment, and personnel during a period of service in South Vietnam. The Army still uses the AH–1.

Reflections

The Vietnam War was, in many ways, a most imperfect war, fought by imperfect men, using imperfect tactics. It was a war in which battles often were brief and bloody, tactical and logistical support often counted for success or failure, and dying could be seconds or minutes away. It was a war in which the tactical helicopter came of age and added a new dimension to warfare, that of mobility.

Though an imperfect, and seemingly ungainly, aircraft, the ubiquitous helicopter touched the everyday lives of the young men who fought in the harsh climes and terrain of South Vietnam. The helicopter took them into battle, provided CAS, supplied and resupplied them, and evacuated the wounded and the dead. In turn, 2,700 young helicopter pilots and crewmen died supporting their comrades on the ground during the war. Seven helicopter pilots and crewmen received the Medal of Honor, two of them posthumously.

The Vietnam War has been over almost two decades. Veterans of that war who once were boys are now middle–aged. Most of them have gone on with their lives, attempting to live the American dream. Others, tragically, have withdrawn into the

inner sanctum of their pain and suffering, not being able to exercise the memories and horrors of war in a land too distant, yet too well remembered. However, it is unlikely that any of these veterans have ever forgotten the helicopter and its role in their lives in Vietnam.

To many, the helicopter was the first aircraft they saw as they were leaving the country to return home. Time and distance have blurred many memories about the Vietnam War, yet one memorial to that war stand—the helicopter. It served a contingency in Vietnam that depended on it often for many things. It served the constituency well. This constituency came of age in the brutal milieu of Vietnam and so did the helicopter. Together they are an indelible part of American history. May we never forget either those who fought in Vietnam or the helicopters that served them well.

AH–1 Cobra escorting two UH–1 Hueys in Vietnam

AH–1 Cobra in low–level attack mode, Vietnam

AH–1G helicopters refueling, Vietnam 1969

AH–1 helicopter (OV–1 Mohawk in background), Vietnam

ENDNOTES

[1]Frederick A. Bergerson, ***The Army Gets An Air Force*** (Baltimore: The Johns Hopkins University Press, 1980), pp. 63, 71, 99–100; Interview, H. P. LePore with LTG (Ret) R. R. Williams, 8 May 1984, hereafter cited as the Williams Interview; Richard T. Weinert, ***A History of Army Aviation 1950–1962*** (Phase I, 1950–1954), HQ, CONARC, 1971, pp. 17, 70, 90–91; Captain John G. Westover, ***Combat Support in Korea*** (Washington: Combat Forces Press, pp. 6, 21, 23, 111–112; Special Text, ***Helicopters in Korea in July 1951—31 August 1953***, April 1955, hereafter cited as Helicopter Special Text—Korea; Korean War Monographs, LTC Walter J. Borden, November 1955, CPT Wesley D. Chitty, Jr., November 1955; CPT Thomas A. Beasley, November 1955, found in special collections at the Aviation Center Special Collections, Technical Library, Fort Rucker, Ala.; MAJ W. H. Thornton, USA, MSC, "The 24th Medical Battalion in Korea," ***Military Surgeon***, Vol. 106, July 1951, pp. 11–20; LTC Spurgeon H. Neel, Jr., USA, MC, "Medical Considerations in Helicopter Evacuation," ***U.S. Armed Forces Medical Journal***, Vol. V, No. 2, pp. 220–227; Peter Dorland and James Nanney, ***Dustoff: Army Aeromedical Evacuation in Vietnam***, (Washington, D.C.: Center of Military History, 1982), pp. 10–20 (Section on Aeromedical Evacuation During the Korean War), hereafter known as ***Vietnam MEDEVAC***; Lynn Montross, ***Cavalry of the Sky: The Story of U.S. Marine Combat Helicopters***, (New York: Harper & Brothers), pp. 55–67, 133–142, 180–186. CPT Frederick M. Clingman, USAF, ***"Analysis of Aeromedical Evacuation in the Korean War and the Vietnam War" September 1989, (thesis), p. 15, DTIC, ADA 214–994–2***, hereafter cited as Clingman Thesis.

[2]Jay D. Vanderpool, "We Armed the Helicopter," ***U.S. Army Aviation Digest*** 17 (June 1971): p. 4; Charles 0. Grimminger, "The Armed Helicopter Story, Part I: The Origins of U.S. Army Aviation," ***U.S. Army Aviation Digest***, 17 (July 1971): p. 15; J. Pouget, "The Armed Helicopter," ***Military Review***, March 1964, pp. 81–96; William Vance, "How the Army Got Its Shooting Helicopters," ***National Guardsman*** (May 1963): pp. 3–4; Grimminger, "The Armed Helicopter Story, Part II: 'Vanderpool's Fools'" (August 1971): pp. 15–16; Ltrs, COL Jay D. Vanderpool to BG Carl I. Hutton, 5 December 1958; BG Carl I. Hutton to COL Jay D. Vanderpool, 13 December 1958; BG Carl I. Hutton to MG Hamilton H. Howze, 9 August 1956; MG Hamilton H. Howze to COL Kenneth K. Blacker, 1 August 1957; (all of the above letters were obtained from the BG Carl I. Hutton Papers in the Special Collections, Aviation Technical Library, Fort Rucker, Ala.); MG Hamilton H. Howze, "The Future Direction of Army Aviation," ***Army***, Vol. 7, No. 5, December 1956, pp. 51–54; MG Hamilton H. Howze, "Future of Army Aviation," ***U.S. Army Aviation Digest***, Vol. 3, No. 6, June 1957, pp. 4–6; Special Study, Leonard Weston and Clifford Stephens, ***The Development, Adaption, and Production of Armament for Army Helicopters, Part I***, United States Army Weapons Command, 11 November 1976, pp. 1, 4–6, 17, 22, 24, 44; LTC Eugene W. Rawlins, USMC, ***Marines and Helicopters 1946–1962*** (Washington, D.C., History and Museum Division, HQ, USMC), 1976, pp. 59–71, 72–81; Weinert, ***A History of Army Aviation 1950–1962, Phase II***, pp. 88–94.

[3]Carl Berger, ed., ***The United States Air Force in Southeast Asia 1961–1973*** (Washington, D.C.; Office of Air Force History, 1977), pp. ll–14, 20, 26–27; Ronald H. Spector, ***United States Army in Vietnam, Advice and Support: The Early Years 1941–1960*** (Washington, D.C.: Center of Military History, 1988), pp. 5, 10–17, 49, 61; Peter Braestrup, Editor, ***Vietnam as History: Ten Years After the Paris Peace Accords*** (Washington, DC: Woodrow Wilson International Center for Scholars), 1984, pp. 6–11, 14–15; Arthur M. Schlesinger, ***A Thousand Days: John F. Kennedy in the White House*** (Boston: Houghton Mifflin, 1965), pp. 997–999; Edgar O'Ballance, ***The Wars in Vietnam 1954–1973*** (New York: Hippocrene Books, 1975), pp. 42, 44, 60; LTG John J. Tolson, ***Airmobility 1961–1971*** (Washington, D.C.: Department of the Army, 1973), pp. 26, 29–32; George M. Kahin and John W. Lewis, ***The United States in Vietnam*** (Revised Edition) (New York: The Dial Press, 1967), pp. 137, pp. 154–157; Weinert, ***History of Army Aviation 1950–1962, Phase II***, pp. 38–41.

[4]Spector, ***Advice and Support: The Early Years***, pp. 291–292; Clarke, ***Advice and Support: The Final Years***, pp. 13–14; Tolson, ***Airmobility***, pp. 8–10, 26–36, 104–108; Shelby L. Stanton, ***The Rise and Fall of an American Army: U.S. Ground Forces in Vietnam 1965–1973*** (Novato, CA: Presidio Press, 1985), pp. 18–24; Williams Interview; GEN Bruce Palmer, Jr., ***The 25–Year War: America's Military Role in Vietnam***, (Univ of Kentucky Press, 1984), pp. 11–12, 14, 16, 19; Shelby Stanton, ***Vietnam Order of Battle***, (New York: Galahad Books, 1986), pp. 59–64.

[5]Weinert, ***History of Army Aviation, 1950–1962, Phase II***, pp. 31–32, 437, 48–49; Tolson, ***Airmobility***, pp. 8–11, 19; Williams Interview; Bergerson, ***The Army Gets an Air Force***, p. 108; Richard K. Tierney, "Forty Years of Army Aviation," (Condensed from ***The Army Aviation Story***, n.d., pp. 49–52; BG Carl I. Hutton, ***Airmobility***, n.d., (believed to be an information paper prepared for insertion into Army Aviation Hall of Fame).

[6]Final Report (U), U.S. Army Tactical Mobility Requirements Board, 20 August 1962; Tolson, ***Airmobility***, pp. 51–57; Weinert, ***History of Army Aviation 1950–1962, Phase II***, pp. 30–39; Palmer, ***The 25–Year War***, pp. 27–29; Bergerson, ***The Army Gets an Air Force***, pp. 111–114; Interview, H. P. LePore, ATZQ–DAP–H with GEN (Ret) Hamilton H. Howze, USA, 23 April 1986.

[7]Stanton, ***The Rise and Fall of the American Army***, pp. 81–96; Palmer, ***The 25–Year War***, pp. 58, 62; Tolson, ***Airmobility***, pp. 52–62; Bergerson, ***The Army Gets an Air Force***, pp. 114–119; W. E. Butter- worth, ***Flying Army***, (Garden City: Doubleday & Company), 1971, pp. 96–100; Williams Interview.

[8]***Dust Off: Army Aeromedical Evacuation in Vietnam***, (Washington, D.C.: Center of Military History, 1982), pp. 96, 116–123; Interview, H. P. LePore with CW4 Michael J. Novosel, 11 January 1984; Williams Interview; MG Spurgeon Neel, ***Medical Support of the United States Army in Vietnam 1965–1970*** (Washington, D.C.: Department of the Army, 1973), pp. 49–68, 73–78, 101–107; Stanton, ***Vietnam Order of Battle***, pp. 47–49, 109; Tolson, ***Airmobility***, p. 62; "Air Force, Army Agree on Role Mission," ***Aviation Week and Space Technology***, 27 April 1966, pp. 26–27; Dorland and Nanney, ***Vietnam MEDEVAC***, chapters II and III. Stanton, ***The Rise and Fall of an American Army***, pp. 50–51, 269, 364; Palmer, ***The 25–Year War***, pp. 62, 160, 168–169; Interview, H. P. LePore with LTG Harry W. 0. Kinnard, 16 September 1986; Genter Lewy, ***America in Vietnam***, (New York: Oxford University Press), 1978, pp. 56–57, 59; Clingman Thesis; USACGSC, 19090.2, After Action Report, ***Critique of Counterinsurgency Airmobile Operations, 5 July 1965, U.S. Army, Vietnam***, p. 58.

[9]Stanton, ***Order of Battle***, p. 109; Stanton, ***The Rise and Fall of an American Army***, pp. 87–91; Palmer, ***The 25–Year War***, pp. 62, 158–160; Tolson, ***Airmobility***, pp. 89, 103–104; ***A Distant Challenge: The U.S. Infantryman In Vietnam, 1967–1970***, (Birmingham: Birmingham Publishing Company, 1971), (a compilation of articles and observations on Vietnam), pp. 133–140, 327–341; ***Report on the War in Vietnam: Commander in Chief Pacific (As of June 1968)***, U.S. Military Assistance Command, Vietnam (MACV), pp. 99, 247, 276, 297; USACGCS, After Action Report, N–18745113–A, 5 June 65, ***173d Airborne Brigade (Separate), 5 June 1965***.

[10]Bernard C. Nalty, ***Air Power and the Fight for Ke Sahn*** (Washington, D.C.: Office of Air Force History), 1973, pp. 96–102; Palmer, ***The 25–Year War***, pp. 109–114; O'Ballance, ***The Wars in Vietnam***, pp. ll9–130; Stanton; ***The Rise and Fall of the American*** Army, pp. 77, 80, 111, 114, 141, 144–145, 157, 181, 231, 241, 256, 259; Tolson, ***Airmobility***, pp. 144, 154–159; Kahnin and Lewis, ***The United States in Vietnam***, pp. 172–177; After Action Report (U), Operation Hue, 1st Cavalry Division (Airmobile), February 1968; After Action Report (U), LAMSON 719, January 1972; Jacob Van Staavern, "Interdiction in the Laotian Panhandle," ***The United States Air Force in Southeast Asia***, 1984, pp. 114–117; USACGCS, MFR (U), 20 March 1971, 101st Airborne (Airmobile), Subject: Airmobile Operations in Support of LAMSON 719; Clingman Thesis, p. 59; Study, Study, MAJ Frank T. Taddonio, USACSGC, 2 December 1985. ***What Can We Learn from a War We Lost?: The Relevance of the Vietnam Experience for Today's Assault Helicopter Doctrine***, pp. 15, 18, 25, 28.

On the Aviation Information Superhighway: Mode–S

Mr. Walter Perron
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U.S. Army Aeronautical Services Agency
Fort Belvoir, Virginia

Installation of the Mode Select (Mode–S) secondary surveillance radar (SSR) system is scheduled to begin for Army aviation before the end of the century. This new system will enhance air traffic control (ATC) efficiency and improve aircraft tracking and processing. Mode–S is an SSR system that provides higher position accuracy and lower interrogation rates than the current Mode–C Air Traffic Control Radar Beacon System (ATCRBS). Mode–S is "backward compatible" with ATCRBS Mode–C and eventually will replace that system. Level–2 Mode–S is the same technology used by Traffic Alert and Collision Avoidance Systems (TCASs) currently required in U.S. commercial air carriers of 30 seats or more.

Under the seven–year advance notification procedures of the International Civil Aviation Organization (ICAO), France and Germany have announced that Mode–S will be required in their national airspace by 1999, even for aircraft operating under visual flight rules. Several other nations will make similar announcements soon. The Federal Aviation Administration (FAA) already has installed more than 149 Mode–S–capable ground interrogation stations in the United States. Mode–S will facilitate the implementation of data–link services that ultimately will provide voice–free communications between air traffic control and pilots. Mode–S also will increase SSR accuracy and performance dramatically; Mode–S will improve air traffic control safety and efficiency and will decrease controller work load.

Most important of all, Mode–S will provide a bidirectional data link that establishes the means to further improve ATC operational efficiency. Data link is the digital transmission of ATC messages that will replace both air–to–ground and ground–to–air voice communications. Mode–S data link will be highly efficient in high–traffic terminal–area environments. The data link provides communication rates of up to 300 bits per second operating in full duplex for all 700 aircraft each ground sensor is capable of tracking simultaneously.

In addition, Mode–S will provide discrete addressing. Every transponder will be assigned a unique identification code. For military aircraft, the FAA has assigned the Department of Defense (DOD) 132,000 codes. Military aircraft, including helicopters and unmanned aerial vehicles (UAVs), will change codes on a yet–to–be–determined schedule. Blocks of codes also will be set aside for deployments so that military aircraft (aviation units) are not tracked when they deploy. Mode–S targets are addressed individually by this code in a "roll–call" mode. Roll–call interrogation differs from the current ATCRBS interrogation because the sensor interrogates only specific aircraft. ATCRBS Mode–C interrogations are broadcast to all aircraft within radar coverage; thus every transponder reply must be processed, which is far less efficient than Mode–S.

The requirements for military use of Mode–S have been recognized as a requirement by the Joint Chiefs of Staff, Office of the Secretary of Defense, and the major North Atlantic Treaty Organization (NATO) commanders. The support of missions in peacetime and during periods of tension and conflict requires unrestricted operation of aircraft and UAVs and the ability to recognize civil aircraft and UAVs to—

- Access/penetrate the civilian route structure/terminal control areas.
- Facilitate the safe coordination of military/civilian air traffic.
- Facilitate the use of civil airfields by military aircraft.
- Provide information to air defense authorities who will aid in the compilation of the recognized air picture.
- Assume management and control of the civil air traffic control and air traffic management system during a crisis.

U.S. Army Aeronautical Services Agency

USAASA invites your questions and comments and may be contacted at DSN 656–4871 or commercial 703–806–4871; or write to—
Commander
U.S. Army Aeronautical Services Agency
ATTN: MOAS–AI (Bldg 1466)
9325 Gunston Road, Suite N319
Fort Belvoir, VA 22060–5582.

Aviation Life Support Equipment Technician Course

MSG Richard L. Dahlin
Chief, Aviation Life Support Equipment Division
Department of Aviation Systems Training
U.S. Army Aviation Logistics School
Fort Eustis, Virginia

The Aviation Life Support Equipment (ALSE) Technician Course has one mission—to develop the skills and knowledge required for a soldier to efficiently and safely perform ALSE tasks.

The aviation commander is responsible for the safety of the aircraft's pilots, crew members, and passengers. In a comprehensive ALSE program with a top–notch ALSE shop, equipment training is paramount. However, without qualified ALSE technicians, the program cannot work.

The ALSE school first opened its doors to students in March 1982. Since the school began, more than 6,000 students have graduated. More than 500 graduates are projected in 1994.

A description of the ALSE course is in Department of the Army (DA) Pamphlet 351–4, *U.S. Army Formal Schools Catalog*. Members of the active Army and Reserve Components are eligible to attend. Further guidance on course eligibility is in the following Army regulations (ARs):

- AR 611–101, *Commissioned Officer Classification System.*
- AR 611–112, *Manual of Warrant Officer Military Occupational Specialties.*
- AR 611–201, *Enlisted Career Management Fields and Military Occupational Specialties.*

Many units complain about not having enough ALSE–qualified personnel. Keep in mind that attendance at the ALSE course is by DA selection. Attendance may be by temporary duty (TDY) and return or by TDY en route with a permanent change of station (PCS). The students selected are given a class number six months or more before the class starts. Commanders are advised not to wait until their ALSE technician receives PCS orders to arrange for a replacement. A DA Form 4187 (*Personnel Action*) should be completed on newly assigned soldiers so that after completing the course they may have 12 or more months of retention in the unit. Also, when a unit lacks ALSE–qualified personnel, a simple check of DA Forms 2A *(Personnel Qualification Record–Part 1)* may reveal unknown qualified personnel.

The ALSE course is divided into three training phases—A Phase, B Phase, and C Phase—which are about nine days each. The phases have two examinations each with a total of 1,000 points for the course. The A Phase comprises an introduction to the course; ALSE management and operations; publications, forms and records; and supply procedures. The B Phase comprises flotation equipment, antiexposure suits, first–aid kits, survival kits, survival vests, radios, harnesses, and body armor. The C Phase comprises the survival training program, helmets, chemical masks, oxygen equipment, flight clothing, new systems, and ALSE shop setup. For those who complete the course, commissioned officers receive the additional skill identifier 1F; warrant officers, H2; and enlisted personnel, Q2.

The 18 ALSE course instructors have combined experience of more than 50 years. The course is taught at the Department of Aviation Systems Training, U.S. Army Aviation Logistics School, Fort Eustis, Va.

New students will report to Building 1018, G Company, 71st Transportation Battalion, Fort Eustis. For more information, call DSN 927–3379/4655 or commercial 804–878–3379/4655; the fax number is DSN 927–1597.

U.S. Army Logistics School

Readers may address matters concerning aviation logistics to—
Assistant Commandant
U.S. Army Aviation Logistics School
ATTN: ATSQ–LAC
Fort Eustis, VA 23604–5415.

What's New in Air Traffic Control?

SFC Steve Almond
Tactical Requirements Division
U.S. Army Air Traffic Control Activity
Fort Rucker, Alabama

I thought now would be a good time to introduce a digitized link to the battlefield—the forward area shelterized terminal tower (FAST). It is to play a major role in the digitized air traffic services (ATS) supporting Army aviation, along with three new acquisitions—the air traffic control navigation, integration, and coordination system (ATNAVICS); the tactical terminal control system (TTCS); and the tactical airspace integration system (TAIS).

The FAST will replace the AN/TSW–7A, Air Traffic Control Central, and the AN/TSQ–70A, Aircraft Control Central, fulfilling dreams we have had for years—*mobility, improved communications, and reliable operations.* This system can be deployed with one C–130 Hercules or two UH–60 Black Hawk sorties or one high mobility multipurpose wheeled vehicle (HMMWV), depending on the type and length of deployment. Three soldiers who are in mission–oriented protection posture (MOPP) IV or extreme cold weather gear can have the FAST fully operational within 30 minutes. Transportability and quick installation will provide Army aviation with *fast* and reliable air traffic services from initial deployment until it is time to come home.

Normally, FAST will be deployed at instrumented tactical airfields or landing sites in division, corps, and echelons above corps (EAC) or provide the capability to restore air traffic services at any military or civil airport disabled by battle damage. The FAST will be equipped with secure, jam–resistant very high frequency–amplitude modulated/frequency modulated (VHF–AM/FM), ultra high frequency (UHF)–AM/FM, and high frequency–single side band (HF–SSB) with automatic link establishment radios that can be removed from the communications rack for manpack operations, if required. Weather–receiving configuration will include a thermometer, a barometer, and wind direction and speed equipment.

Two operators will be able to sit comfortably with an excellent view of the traffic situation, all control heads, and weather instruments to allow effective aircraft management during the day and under night–vision devices. A third position is provided for a supervisor and may be used for aircraft management. The radios, except HF–SSB, will have a backup and be equipped with a low–power mode for operations in an active electronic warfare environment. Electronic counter–counter measure capabilities will be provided by the single channel ground and air radio system (SINCGARS) and Have Quick II–system radios.

A new addition to tactical tower operations is the installation of a multifunctional radar display in the FAST. Data will be received from the ATNAVICS collocated at the same airfield—introducing a new spectrum of tactical ATS.

Maintenance is always at the forefront of any equipment discussion. Rest assured that maintenance will be simplified with FAST. Mean

time between failures will be about 750 hours—and 1,500 hours for a critical failure. Equipment repair time at the organizational level will be about 17 minutes and at the intermediate level, about 50 minutes. The FAST will provide a 95–percent operational availability, and preventive/scheduled maintenance should not exceed about 3.5 hours per 30–day period. Most repairs at the organizational level will be as simple as replacing a module or circuit board identified by the built–in test diagnostics/prognostic program that the operator will be able to run. *High tech?* Not really; Army ATS is finally getting into the mainstream of technology.

On the modern battlefield, FAST will be part of the command and control network. Along with ATNAVICS, TAIS, and TTCS, FAST will play a larger part in Army airspace command and control (A^2C^2) and command, control, communications, and intelligence (C^3I), while providing enhanced air traffic control services. The system will have a data display system capable of receiving, manipulating, and transmitting digital information between the aviator on the front line and deep operations to EAC to airborne command and control platforms. This capability of moving digital target data, airspace control orders, air tasking orders, flight information, weather data, operation orders, and fragmentary orders and other information around on the battlefield links Army aviation and Army ATS with the *digitized force projection battlefield.*

What's new in air traffic control? The forward area shelterized terminal tower (FAST).

Components will be hardened to the effects of nuclear, biological, and chemical contamination and decontamination agents. These components also will be hardened to the effects of high–altitude electromagnetic pulse. This combination will give FAST greater survivability during attacks, recovery, and decontamination operations.

A few other improvements will be added, keeping mobility at the forefront of all decisions along with making use of every inch of dead space. Three racks will be available to safely secure individual weapons while working traffic. The shelter contains storage space for the camouflage system, personnel equipment, and tools necessary for installation.

FAST is scheduled for delivery to the first unit around 1998. This may seem like a long time away, but taking into consideration the addition of advanced technology and capabilities, the wait will be well worth it.

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.

Aviation Warrant Officer Cargo Helicopter Update

CW5 Clifford L. Brown
Aviation Proponency
U.S. Army Aviation Center
Fort Rucker, Alabama

The Aviation Restructure Initiative (ARI) has already begun converting units to the new A–series table(s) of organization and equipment (TOE). Elements of the Warrant Officer Management Act (WOMA) and the Warrant Officer Leader Development Action Plan (WOLDAP) have been built into these new TOE.

For cargo–qualified warrant officers in area of concentration (AOC) 154, career patterns have changed. Four aviation warrant officer (AWO) career paths now lead to chief warrant officer 5 (CW5). These career paths are *safety*, *operations*, *maintenance*, and *training* and are identified with specific special qualifications identifiers (SQI).

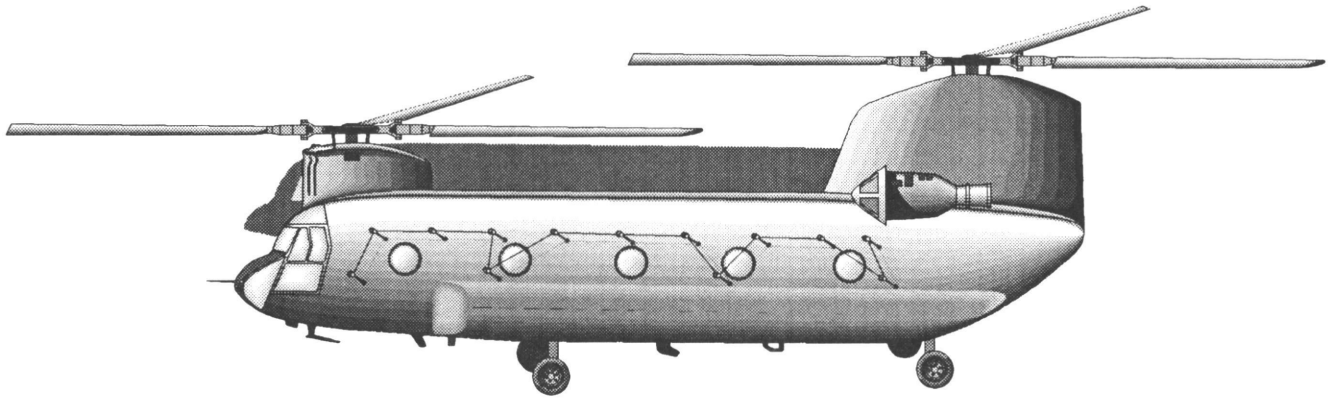
Safety. Warrant officers can unofficially enter this career path as a warrant officer 1 (WO1) or CW2 by performing duties as assistant safety officer, fire marshall, and ground safety or foreign object damage officer at the company level. Official entry into the safety career path occurs as a CW2 promotable (P) or CW3 by completing the Aviation Safety Officer (ASO) Course and being awarded SQI B.

All company–level safety officer positions in cargo units are rank coded for CW4. Upon promotion to CW5, safety officers will be assigned to a medium helicopter battalion as the battalion ASO. Also, tables of distribution and allowances (TDA) safety officer positions are available at installation, corps, and Army levels. The U.S. Army Safety Center, Fort Rucker, Ala., has several positions at the CW5 level as accident investigator team chiefs.

Operations. A warrant officer can begin this career path as a WO1 or CW2 by becoming the company Aircraft Survivability Equipment/ Electronic Warfare (ASE/EW) Officer. Completing the ASE/EW course generates the award of additional skill identifier (ASI) H3. Receiving the ASI H3 does not require an officer to follow the operations career path; however, tactical operations officers must have a strong background in ASE/EW. Official entry into the operations career path occurs as a CW2(P) or CW3 after either completing one year as an assistant operations officer or completing the Joint Air Operations Course given at the Eglin Air Force Base, Fla., Air Ground Operations School and being awarded the SQI I. Company–level tactical operations officer positions are rank coded for CW4. Upon promotion to CW5, tactical operations officers will be assigned to a medium helicopter battalion Operations and Training Officer (U.S. Army) (S3) staff as the Tactical Operations/EW Officer.

Maintenance. A warrant officer can unofficially begin this career path as a WO1 or CW2 by assisting with maintenance test flights. Official entry into the maintenance career path occurs as a CW2(P) or CW3 after completing the Maintenance Manager/Maintenance Test Pilot Course and being awarded SQI G. All company–level maintenance test pilot positions are rank coded for CW3s. Upon promotion to CW4, aviation maintenance officers can be assigned as the company maintenance test flight evaluator (MTFE). The new SQI L will be used in coding positions and warrant officers who require MTFE skills. Upon promotion to CW5, aviation maintenance officers will be assigned to a medium helicopter battalion Supply Officer (U.S. Army) (S4) staff as the aviation materiel officer (AMO). Positions also exist in TDA organizations for AMOs at the installation, corps, and Army levels.

Training. A warrant officer can unofficially enter this career field as



Career patterns have changed for cargo–qualified warrant officers in AOC 154.

a WO1 by performing duties as a unit trainer. Official entry into this career path occurs as a CW2 after completing an instructor pilot course and being awarded SQI C. All company–level instructor pilot positions are rank coded for CW2. Upon promotion to CW3 and completing the Instrument Flight Examiners Course, warrant officers will be awarded SQI F. This SQI is coded for CW3s at the company level with a duty position title of Senior Instructor Pilot. Upon promotion to CW4 and completing local certification procedures, a warrant officer can become a standardization instructor pilot (SIP) and be awarded SQI H. As a CW4, an SIP will be assigned as a company SIP or standardization officer. Upon promotion to CW5, an SIP will be assigned to a medium helicopter battalion as the battalion standardization officer. Positions also exist in air defense artillery (ADA) organizations for SIPs/standardization officers at the installation, corps, and Army levels.

Leader Development. During each successively higher level of rank, warrant officers are required to attend leader development courses. As a CW2(P) or junior CW3, the warrant officer must attend the Warrant Officer Advanced Course, MEL 6. Upon selection for CW4, attendance at the Warrant Officer Staff Course, MEL 4, is mandatory. Upon selection for CW5, warrant officers must attend the Warrant Officer Senior Staff Course, MEL 1.

Aviation Proponency Office

Readers may address matters concerning aviation personnel to—
Chief
Aviation Proponency Office
ATTN: ATZQ–AP
Fort Rucker, AL 36362–2359.

U.S. Army Class A Aviation Flight Mishaps

Fiscal Year	Number	Flying Hours	Rate	Military Fatalities	Total Cost (in millions)
FY 93 (through 30 June)	20	967,114	2.07	22	97.9
FY 94 (through 30 June)	18	967,114 (estimated)	1.86	6	50.4

TEXCOM

U.S. Army Test and Experimentation Command Celebrates Anniversary

Mr. Wayne E. Hair
Public Affairs Officer
U.S. Army Test and Experimentation Command
Fort Hood, Texas

This October, the U.S. Army Test and Experimentation Command (TEXCOM) will celebrate its twenty–fifth anniversary as a unique independent test organization. From day one, TEXCOM had *the soldier* as its ultimate customer.

It has come a long way from its early days in 1969 at Fort Hood, Tex., as a highly secret organization called Project Mobile Army Sensor Systems Test, Evaluation, and Review—better known as Project MASSTER. This organization came in existence at the direction of then–Army Chief of Staff GEN William Westmoreland, with a priority second only to combat operations in Vietnam. Fort Hood was selected as the site over Fort Carson, Colo.; Fort Riley, Kan.; and Fort Bragg, N.C.

Project MASSTER was chartered to evaluate the many items of equipment developed under the Army's surveillance, target acquisition, and night observation (STANO) program. As the Vietnam War escalated, many systems from industry were offered that would fill specific needs. The crux of Project MASSTER's mission was to quickly test, evaluate, and find the best system to satisfy each need. A Fort Hood soldier thought a more descriptive meaning for MASSTER was "Making American Soldiers Safer Through Electronic Reconnaissance."

To accomplish its mission, Project MASSTER was given an operational assault helicopter company (AHC)—the 181st AHC—and an OV–1 Mohawk company—the 293d Aviation Company—both based at Robert Gray Army Airfield, West Fort Hood. Troops from Fort Hood's 1st and 2nd Armored Divisions and others were tasked to provide soldier support.

The equipment being tested included unattended ground sensors; ground and airborne search lights; night observation devices for individuals, tanks, and aircraft;

This AH–1G Cobra was equipped with an experimental night fire control system.

This UH–1H Iroquois (Huey) helicopter was equipped with an airborne magnetometer system; this project was terminated because of lack of potential for further development.

and an array of target–acquisition devices for ground and air soldiers.

One of those pioneer testers charged with conducting quick, but accurate, experiments was retired civil servant Dr. Virgil Henson. About those early days, Henson says, "What was important was to find out what *didn't* work well so that we didn't ship the combat troops bad equipment to stake their lives on.

"The battlefield was no place to experiment," he says. He points out that the employees, military and civilian, fully realized their enormous responsibility and were totally dedicated to do each and every test right.

The central Texas skies at night were dotted with strange lights emitting from helicopters. During the day, helicopters could be seen with unusual attachments and protrusions from the airframe. Relatively few people at or around Fort Hood knew what these aircraft were—other than if they looked unusual, they must be MASSTER's. The civilian communities surrounding Fort Hood were accustomed to secrecy at the sprawling post—especially at West Fort Hood. Also known as "KAY–BEE"—for Killeen Base, when the Air Force ran it—there is an extensive tunnel complex in the rolling hills of the post from when it was a highly classified nuclear storage facility (1948–1960).

Early in 1969, Killeen Base was scheduled for deactivation and closure. However, on the same date—1 October 1969—it was announced that Project MASSTER was to be activated. "KAY–BEE" was changed to West Fort Hood and received a new lease on life.

In 1971, Project MASSTER became a permanent headquarters and the acronym retitled to Modern Army Selected Systems Test Evaluation and Review—tasked with conducting quick–reaction, innovative tests to evaluate the utility of adopting new equipment. Also in 1971, the 1st Air Cavalry Division returned from Vietnam and was designated a triple capability (TRICAP) division at Fort Hood. This test division consisted of an armor brigade, a mechanized infantry brigade, and an all–new air cavalry combat brigade. Redesignated United States Army Training and Doctrine Command (TRADOC) Combined Arms Test Activity (TCATA) in 1978, the Army's premier operational test organization expanded its charter to include combined arms testing and training analysis.

In October 1988, TCATA was reorganized and redesignated as the TRADOC Test and Experimentation Command. The TRADOC test boards, located around the country, were redesignated as TEXCOM Test Directorates. Then in 1990, as a result of the Defense Management Review, TEXCOM left TRADOC and was aligned under a new organization—the U.S. Army Operational Test and Evaluation Command, located in Alexandria, Va.

Throughout its quarter–century, the employee dedication to the soldier on the battlefield has never wavered. Indeed, the philosophy aptly stated by a former test director is paramount: "The American soldier will use his ingenuity to make the equipment work. This doesn't absolve us if we send him into battle with a piece of junk."

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.

MOS Consolidation Made Easy

MSG John Gartman
Leader Development
Personnel Proponency Office
U.S. Army Aviation Logistics School
Fort Eustis, Virginia

For nearly a decade, the AH–1 Cobra served the Army well as the primary attack helicopter. The Army fielded the AH–64 Apache to fill the void for the night–fighting capability and to provide an enhanced weapons platform. This created a maintainer shortfall for the AH–64 in military occupational specialties (MOSs) 68J (Aircraft Armament/ Missile Systems Repairer), 68N (Avionic Mechanic), and 68F (Aircraft Electrician). The additional skill identifier (ASI) X1 (AH–64 Maintenance) was introduced to handle the armament, electrical, and avionic repair mission. Problems occurred in the personnel requisition system; the ASI could not be managed efficiently—68J ASI X1 personnel were being assigned to AH–1 Cobra units, and 68J personnel were being assigned to AH–64 units. The problem was partially corrected by incorporating ASI (X1) for 68F and 68J into a single MOS of 68X, AH–64 Armament/ Electrical Systems Repairer.

In the past, 68Js maintained the armament systems and 68F maintained the electrical systems for both the AH–1 and AH–64 helicopters. Advanced individual training (AIT) for both MOSs focused solely on AH–1 systems. To repair the AH–64 armament systems, soldiers had to attend the 68J ASI X1 training, with a course length of 41 weeks and two days. To repair the electrical systems, they had to attend the 68F ASI X1 training, with a course length of 29 weeks. The Department of the Army (DA) then introduced the OH–58D Kiowa Warrior aircraft into the inventory. It was now time to merge similar skills, training, and MOSs. It was envisioned that the 68N ASI X1 would be added into MOS 68X. This action would allow for greater flexibility in performing avionic, armament, and electrical repairs for the AH–64 and further expand the warfighting capability of the 68X repairer. By adding 68N X1 positions to MOS 68X, we would eliminate the requirement for ASI X1 linkage with MOS 68N.

To avoid similar problems experienced with the AH–64/ AH–1, it is envisioned that the ASI W5 (OH–58D maintainers) personnel for MOSs 68J, 68F, and 68N will be combined into a single MOS designated 68S (OH–58D Armament/ Electrical/Avionics Repairer). Currently, three MOSs (68J, 68F, and 68N) are required to maintain the armament, electrical, and avionic systems for the OH–58D. The AIT for these MOSs concentrates solely on AH–1 systems. To repair the OH–58D systems, personnel also must attend three ASI W5 maintenance courses. According to DA guidance, as in the 68X MOS,

soldiers will be assigned to OH–58D units for four years. A total of 71 weeks of training on systems other than OH–58D will not be used during the soldier's first assignment. The merging of ASI W5 for MOSs 68J, 68F, and 68N into new MOS 68S will provide enhanced armament, electrical, and avionic maintenance training for the OH–58D. These actions will improve personnel management for the OH–58D maintainers, conserve training funds, and provide maintainers exclusively for the OH–58D aircraft systems.

MOS 68J W5 personnel will be retrained and reclassified into new MOS 68S. ASI W5 duties and positions for MOSs 68F and 68N will be transferred to MOS 68S. The personnel in MOSs 68F and 68N will be retrained and reclassified into new MOS 68E (Aircraft Avionics/Electrical Systems Repairer). Transferring the ASI W5 authorizations to MOS 68S will eliminate the requirement for ASI W5 linkage with MOSs 68J, 68F, and 68N. The new MOS 68S course length would be 27 weeks and four days, saving 7 weeks over the current course length of 34 weeks and three days to produce a 68J W5 maintainer and 3 weeks for the MOS 68N W5 maintainer.

The plan to consolidate MOSs 68F and 68N duties, titles, authorizations, and personnel into new MOS 68E will keep the number of MOSs being managed at the current levels. Personnel in MOS 68F currently cap into MOS 68K (Aircraft Components Repair Supervisor) at the rank of sergeant first class. Currently MOS 68N personnel cap into MOS 68P (Avionic Maintenance Supervisor) at the rank of sergeant first class. The requirement to maintain a correct grade structure for MOS 68E requires the transfer of 53 68P positions to MOS 68K. MOS 68E will cap into MOS 68K at the rank of sergeant first class.

The number of ASIs will be reduced by including ASI W6 (Aircraft Survivability Equipment) training into the core training for MOSs 68S, 68E, and 68X.

Future plans are to merge the following MOSs:

- 68B (Aircraft Powerplant Repairer) and 68D (Aircraft Powertrain Repairer).
- 67T (UH–60 Helicopter Repairer) and 67N (UH–1 Helicopter Repairer).
- 67S (OH–58D Helicopter Repairer) and 67V (Observation/Scout Helicopter Repairer)
- 67R (AH–64 Attack Helicopter Repairer) and 67Y (AH–1 Attack Helicopter Repairer).

Proposed merge dates are fiscal year (FY) 1996 through FY 2001. MOSs 68B, 68G (Aircraft Structural Repairer), 67N, 67V, and 67Y will be deleted during FY 1996 through FY 2003. MOSs 68B and 68G will be merged with all 67–series MOSs by FY 2003.

These revisions will not affect the assignment or utilization of female soldiers. The revisions will increase the readiness and effectiveness of the Aviation Branch.

Maintaining and Flying in SOUTHCOM

Colonel Michael J. Van Airsdale
Commander, 128th Aviation Brigade

Lieutenant Colonel Kurt A. Andrews
Deputy Aviation Officer
U.S. Army South
Fort Clayton, Panama

These missions keep the aviators flying, and the mechanics turning wrenches, in Central and South America, the U.S. Southern Command (USSOUTHCOM) Area of Operations (AOR): Air assault, air movement, counterdrug, joint search and rescue, peacetime contingency, VIP, and the aircrew training program (ATP).

The primary aviation operator in the USSOUTHCOM theater is the 128th Aviation (Avn) Brigade (Bde), which consists of two aviation battalions, the 1–228th Aviation in Panama and the 4–228th Aviation in Honduras; the 214th Medical Evacuation (MEDEVAC); and E/228th Aviation (Aviation Intermediate Maintenance (AVIM)).

Total aircraft assigned to the Brigade are 79 to include 40 UH–60 Black Hawks, 8 CH–47 Chinooks, 13 UH–1 Hueys, and 3 C–12 Huron aircraft. All Panama–based UH–1H aircraft departed before the inactivation of B/1–228th Aviation.

The aviators' missions can take them anywhere from the Mexican border to the tip of South America. Yet it takes 30 days on average to receive parts from the continental United States (CONUS) in Panama.

There is the additional maintenance workload associated with operating in a corrosive, salt–laden, tropical environment. Remarkably, in FY94, the brigade's aviation maintenance program is not only keeping pace with a high flying hour operational tempo (OPTEMPO) but consistently produces readiness rates higher than the Army average and DA standards. The 128th Aviation Brigade's OPTEMPO also significantly exceeds the Army average. (See also table, p. 51.)

FY 94 OPTEMPO (hours/month)			FMC Readiness Rates (percent)		
Aircraft Type	128th Avn Bde	Army	128th Avn Bde	Army	DA Standard
CH-47D	19	11	79	64	70
UH-60A	17	10	79	66	75
UH-1H	16	9	77	71	75

Aviation maintenance is **"Commander's Business"** within the Aviation brigade. At all levels, command involvement in aircraft maintenance is present. Both the U.S. Army South (USARSO) commander and the USCINCSOUTH (Commander-in-chief SOUTHCOM) have command briefings twice weekly and daily review of aircraft maintenance. Commanders must notify the brigade tactical operations center (TOC) if any mission design series (MDS) aircraft falls below DA standard.

Aircraft maintenance is an essential element of operational planning, not an afterthought. This command focus ensures involvement and concern from all who have an impact on aviation maintenance.

Twice monthly the brigade commander chairs the Aviation Readiness Council (ARC): subordinate battalion and separate company commanders; the class supply support activity (SSA) manager; the AVIM Production Control (PC) officer; Logistical Assistance Representatives (LARs) of the U.S. Army Aviation and Troop Command (ATCOM); and representatives from the USARSO Deputy Chief of Staff for Logistics (DCSLOG) and the 93d Transportation Army Aviation Maintenance Command (TAAMMC). Aircraft readiness, phase management, and supply actions are reviewed and discussed.

More specifically, at a minimum battalion and company commanders brief the status of—

. Aircraft down over 30 days.

. Get well plans for MDS aircraft exceeding optimum bank time by over 5 percent.

. Get well plans for MDS not meeting DA fully mission capable (FMC) standards.

. Aircraft with over 10 writeups on DA Forms 2408–13.

The forum allows the brigade com-

mander to reallocate resources and prioritize work efforts. The maintenance effort has not always been so focused. The first step to this end was transferring the one AVIM company in theater, E/228th Aviation, to the 128th Aviation Brigade in May 1992. The brigade commander/theater aviation officer is able to shift resources, particularly manpower, when needed throughout USSOUTHCOM on short notice.

Without this direct control, delays in resource allocation occur, resulting in readiness being the loser. Having all aviation assets under the commander responsible for combat readiness results in maintenance resources and manpower being used with maximum efficiency and performance.

LARs are part of the aircraft maintenance support team. They are full team members who provide that critical link to the ATCOM engineers and assistance procuring those hard to get parts. Their place of duty is with the aircraft. In USSOUTHCOM that means one is always forward–deployed to Honduras.

The LARs work closely with a 35–personnel Lockheed Support Systems, Inc., (LSSI) team that performs not only aviation unit maintenance (AVUM)/AVIM, but depot repairs. The team's annual cost is $2.7 million. However, the savings associated with onsite repair of depot level reparables (DLRs) outweigh the costs.

Every unserviceable repair part is evaluated by the AVIM unit for economical repair. Request for authorizations to perform depot–level work are routine and the unit is in the process of requesting Specialized Repair Activity (SRA) designation. These procedures, along with meticulous financial management, have allowed the brigade to fly its aircraft at below the DA–funded rate.

Although, USARSO is at the end of the aircraft parts food chain, and suffers from order–ship times (OSTs) that are the longest in the Army, assigned stockage list (ASL) and prescribed load list (PLL) performance is good.

In a recent rollup of E/228th Aviation ASL performance, **1842** lines of aviation material requests received a **79**–percent demand satisfaction, compared to the DA goal of **75** percent; and maintained a zero–balance–with–due–outs of only **6** percent, compared to the DA goal of **8** percent.

Aviation PLLs are collocated at battalion level, but managed by MDS, and normally experience zero balance rates below 5 percent.

Aircraft maintenance is a training event as significant as weapons qualification. Time for it is guarded closely on the training schedule. Tuesday through Thursday are maintenance training days when distractions are kept to a minimum so quality, organized, and by-the-book maintenance can be accomplished. Mondays and Fridays are for other training events, appointments, and other administrative actions.

High OPTEMPO and FMC rates can go hand in hand with proper command attention (figures 1–3 and and 4–6). The theater aviation officer/brigade commander is the Aviation Resource Manager in USSOUTHCOM. All AVUM/AVIM and depot assets to include the primary aviation SSA are organic to the aviation brigade. Maintenance support activities and staff agencies at all levels recognize the focus on aircraft readiness.

Commanders raise maintenance problems through command channels and receive timely response from the maintenance support activities. All players on the USARSO Aviation maintenance team combine with synergism to produce the right action at the right time and place.

128 AVN BDE OPTEMPO

	UH-60			UH-1			CH-47		
	FY92	FY93	FY94	FY92	FY93	FY94	FY92	FY93	FY94
OCT	15.0	18.4	13.4	24.5	16.9	14.7	16.1	19.1	20.9
NOV	20.5	18.0	11.0	23.1	18.9	10.3	17.1	13.2	16.5
DEC	14.2	17.5	12.7	22.4	14.1	14.0	11.1	24.5	20.7
JAN	20.8	14.9	8.8	21.1	14.1	9.3	20.4	24.2	19.2
FEB	20.7	18.9	17.0	20.6	16.9	15.4	21.6	28.4	19.8
MAR	18.8	18.0	14.0	19.2	15.7	16.2	20.0	21.8	20.1
APR	20.1	21.1	14.5	17.6	20.6	10.7	20.7	27.6	16.7
MAY	21.8	16.9		20.8	14.2		21.7	17.1	
JUN	17.6	16.1		19.4	14.8		21.2	12.6	
JUL	17.7	10.9		17.7	13.8		16.1	14.2	
AUG	17.1	16.4		20.5	15.7		15.5	16.4	
SEP	11.1	21.3		24.8	15.7		16.5	16.8	
BDE AVERAGE	18.0	17.4	13.1	21.0	16.0	13.0	18.2	19.7	19.1
ARMY AVERAGE	11.0	10.0		8.0	9.0		12.0	11.0	

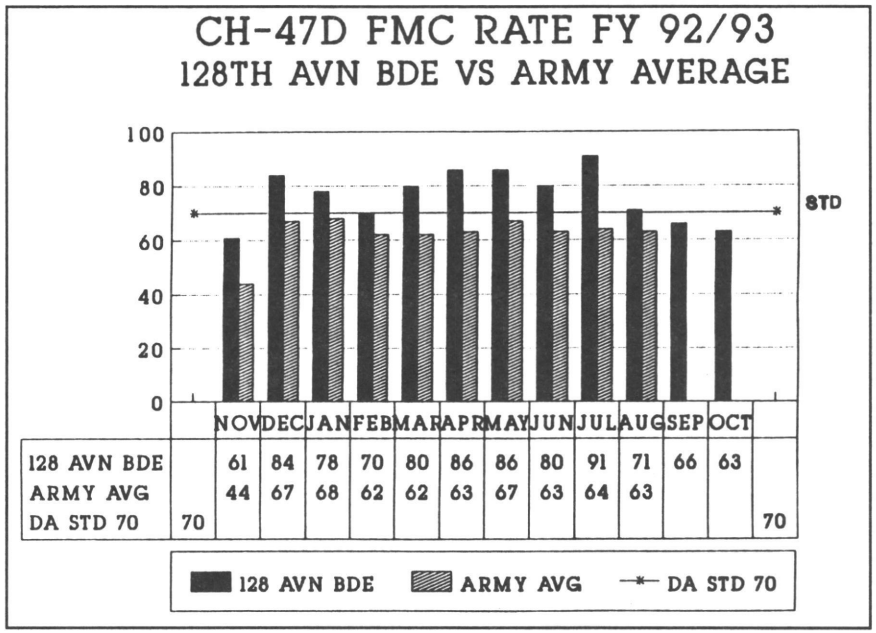


Figure 1.

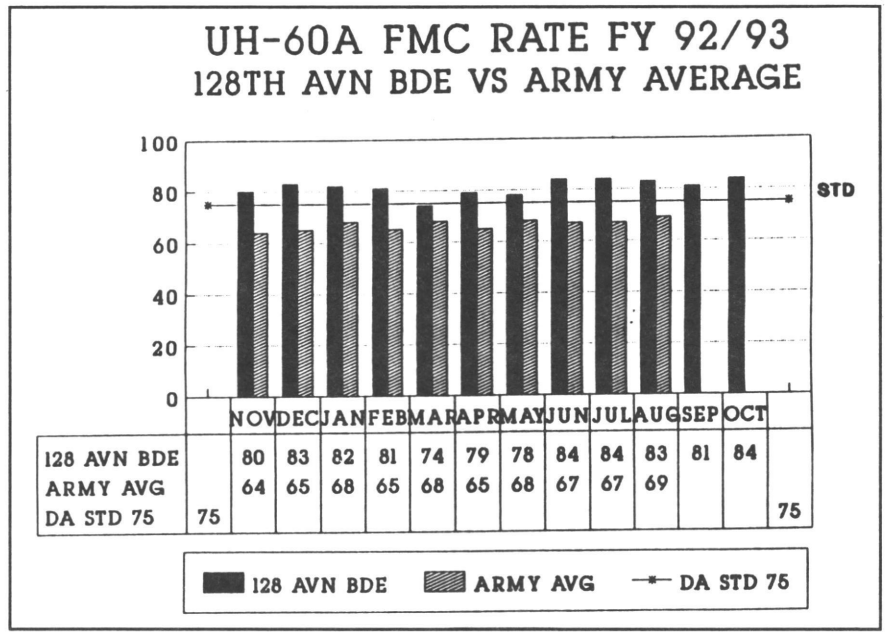


Figure 2.

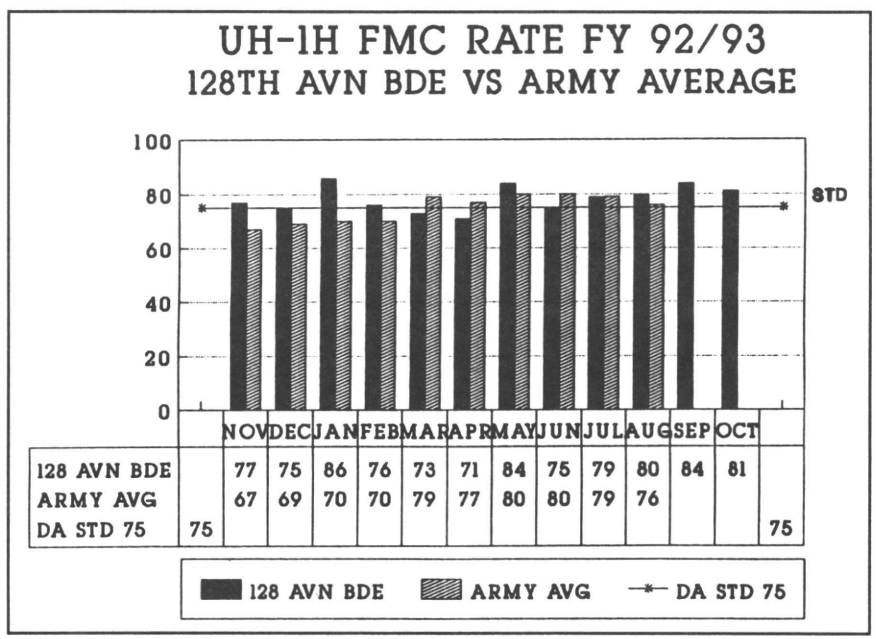
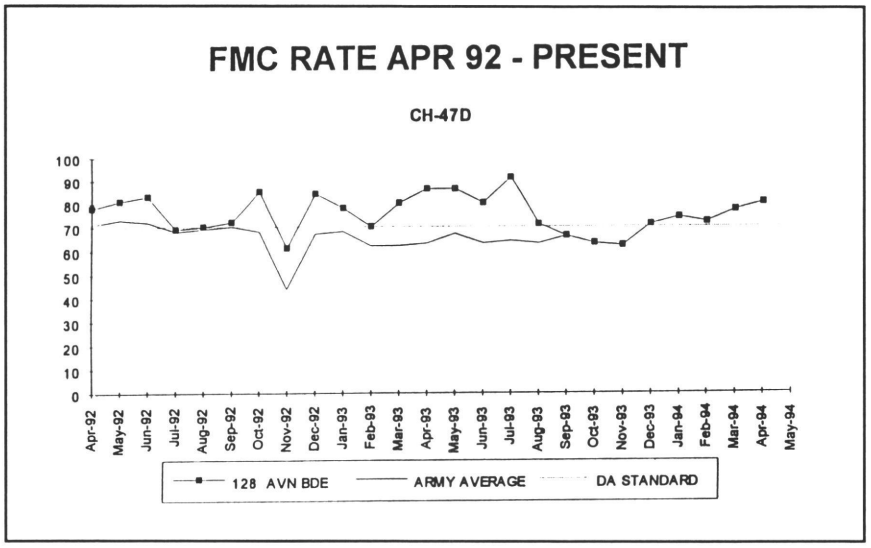


Figure 3.



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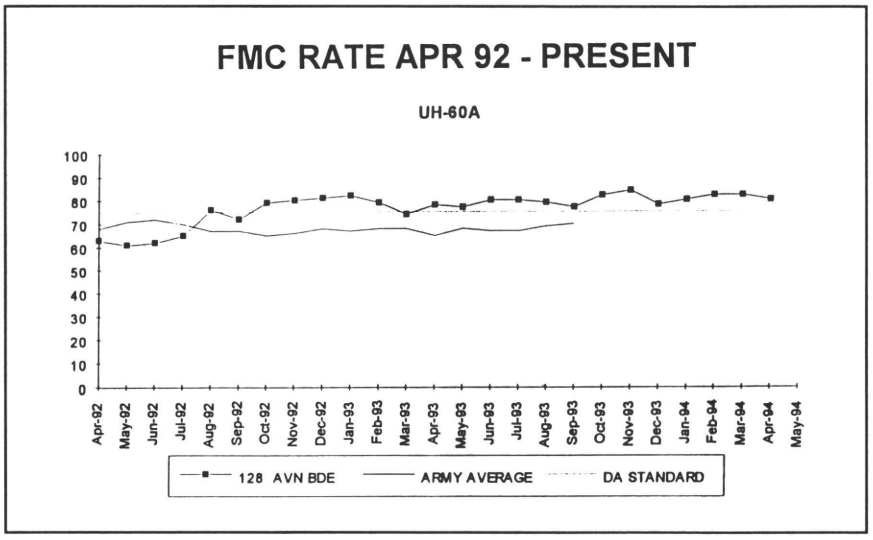

Figure 5.

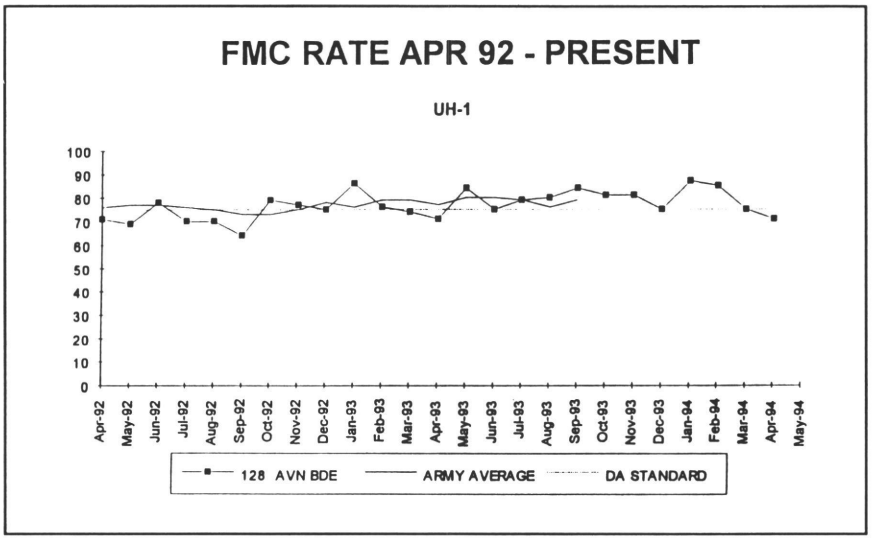

Figure 6.

Grizzly Flight—a small detachment at Fort Greely, Alaska—Its three UH–1 Huey aircraft fly a variety of missions in arctic weather that challenge the most experienced aviators. (Story starts on page 18.)

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