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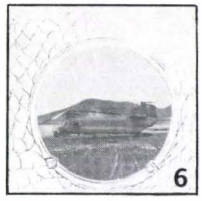
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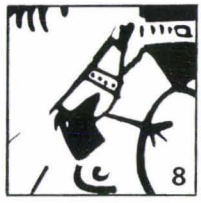
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VANGUARD OF FREEDOM
BICENTENNIAL 1775-1975
UNITED STATES ARMY

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ABOUT THE COVER

From the frontier days of the Wild West to urban technology centers and highways in the sky, come the "Buffalo Soldiers" with horses and sabers giving way to sleek helicopters—each having more destructive firepower than an entire frontier regiment. This is the history of the cavalry . . . the REAL CAVALRY . . . Army aviation's air cavalry combat brigade, the 6th CAVALRY BRIGADE (Air Combat).

Cover by M. Dorough

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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The activation of the 6th Cavalry Brigade (Air Combat) on 21 February was the realization, after more than 13 years, of the recommendation of General Hamilton Howze who chaired the Army Tactical Mobility Requirements Board. The shield of the 6th appears on the cover and on this page. Below is a scene from the activation ceremonies at Ft. Hood. This article describes the new brigade and affords the reader insight into the tactical employment and potency of this team member of the combined arms

Colonel Charles E. Canedy

Commander, 6th Cavalry Brigade (Air Combat)

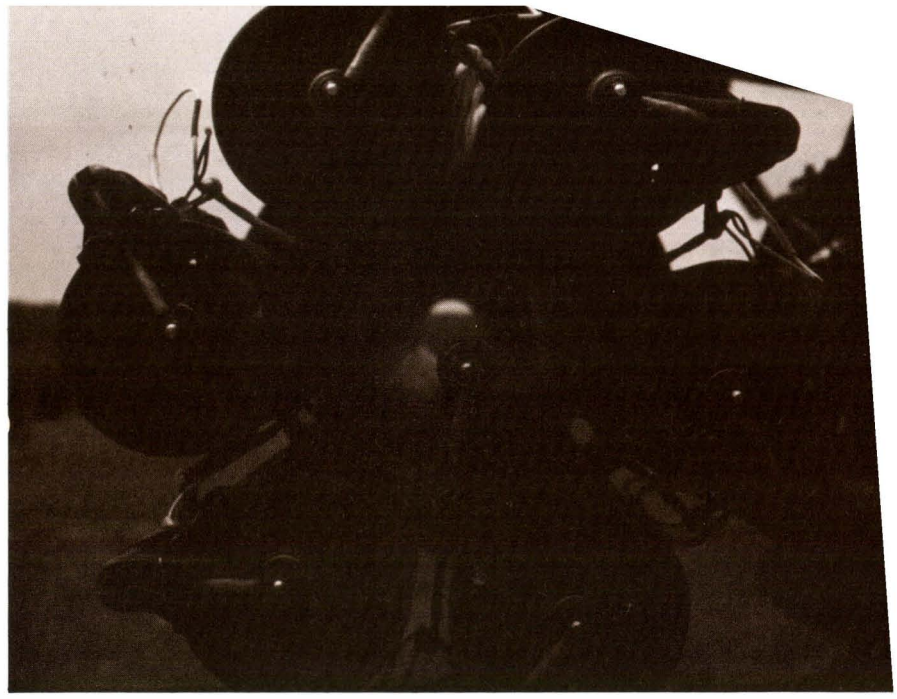
From ACCB To The 6th Cavalry Brigade (Air Combat)

SOME 13 YEARS ago, the Army Tactical Mobility Requirements Board, more commonly known as the Howze Board, recommended to the secretary of defense that the Army have an air cavalry combat brigade (ACCB) in the force structure. On 21 February 1975, at Fort Hood, TX, that recommendation became a reality. True, the 6th Cavalry Brigade (Air Combat) is not structured like the recommended brigade, but it does employ the same mission—*to find and kill armor and mechanized forces by aerial means.* There has been a great deal of water under the bridge since that historic board, chaired by General Hamilton H. Howze (see page 5). I believe the events that have occurred since warrant discussion.

The year was 1962. The Howze Board was called in response to then Defense Secretary Robert McNamara's challenge to the Army to examine the technology of the helicopter with respect to improving the Army's mobility. Most have forgotten that the scenario for the board spanned the spectrum of warfare, from low-intensity to high. All of the testing in the southeastern section of the United States was conducted against the envisioned mid-intensity (high threat) environment.

The year 1962 also signalled the start of United States involvement in the Republic of Vietnam, which rapidly escalated to a total commitment by 1965. All of the major recommendations of the Howze Board were visible and made good sense, however, I believe that our forces diverted to hostilities at hand; consequently, we simply lost sight of the rest of the world.

With respect to examining the roles of the attack helicopter on the mid-intensity battlefield, the period 1965 to 1970 can best be described as a vacuum. When we did get serious about the subject in 1970, frequently the inevitable occurred — we once again reinvented the wheel. This is not to say that it was all bad. Technology in aircraft, weapons systems, and to some degree doctrine, had changed. Through a multitude of studies, simulations and testing, we once more agreed with General Howze and his board members that there truly was a requirement for an air cavalry combat brigade.



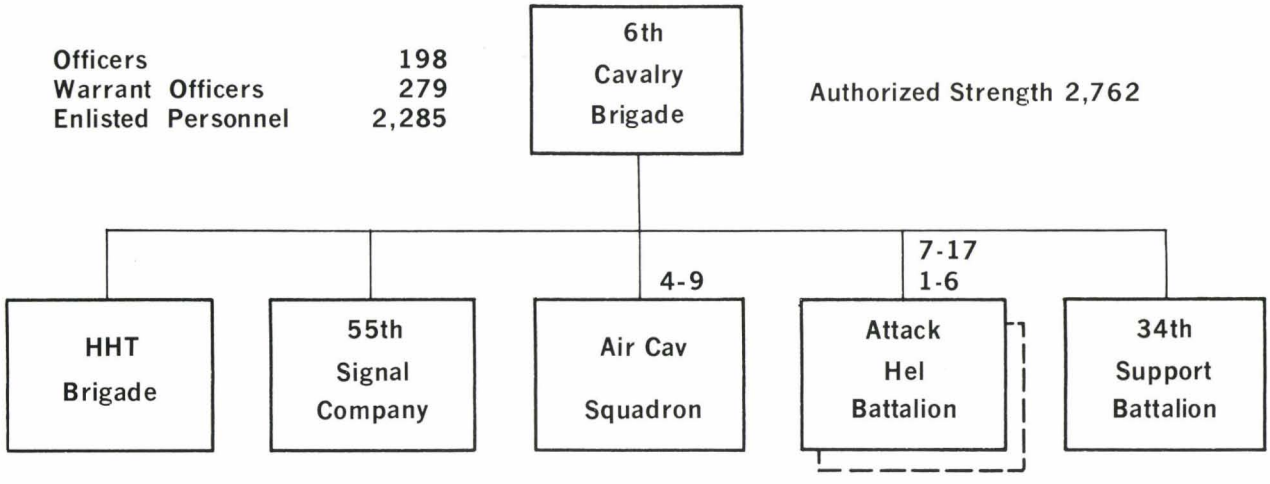
Closeup of a 2.75 rocket launcher aboard an AH-1 Cobra. " . . . we did get serious about the subject in 1970 . . . "

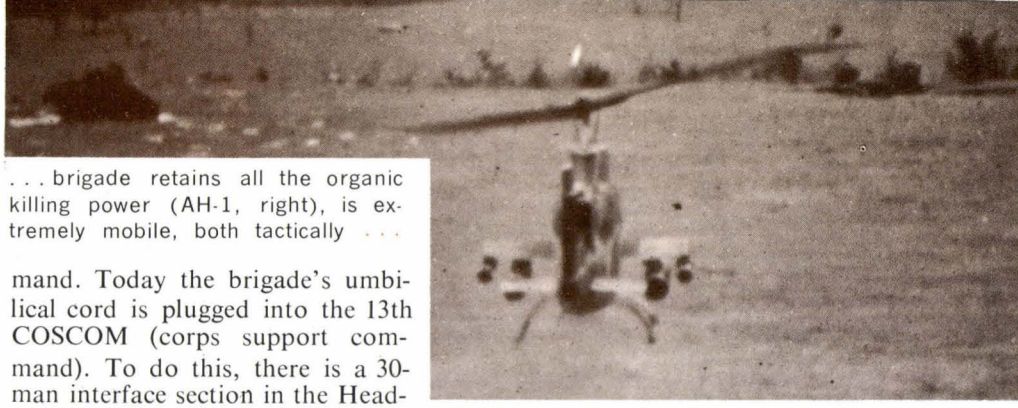
There are a number of ways to describe the 6th Cavalry "Blackhorse Brigade," but perhaps the simplest is, *awesome*. If you can accept test results, and if you believe the basic load of TOW (tube-launched, optically-tracked, wire-guided) missiles for the brigade, and if the brigade is properly employed, it should be able to kill somewhere around 1,700 hard targets in combat in a period of less than two hours. That's awesome! Even if you can't accept that figure, half as many is still awesome.

Organizationally the 6th Brigade consists of an HHT (Headquarters and Headquarters Troop), the 55th Signal Company; the 34th Support Battalion; the 7th Squadron, 17th Cavalry; the 4th Squadron, 9th Cavalry; and although at zero strength, the 1st Squadron, 6th Cavalry. The 17th and the 6th Cavalry are the attack squadrons. These organizations each consist of three identical attack troops with a scout platoon of 12 OH-58 Kiowa helicopters and 3 attack platoons of 6 AH-1 HueyCobra helicopters. Integrated direct support maintenance for the squadron is retained in the HHT and consists of some 90 maintainers.

The concept of direct support (DS) maintenance envisions the squadrons performing 60 percent of the DS maintenance with the remaining 40 percent performed by the DS maintenance company in the 34th Support Battalion.

The air cavalry squadron, the 4th of the 9th Cavalry, is a bobtailed squadron. It is designed to





. . . brigade retains all the organic killing power (AH-1, right), is extremely mobile, both tactically . . .

have 3 cavalry troops, each consisting of an aero-scout platoon of 10 OH-58s, an attack platoon of 9 AH-1s and a reconnaissance platoon lifted by 5 UH-1 Hueys. The basic change in the recon platoon over the old aero rifle platoon is the MOS (military occupational specialty) of its members. All 36 troopers are 11D scouts as opposed to 11B infantrymen. The squadron does not have a ground troop. Because of asset limitations, Troop B is not filled, hence only two line troops in the squadron.

The 55th Signal Company provides the RATT (radio tele-typewriter) and multi-channel communications to link the brigade with the organic squadrons. The company is lean with only 99 souls authorized.

Perhaps the most interesting battalion is the 34th Support. It is the largest battalion-sized unit with 1,069 personnel authorized and has 157 different MOS codes. The concept of General W.E. DePuy (commander of the Training and Doctrine Command) for structuring the brigade must be understood to appreciate the tailoring of the 34th. His concpt for the 6th Cav was to keep the tooth-to-tail ratio as high as possible, and not to burden the brigade with all of the where-with-all to make it a self-sustaining organization. The brigade cannot live without someone's support. The concept, and in fact the modus operandi at Fort Hood, is to simply play into a convenient corps support command. Today the brigade's umbilical cord is plugged into the 13th COSCOM (corps support command). To do this, there is a 30-man interface section in the Headquarters and Service Company of the 34th. All finance, SIDPERS (Standard Installation/Division Personnel System) and personnel actions are handled by the supporting COSCOM. In my judgement, the system makes a great deal of sense and, thus far, is working beautifully.

The real benefit of the concept is that the brigade retains all of the organic killing power, is extremely mobile, both tactically and strategically, and can plug into any theater's support command. Also, included in the Headquarters and Service Company are such people as riggers and pathfinders who are dedicated primarily to D Company, the CH-47 Chinook company.

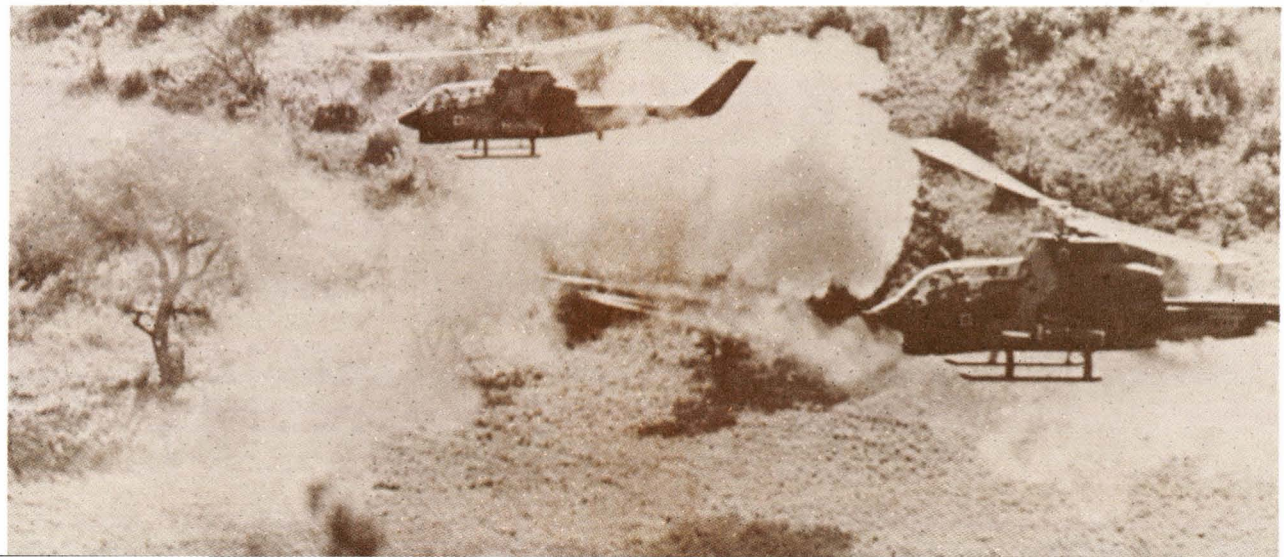
Delta Company is the assault support helicopter company, with the mission to provide the air resupply of fuel and ammo. Equipped with the "super-C" CH-47 models, the company's lift capability amounts to about 144 tons, assuming all 16 Chinooks are operational. That's a lot of TOWs.

Alpha Company is the supply and transport company. Its mission is to provide the surface line hand capability for the movement of all classes of supply.

Bravo Company is the ground maintenance DS company which supports the 640 vehicles organic to the brigade. Company C is the aircraft maintenance direct support unit. As mentioned earlier, C Company is designed to provide 40 percent of the aircraft DS maintenance.

So much for the wiring diagrams and the mission statements. *Why do we need an ACCB?* I am sure that there are those who would say we don't; but more importantly, the decision makers obviously believed that we did. Attack helicopters differ from all other major weapons systems by virtue of their speed and agility. Whereas the tank achieves protection from armor plate, the attack helicopter relies upon standoff distances, speed and agility. What this translates into in terms of attack helicopter formations is that the USAREUR (U.S. Army, Europe) commander now has a fighting unit that can literally shoot for V Corps in the morning and VII Corps in the afternoon. The real secret to the success of the brigade, in my

. . . and strategically and can plug into any theater's support command



judgment, is when to use it. Tantamount to this decision is understanding how best to employ the attack elements.

Any aviation organization with attack helicopters can attack. The air cavalry troop can attack with its 9 AH-1s. It cannot, however, sustain a sizeable attack. The attack troop on the other hand, with its 3 platoons of 5 operational AH-1s each, can sustain a platoon-sized attack indefinitely. The attack would develop with one platoon shooting, one at the FARRP (forward area refueling and rearming point) and the other platoon enroute. This is the smallest element that can sustain a significant attack. Similarly, the squadron attack would see one troop in the attack with the other troops at the FARRP and enroute. Now, when to use it.

It makes great sense to me for the force commander to visualize the ACCB as his "Fire Brigade." Keep it intact, and move it to the crisis areas, as opposed to fragmenting the unit and providing every one with a platoon or troop. This is not to suggest that the brigade would not be totally integrated into the combined arms team. There appears to me to be two basic kinds of employment for the brigade. One is as an independent force inflicting attriting damage on the enemy. In this situation, I would visualize a desert environment where you would be willing to trade terrain for tanks. Optimize the attack helicopter by always having the enemy come to you so that you are always attacking from ambush. This could be done with other supporting forces, such as artillery, armor, mechanized infantry, tactical air, etc., or it could even be done by the ACCB alone.

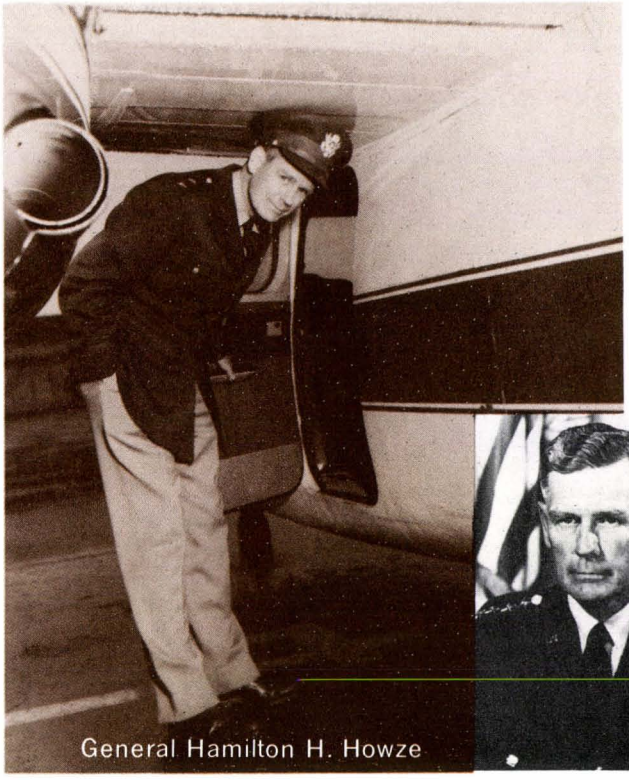
Whereas the tank achieves protection from armor plate, the attack helicopter such as the Cobra above, relies upon standoff distances, speed and agility

The second role is that of integrating the brigade in the nose-to-nose confrontation. After the covering force is blown away, and I would submit that the brigade also could accomplish that mission, and the good guys are nose-to-nose, then it would make sense to support the critical division in the corps sector. Appreciating the available combat power, and knowing when to move the brigade, will determine the real success of the ACCB.

Let's talk just a moment about that combat power. The brigade conducted the TOW followon evaluation last spring. The test was designed to place the attack helicopter in a mid-intensity type environment to determine several things such as hit probability, hand-off techniques, exposure time, crew training, etc. All missile firings were from the nap-of-the-earth, hover out of ground effect at moving M-48 tanks at ranges from 1,800-to-3,600 meters. Of the more than 100 missiles fired, a high percent were hits. Surprisingly enough, we also learned that with a little American ingenuity we could hit a significant percent of the time at night. Not too bad for a daylight designed system. The technique used was to strap a pair of CAV-NAV (combat air vehicle navigation and vision system) goggles to the TOW sight unit, and use any available illumination (artillery flares, 2.75 inch rocket flares or searchlights). Recognizing that the battlefield was simulated and that no one was returning fire, I believe that the TOW is the finest weapon system ever introduced into the Army in my 21 years of service. Any target that can be seen, out to the range of the TOW system, can be hit. It's just as simple as that.

There are many other exciting things going on in the 6th Cavalry Brigade. We are constantly developing new tactics and techniques as we work with the two fine armored divisions — the 2nd Armored and the 1st Cavalry — at Ft. Hood. We certainly do not know all the answers, in fact, we don't have a handle on all the questions. But we, the U.S. Army, are learning.

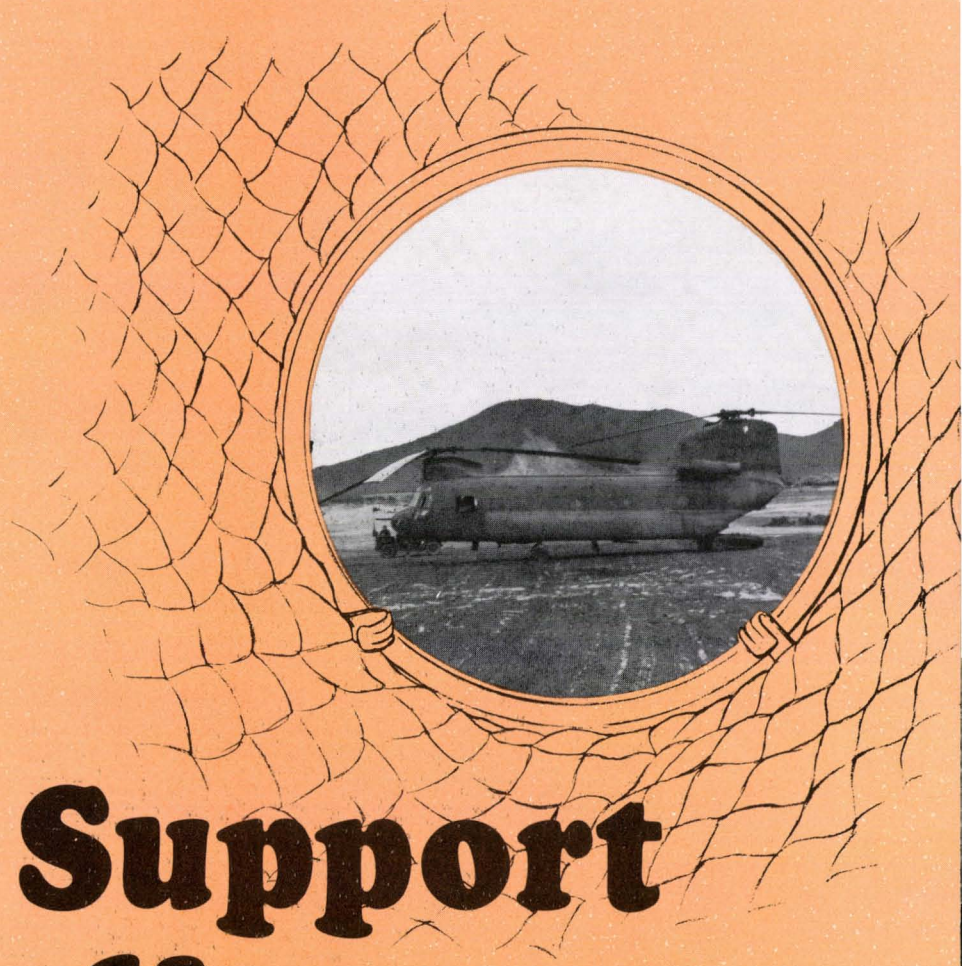
The author is a dual rated master aviator. He has completed the Armor Basic Course, and attended C&GSC and the Army War College. COL Canedy served in Vietnam in 1963 and in 1968. He was assigned as commander of the world's first Air Cavalry Combat Brigade (ACCB) and upon activation of the 6th Cavalry Brigade, was selected to command it.



General Hamilton Howze, in 1956 when he was a major general and Director of Army Aviation, prepares to board an aircraft. Below—General Howze before he retired in 1965

ARMY AVIATION HALL OF FAME

GENERAL HAMILTON H. HOWZE was graduated from West Point and commissioned in the Cavalry in 1930. He earned his Army Aviator wings in 1947. He is widely recognized as the intellectual force behind current airmobility and Army Aviation doctrine. While Director of Army Aviation from 1955 to 1958, he developed new tactical principles for the employment of Army Aviation, and was instrumental in helping the Aviation School become fully established in its new home at Fort Rucker. As Chairman of the Tactical Mobility Requirements Board in 1961, he cited the need for the development of airmobile theory and doctrine. Adoption of the Howze Board recommendations revolutionized mobile warfare concepts based on the use of organic aviation in much the same manner as the introduction of the tank had affected mobility concepts almost fifty years earlier. The 11th Air Assault Division was formed in 1963 to test and validate these concepts. As a result of his leadership, foresight, and perception, two airmobile divisions were eventually established in the Army force structure. These divisions successfully provided the full spectrum of mobile, combined arms capabilities which are requisite to successful ground combat and which have become fundamental to modern airmobility doctrine. General Howze retired from the Army in July 1965.



The 34th Support Battalion

LTC Charles U. Vaughan
Commander
34th Support Battalion

THE CHARACTER AND strengths of the organization providing logistical support for the 6th Cavalry Brigade (Air Combat) is traceable to the concepts partially tried and proven in the Republic of Vietnam; philosophically and physically generated in the formation of the TRICAP (triple capability) Division at Ft. Hood, TX; and finally, accepted in the authorization and formation of the Air Cavalry Combat Brigade (ACCB), now the 6th Cavalry. That logistical support organization, the 34th Support Battalion, embraces basic, established logistics support doctrine in organization, equipment and employment of assets. However, as is the case with line squadrons of the 6th Cavalry Brigade, it must be able to do the job over an area of operations broader and deeper than any ever assigned to a support activity in the U.S. Army force structure.

The 34th must be capable of supporting the huge logistical appetites of squadrons that can deliver more firepower faster and farther than any other organization of similar size. It must be structured to handle communication and coordination problems inherent to the brigade's mode of operation. And even more important, it must be structured to communicate, coordinate and operate more rapidly than any other support organization in the history of the United States Army.

Toward meeting these requirements, the 34th Support Battalion includes expanded functional companies to include Headquarters and Headquarters, Supply and Transport, Ground Maintenance, Transportation Aircraft Maintenance and

Continued on page 20

From "Buffalo Soldiers" To Air Cav

The author traces the "Real Cav" from its origin in 1866 when Congress authorized formation of the 9th Cavalry Regiment. The name "Buffalo Soldiers" was acquired from the Indians of the southwest; 13 Medals of Honor were awarded the 9th during the Indian Wars. Today the Air Cavalry retains the traditions inherited during its 109-year history

Lieutenant Colonel George D. Burrow
Commander, 4th Squadron, 9th Cavalry

THE CONGRESS OF the United States enacted legislation 109 years ago that authorized the establishment of the "9th Cavalry Regiment," United States Army. From its auspicious beginning on 28 July 1866, 'til today, the 9th Cavalry has served the nation gloriously throughout its history.

The 9th was, by law, composed of "Black Troopers." It was mustered in Louisiana and trained at San Antonio, TX, for duty on the frontier. On completion of training, the 9th was assigned to patrol the western and southwestern portions of Texas, at that time a part of the frontier. The principal duties were to protect the stage and mail route from San Antonio to El Paso; to establish law and order; and to be on the lookout for roving bands of Mexicans and Indians. The 9th Cavalry Regiment spent eight years on the Texas prairie, constantly patrolling and being confronted with an occasional skirmish.

In 1875 the regiment was transferred to Santa Fe, NM, and the 12 troops were scattered over the

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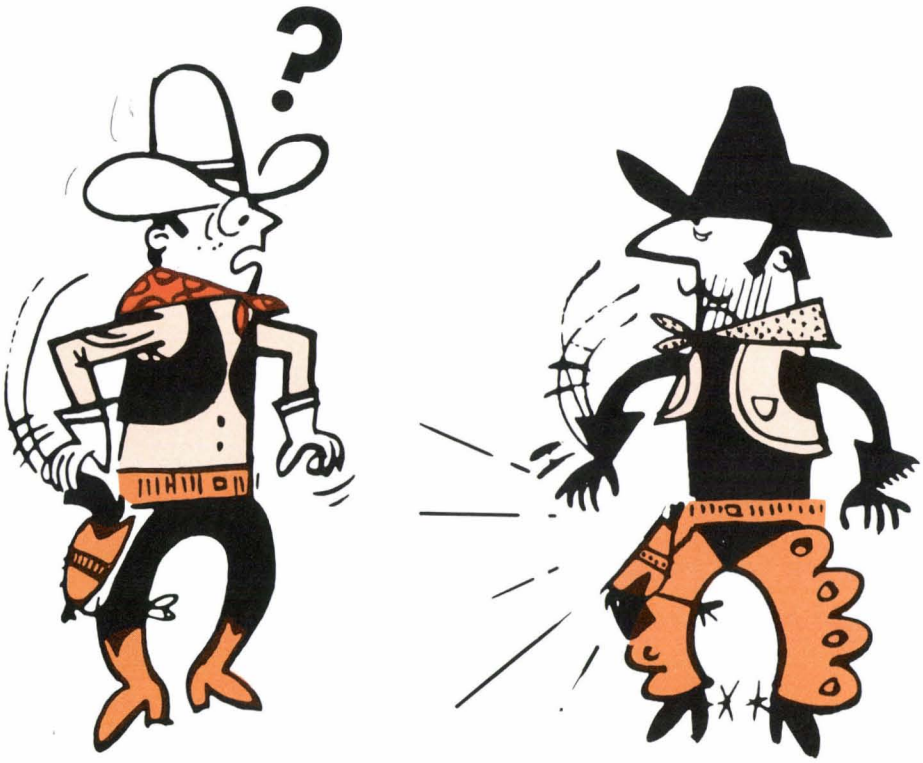


The Up-gun Dilemma

MAJ Thomas E. Murray II CPT William W. Stuck

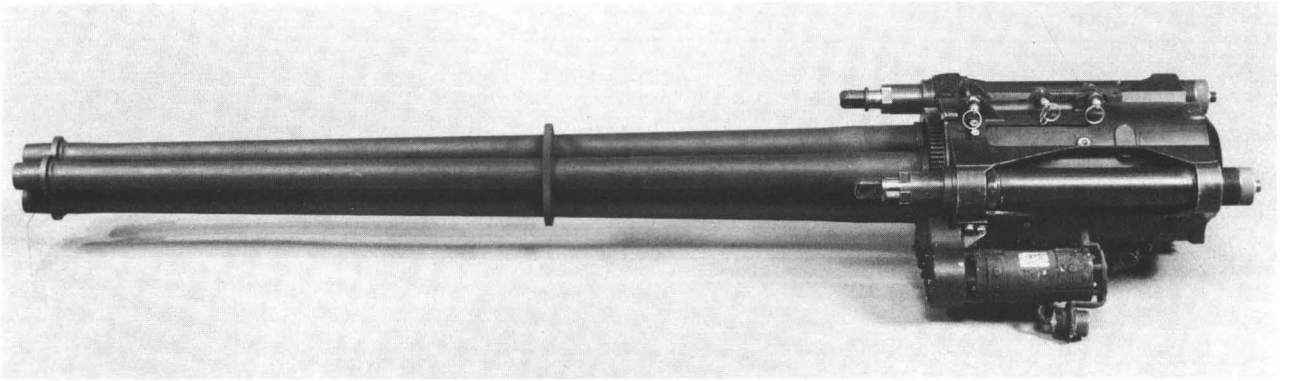
Project officers, PASS IN REVIEW study group

Presently underway at the U.S. Army Aviation Center, Ft. Rucker, is the Priority Aircraft Subsystem Suitability Intensive Review (PASS IN REVIEW). This special Training and Doctrine Command directed study group is conducting a user's review and analysis of all subsystems and product improvements applicable to the AH-1 HueyCobra helicopter. More simply put, the study group is attempting to determine the configuration of the AH-1 Cobra for the 1980s. Inherent in any study effort concerning the futuristic portrait of the attack helicopter is, of course, a detailed analysis of the Cobra "up-gun" question.

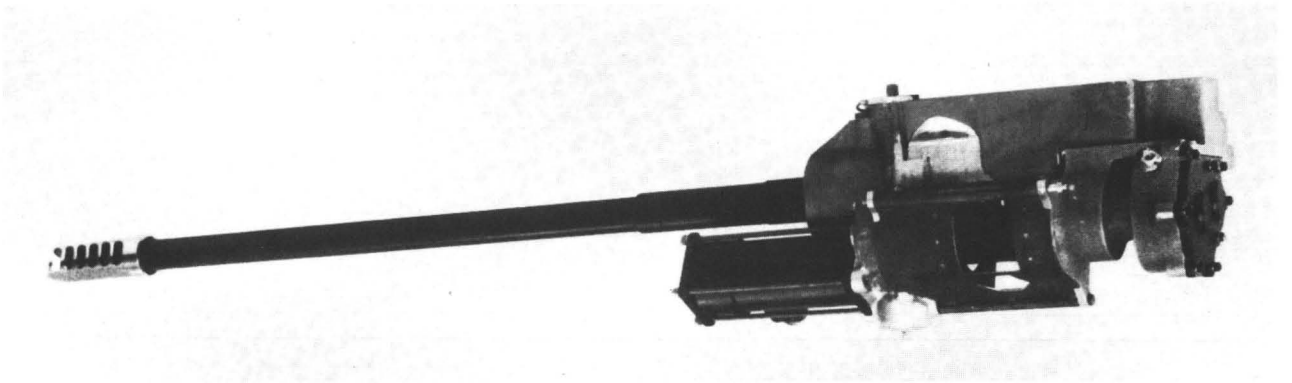
IN SOUTHEAST ASIA the AH-1 HueyCobra and Army aviation in general were proven to be an integral part of the total combined arms team. In this low-intensity conflict, the Cobra's M-28 weapons system (40 mm grenade launcher and 7.6 mm machinegun) proved to be a very viable option against the enemy's relatively unsophisticated antiaircraft threat.

Although the experience gained in the Republic of Vietnam certainly brought Army aviation to the forefront, it also tended to give many personnel a degree of false security. If we are to "win the first battle of the next war" we cannot sit idly by and expect that because our current equipment did the job in Vietnam it also will accomplish the mission in any future conflict.

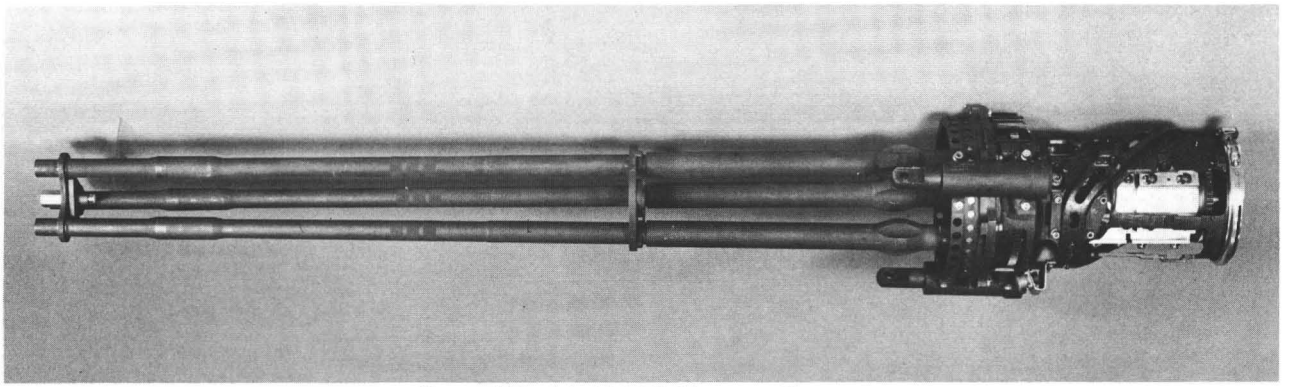
More specifically, the AH-1G Cobra equipped and flown as it was in Southeast Asia, cannot survive in the high threat environment. Based on this premise, Army aviation has aggressively continued to develop new tactics and equipment in order to solidify the Cobra as an effective weapon on *any* battlefield. This new equipment, much of which has not yet been fielded, includes such items as IR (infrared) suppressors; TOW (tube-launched, optically-tracked, wire-guided) missile systems; radar warning receivers; ballistically hardened



General Electric XM-188 30 mm gatling gun



Hughes XM-230 30 mm chain gun



General Electric M-197 20 mm gatling gun

aircraft components; and a more effective turret weapon system. This more effective or "up-gunned" future AH-1 turret has not yet been selected, but the candidates have been narrowed to either a 20 mm or 30 mm cannon.

The cannon issue has been studied, discussed and sometimes argued by numerous developing agencies during the past several years. Each time a decision is near it seems new problems or possibly better solutions appear and they require investigation. The "up-gunned" dilemma has been and is truly "a tough nut to crack."

The "up-gun" situation involves several interrelated questions which must be addressed by the PASS IN REVIEW Study Group to ensure an effective Cobra turret weapon system is ultimately fielded. Of primary consideration are:

- Can the aircraft structure withstand the firing forces caused by a 20 mm or 30 mm cannon?
- Can a reliable 20 mm or 30 mm system be built and mounted in the turret of the Army's Cobras?
- Is the ammunition for the 20 mm and 30 mm guns effective at the ranges required?
- Will the administrative and development lead times of each weapons system allow for integration into the upcoming purchase of 305 new Cobra aircraft?

Several limited tests have been

conducted which indicate that the structure of the Cobra can withstand the effects of some versions of the 20 mm or 30 mm turrets without shortening the life of the aircraft. This critical element must be proven before large amounts of money can be spent to purchase any new weapon system. Tests to measure these effects, to the confidence level required for integration on an Army helicopter, may require more than 100,000 rounds be fired from the same aircraft.

There are now three turret/gun combinations being considered for the Army's Cobra fleet. The only 20 mm contender is the M-97 turret combined with the XM-197 gun. This combination currently is installed in the U.S. Marine's AH-1J (twin engine) Cobra. The two 30 mm contenders are the M-97/XM-188 and M-28/XM-230 combinations. It is important to note that the XM-188 and XM-230 guns are on the Bell and Hughes versions, respectively, of the advanced attack helicopter candidates.

Two turret options are being considered. One is a modified M-28 turret made by the Emerson Electric Company. The second option is the M-97 turret produced by General Electric. Each of these has basically the same traverse, elevation and depression limits as well as comparable side-to-side movement rates. The major difference between the two is that the M-28 turret, which will be modified to accept the XM-230 gun, is hydraulically operated and electrically controlled. In the other option, the M-97 turret, used with the XM-197, XM-188, and XM-230 is electrically operated and controlled.

The XM-197 gun, also manufactured by General Electric, is a three-barrel gatling-type gun. It fires the standard M-50 series, 20 mm ammunition at a rate of 750 shots per minute. This gun is a lightweight version of the 6-barrel M-61 Vulcan used in Army Air Defense systems and on several Air Force aircraft. Each barrel has its own bolt mechanism which sequentially rams, locks, fires, unlocks and extracts rounds during one revolution of the barrel cluster. The ammunition box, stored in the belly of the aircraft holds 750 rounds of linked ammunition. The 20 mm XM-197 gun has proven to be highly reliable, but the feed system installed on the Marine AH-1J has caused a considerable number of stoppages. This deficiency has been isolated and changes have been initiated to provide better feed system reliability.

The XM-188, another General Electric product, is similar to the XM-197. In fact, General Electric advertises that the XM-188 gun, chuting and feed system can be completely interchanged with the XM-197 system. This procedure can be accomplished in less than 30 minutes with no modifications to the aircraft. The XM-188 fires the XM-552 high-explosive dual-purpose (HEDP) or the XM-639 target practice (TP) rounds. When installed in the M-97 turret, it is set to fire at 750 shots-per-minute. The storage capacity of the XM-188, 30 mm ammunition box is 500 linked rounds. A 30 mm M-97/XM-188 system was installed in a Marine AH-1J in 1972. A limited test was performed to measure the effects of firing on the aircraft's structure. During this evaluation the XM-188 gun operated without a malfunction but, as with the 20 mm, the feed system caused several stoppages. To date, 20,000

A U.S. Marine AH-1J (above) and an Iranian AH-1J armed with 30mm weapons systems perform test flights

rounds have been test fired, 1,200 from the Marine aircraft described above and the remainder were fired in static ground test.

Hughes Helicopters and Ordnance Systems manufactures the XM-230 Chain Gun, the other 30 mm candidate. The XM-230 is a single barrel weapon. It has a rotating bolt mechanism driven by a chain. Interestingly, this chain is similar to the chain found on a motorcycle. The Chain Gun will fire the XM-552 HEDP or the XM-639 TP rounds. It fires at a rate of 620 plus or minus 50 shots-per-minute. The ammunition box, holding 600 rounds, is located in the ammunition bay. More than 50,000 rounds have been fired by the two prototype models of the XM-230 Chain Gun. These tests, conducted by the manufacturer, indicate that the required high reliability can be achieved. The XM-230 never has been installed in an AH-1. The turret which is planned for its installation is, however, a modified version of the M-28 turret on all Army Cobras. Although a prototype M-28 (modified) turret has never been built, Emerson Electric is confident that the M-28 turret can accommodate the Hughes XM-230X.

Up to this point it is apparent that although there are three systems which seem to "fit," with respect to the aircraft structural stress and size, each still requires further development and testing. The M-97/XM-197 combination, because of the AH-1J installations, will require the least amount of development and testing time. Both of the 30 mm systems will require a considerable developmental and evaluation effort. Less time will be required to complete the XM-188 total qualification process because of the similarity between the two General Electric combinations, the M-97/XM-197 20 mm and the M-97/XM-188 30 mm. It should be remembered that these guns must first prove themselves on the ground and then be flight qualified in the Army's (single engine) Cobra.

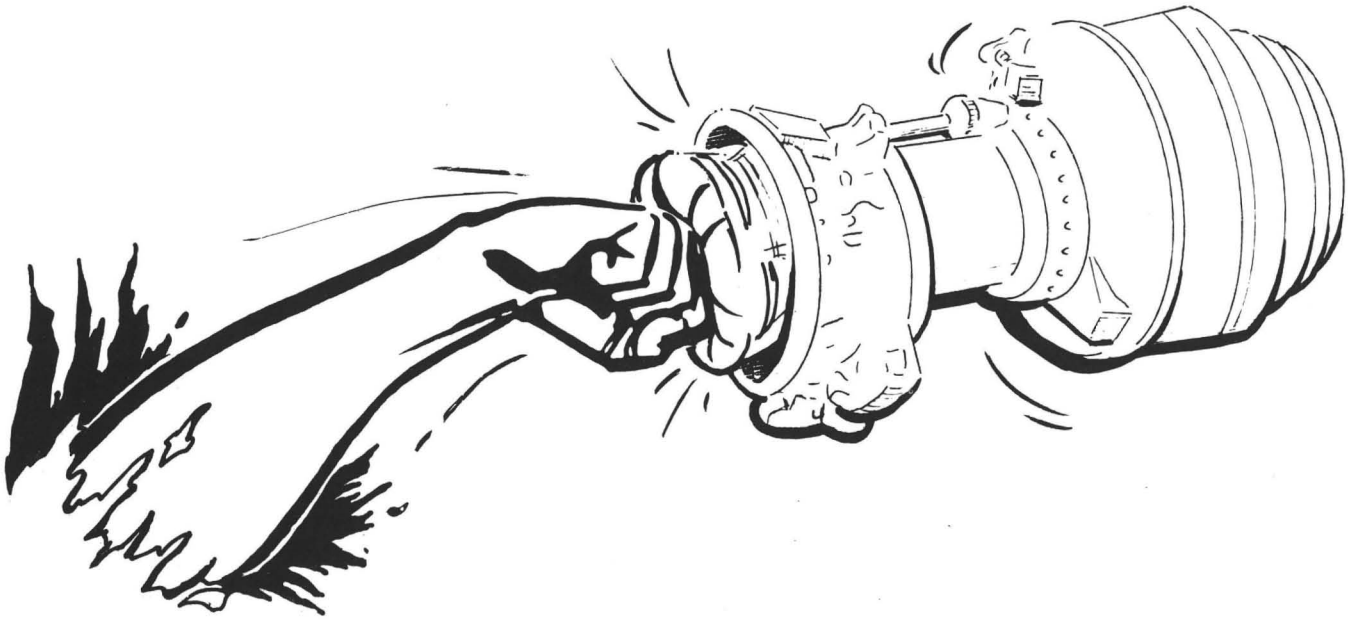
Ammunition is another critical area which must be minutely examined before resolving the "up-gun" issue. The standard 20 mm ammunition available for Army consideration was developed for an air-to-air application from high performance aircraft. Because 20 mm ammunition performance was optimized for that use, its performance from a helicopter at low speed and low altitude is somewhat lower than desired. Funding has been approved to develop a new fuze, the XM-714A2 which is designed to improve the rounds effectiveness when fired from helicopters. The Army Materiel Command (AMC) reports that definite progress is being made in solving this deficiency. An additional disadvantage of current 20 mm ammunition is the lack of a dual-purpose, anti-personnel/armor-piercing, round. The current 20 mm rounds are the M-56A3 high-explosive incendiary (HEI) and the M-53 armor-piercing incendiary (API). To achieve simultaneous effectiveness against lightly armored vehicles and personnel, the 20 mm rounds must be linked together like the ball/tracer combination used in the common machinegun.

On the other side of the spectrum the XM-552 30 mm round is being developed specifically for the advanced attack helicopter. It is a high-explosive, dual-purpose munition. The XM-552 development and testing program is progressing well, and the ammunition should be type classified before either the XM-188 or XM-230 guns are ready for production. The XM-552 is more effective against personnel than the 20 mm M-56A3 and is much more effective against lightly armored vehicles than the 20 mm M-53 round.

The driving force which complicates but dictates a rapid decision on the "up-gun" issue is the 305 new Cobras to be delivered to the Army beginning in March 1977. The number of aircraft delivered per month varies, but all 305 are due by April 1981. A decision must be made soon to ensure an "up-gunned" capability on the new AH-1s.

Ideally, all of the new aircraft should include an "up-gun." A review of the options, however, reveals that this ideal situation may not be possible if the projected aircraft production schedules are to be met. Today, there are 100 standard M-28 turrets in the Army's stockpile. These could be used on the first 100 aircraft produced. Beginning with aircraft 101 any turret employed must be newly manufactured. Even if the M-28 option is selected, expensive retooling of the production line will be required. Using normally computed development times, only the M-97/XM-197 combination could be developed, tested and produced in time to be installed on aircraft 101. This is only possible if funded development begins by September.

The real question then becomes, should the Army install a 20 mm cannon which has somewhat proven its reliability, and count on the new fuze to increase the round's effectiveness, or should it accelerate the research and development (R&D) effort for a 30 mm weapon that will be more effective if the yet unproven reliability is achieved? Accelerated R&D means more expense and, most importantly, increased risk. As stated, the deadline for inclusion in aircraft 101 is coming fast and a decision must be made. Hopefully the PASS IN REVIEW Study Group will "crack the tough nut" and provide the Army's Cobra with an "up-gunned" capability necessary to aid survival on the high threat battlefield.



HIT YOUR ENGINE

F. J. McCrory Jr.

Aerospace Engineer
U.S. Army Aviation Test Board
Fort Rucker

RIGHT-ON! DON'T kick the tires or skids, but *do* HIT your engine.

Now, before you bust your knuckles on the side of the engine, perhaps you should note that HIT stands for health indication test. HIT is an accurate, safe and simple method for assessing the engine condition prior to flight. The engine health indication test has been in use for several years at the U.S. Army Aviation Center, Ft. Rucker. It was developed at the U.S. Army Aviation Test Board at Ft. Rucker and now has

The engine health indication test (HIT) has been in use for several years at the U.S. Army Aviation Center. It has now been adopted by the U.S. Army Aviation Systems Command, St. Louis to assess engine health in the field

been adopted by the U.S. Army Aviation Systems Command (AVSCOM), St. Louis, MO, as the standard method of assessing engine health in the field. The necessary changes to the technical manuals should soon be in the field.

To get the maximum benefit from the engine HIT program, you, as a professional Army aviator, need to have an understanding of what HIT can do for you.

During the last several years a great amount of effort has been expended in trying to develop various types of engine diagnostic equipment. Most of the proposed devices incorporate means of determining when torque, engine speed or temperature limits have been exceeded. Others attempt to project how much of the expectant life of the engine has been consumed due to the accumulative effects of hours of operation at various temperature and power conditions. While all of these efforts are good, they may not be geared toward directly monitoring the *health* of the engine. To illustrate this, let's compare a turbine engine to your physical body. You may abuse your body by drinking too much, eating too much or getting too little sleep. By analogy the engine may be abused by exceeding its predetermined torque, engine speed or temperature values. Your body might let you know if you are abusing it by presenting you with a hangover, indigestion, ulcers or fatigue. The engine can let you know of abuse by red-line limit exceedance.

As time passes, your body ages and may be said to simply wear out. The rate at which the body wears out is affected by the degree of mental and physical stress and abuse to which you submit it. By analogy the engine wears out as a function of operating time, and its rate of wear-out is affected by engine temperature cycling and abuse. Your body has a projected lifetime just as the engine has a projected lifetime from which its time-between-overhaul or TBO may be derived. Just as some peoples' bodies do not make it to the projected lifetime and some exceed it, so do some engines fail to make it to TBO, for various reasons, while others are still operable when they reach it.

Finally, in illustration, your body can simply become ill. Illness can occur as a result of abuse or age, or without either being a factor. It is recommended that we periodically have a physical checkup just to monitor our health and provide a means of early detection of illness or disease. In addition, you occasionally may feel ill and not function well because of heat, humidity or simply because you are doing hard work. If a medical doctor monitors your body temperature, pulse rate, etc., he can determine if you are indeed manifesting symptoms of illness or whether your subpar feeling or performance is due to some of the enviromental conditions mentioned. The important thing is that a doctor doesn't use exploratory surgery just to find out if you are all right when you go in for a periodic checkup. Neither does he start cutting away the instant you show up at sick call. Surgery, if necessary, is only used to determine the cause of the illness, remove diseased portions of the body or effect repairs. By monitoring the body through periodic checkups, the physician has a high probability of detecting illness before it becomes more serious. By analogy an engine health check should provide monitoring for signs of a sick engine and provide a relatively simple means for the pilot to check engine health at any time.

There are many things a doctor might check while giving an examination, but first he usually sticks a thermometer in your mouth to get a reading of your body tempera-

Aircraft S/N 70-11177
Engine S/N LE-15724
Aircraft Hrs 1315.5
Engine Hrs 5.0

Instructions to Maintenance Officer:

1. Face aircraft into wind and turn off all bleed air.
2. With rotor turning read free air temperature from cockpit gage.
3. Enter line 1 at OAT nearest free air temperature.
4. Set N_1% at value indicated in line 2.
5. Maintain N_2 at 6600 RPM and stabilize instruments.
6. Read EGT from indicator.
7. Apply Δ EGT_A Correction Factor in line 3 to indicated EGT and record result in open space in line 4.
8. Apply Δ EGT_B Correction Factors in line 5 to EGT in line 4 and record results in line 8 for corresponding columns.
9. Enter Baseline Information in the respective columns of the EGT HIT Log.
10. Enter aircraft or engine hours and word "Baseline" in log section at bottom of Engine HIT Log.

LINE																																									
1.	OAT °C	-10	-8	-6	-4	-2	0	2	4	6	8	10	12	14		16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
2.	N_1%	86.0	86.3	86.7	87.0	87.4	87.7	88.0	88.3	88.7	89.0	89.3	89.6	89.9		90.1	90.4	90.7	91.0	91.4	91.7	92.1	92.4	92.7	93.0	93.3	93.6	93.9	94.2	94.5	94.9	95.2	95.5
3.	Δ EGT_A	+68	+62	+57	+51	+46	+40	+35	+30	+24	+19	+14	+8	+3		-3	-8	-13	-18	-24	-29	-35	-40	-45	-51	-56	-62	-67	-72	-77	-83	-88	-93
4.	EGT / θ														486																		
5.	Δ EGT_B	-68	-62	-57	-51	-46	-40	-35	-30	-24	-19	-14	-8	-3		+3	+8	+13	+18	+24	+29	+35	+40	+45	+51	+56	+62	+67	+72	+77	+83	+88	+93

THIS PORTION WILL BE TRANSCRIBED TO HIT EGT LOG

6.	OAT °C	-10	-8	-6	-4	-2	0	2	4	6	8	10	12	14		16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
7.	N_1%	86.0	86.3	86.7	87.0	87.4	87.7	88.0	88.3	88.7	89.0	89.3	89.6	89.9		90.1	90.4	90.7	91.0	91.4	91.7	92.1	92.4	92.7	93.0	93.3	93.6	93.9	94.2	94.5	94.9	95.2	95.5
8.	BASE LINE EGT	418	424	429	435	440	446	451	456	462	467	472	478	483		489	494	499	504	510	515	521	526	531	537	542	548	553	558	563	569	574	579

Figure 1

Figure 2

ACFT S/N 70-11177 UH-1H/M, AH-1G, TH-1G EGT LOG ENGINE S/N LE-15724

OAT °C	-10	-8	-6	-4	-2	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
N_1%	86.0	86.3	86.7	87.0	87.4	87.7	88.0	88.3	88.7	89.0	89.3	89.6	89.9	90.1	90.4	90.7	91.0	91.4	91.7	92.1	92.4	92.7	93.0	93.3	93.6	93.9	94.2	94.5	94.9	95.2	95.5
BASELINE EGT	418	424	429	435	440	446	451	456	462	467	472	478	483	489	494	499	504	510	515	521	526	531	537	542	548	553	558	563	569	574	579

Instructions:

1. Maintain N_2 at 6600 RPM.
2. Turn off all bleed air.
3. With rotor turning read free air temperature from OAT gauge.
4. Enter OAT line at value nearest to free air temperature.
5. Set N_1 at value indicated in N_1% line.
6. Read EGT from indicator.
7. Compare EGT with value indicated in line labeled "Baseline EGT".
8. Record aircraft hours and difference (±) between indicated EGT and Baseline EGT in EGT Trend Log.

Acft ~~or Eng~~ Hrs (-13)	Diff. from Base line EGT (±)	Acft ~~or Eng~~ Hrs (-13)	Diff. from Base line EGT (±)	Acft or Eng Hrs (-13)	Diff. from Base line EGT (±)	Acft or Eng Hrs (-13)	Diff. from Base line EGT (±)	Acft or Eng Hrs (-13)	Diff. from Base line EGT (±)
1315.5	BASELINED	1355.0	-5						
1319.0	+2	1360.0	+31						
1324.0	-4								
1328.5	-3								
1330.0	+4								
1335.0	0								
1340.0	0								
1345.5	-3								
1350.2	+5								
1352.0	+1								

ture. He compares it with a standard normal temperature to note signs of infection. In the same way, the engine health indication test or HIT system provides a means of taking your engine's temperature in the field. By keeping a record of how that temperature varies from normal, you can have a continuous record of the health of your engine.

During warmer weather, your engine may have symptoms of being sick due to higher engine temperatures and sluggish helicopter performance. This, however, may be due only to the higher prevailing free air temperatures and correspondingly higher density altitudes. During cooler weather, the engine may seem healthy due to lower free air temperatures and density altitudes when in reality it is sick. The HIT system is designed to compensate for these varying conditions in analyzing the engine's

health. It monitors components exposed to the engine gas path. The HIT system is no miracle method that can replace other established procedures such as oil analysis, primary preventive maintenance procedures, chip detectors, oil filters, etc., but it is, as the physician's thermometer, one of the best front-line tools for monitoring engine health.

In order to get an example of how the HIT worksheet is set up by the maintenance officer and used by the aviator, the following example is provided. Figure 1 shows the worksheet that the maintenance officer uses to set up the HIT baseline EGTs (engine gas temperatures) for the UH-1H/M, AH-1G and TH-1G. Suppose that the free air temperature is 26 degrees C. Entering line 1 at 26 degrees C, the maintenance officer would find that the N_1 speed at which to set the engine is 91.7 percent (line 2). After facing the aircraft into the wind, turning off all bleed air, setting the N_1 at that speed and maintaining 6,600 rpm (revolutions per minute) N_2 speed, he lets the engine instruments stabilize. Let us imagine that he then reads 515 degrees C on the EGT cockpit indicator. Just to make sure, he reduces the collective and repeats the check two more times. If he reads 510 degrees C and 520 degrees C the next two times, the average EGT is 515 degrees C as follows:

515 degrees C
510 degrees C
+ 520 degrees C

1,545 degrees C

515 degrees C average
3⟌1,545 degrees C
15
4
3
15

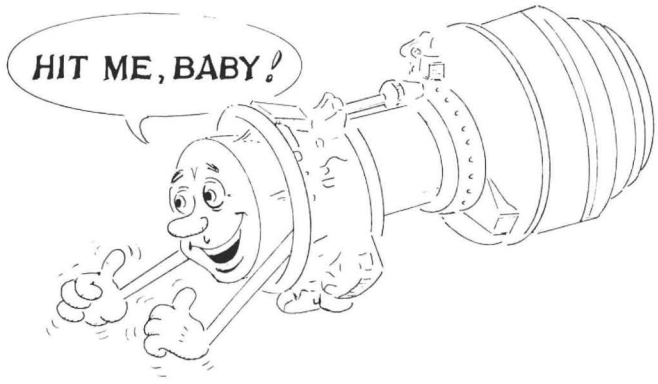
The maintenance officer then looks at line 3 under the 26 degrees C outside air temperature (OAT) and finds a Δ EGT_A factor of -29 degrees C. He thus subtracts 29 degrees C from the average reading of 515 degrees C as follows:

515 degrees C
- 29 degrees C

486 degrees C

The value of 486 degrees C is entered in the open space in the middle of line 4 as shown. Each of the ΔEGT_B corrections in line 5 is then applied to the value in line 4 to get each of the baseline EGTs in line 8. For example, on the far left end of line 5 the ΔEGT_B factor is -68. Thus we subtract 68 degrees C from the 486 degrees C value in line 4 and record the answer in line 8 directly below the -68 ΔEGT_B. The values in line 8 are then transferred to the corresponding baseline EGT spaces on the HIT log as shown in figure 2. The worksheet is placed in the engine historical record file and the log is placed in the aircraft log book. The aircraft is then released to operations.

Now, imagine that other aviators have HIT the engine several times during the course of operations and the variations from the baseline EGT or normal temperatures are shown on the log record (figure 2). Finally at 1,360 aircraft hours it's your turn to HIT the engine. The free air temperature or OAT is +20 degrees C. You set the N_1 speed at 90.7 percent. After letting the engine instruments stabilize, let's imagine you read 530 degrees C from the EGT cockpit indicator. The HIT log shows a baseline EGT of 499 degrees C. Thus the HIT system shows a 31 degrees C increase in engine temperature over baseline EGT. You would normally repeat



the HIT again to verify the increased EGT prior to taking any actions.

For differences of 20 degrees C or more between an observed EGT and a baseline EGT, an entry should be made on DA Form 2408-13. For differences of 30 degrees C or more, the aircraft should be grounded and an appropriate entry made on the dash 13 form. You will observe, in making an engine HIT, that the helicopter position may vary from skids on the ground, if the helicopter is heavy and the density altitude relatively high, to a 3 to 5 foot hover, if the helicopter is light and the density altitude is relatively low.

If an engine is in less than good condition when the baseline EGTs are established, HIT will only indicate further deterioration. For this reason, every reasonable effort should be made to ensure that the engine is in sound operating condition prior to initiating the HIT system. This should include such things as checking for bleed air leaks, dirty compressors, foreign object damage or faulty engine gas temperature monitoring systems. As with any system that relies on instrument readings to establish baseline data, it is only as good as the effort and care exercised by the individual taking the initial readings. Meticulous care and accurate readings are required of the maintenance officer in developing the baseline EGTs if HIT is to provide a reliable means of assessing engine health. Once, however, the baseline EGTs have been properly developed, any pilot can make a reliable HIT on his engine regardless of previous HIT checks.

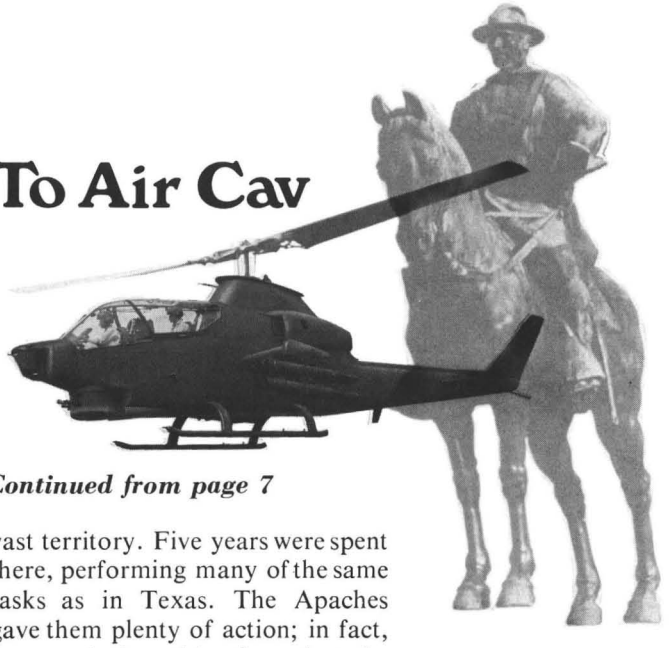
Experience has indicated that if the baseline EGTs have been properly established by the maintenance officer and the HIT has been properly conducted by the pilot, certain changes in EGT are characteristic of certain conditions. A large drop in EGT below baseline, which is evident over several HIT checks, is often associated with an EGT or N_1 sensing system fault. In this event the EGT harness, EGT and N_1 systems wiring and connections and instruments should be checked. Erratic HIT readings may be associated with some of the above problems, but may also result from failure to follow the instructions carefully when conducting the HIT. Care should be exercised in ensuring that the N_1 is set properly and that all engine instruments have stabilized prior to reading the EGT. Sudden increases in EGT above baseline, if confirmed, are often associated with such things as bleed air leaks or faulty EGT or N_1 sensing systems. More gradual increases may be associated with such things as dirty compressors or deterioration of internal engine parts associated with the gas path in the engine. In these cases, cleaning or internal engine inspection may be necessary. In all cases, however, the troubleshooting procedures for high EGT that appear in the technical manuals should be followed in determining the cause of the EGT rise.

The engine HIT system is not a panacea for detecting all malfunctions associated with an engine, but it can be used to great benefit. It does provide the pilot with a method of checking engine health prior to flight or anytime during a mission, and it provides the maintenance personnel a method of monitoring the trend in engine health on a day-to-day basis.

HIT will work! Experience has proven this! All that's needed is for you to use it and use it right. HIT can be of significant benefit in improving the safety and reliability of helicopter operations. So next time instead of kicking the skids, *HIT YOUR ENGINE!*

The U.S. Army Aviation Systems Command has awarded a $37,682,300 contract to the General Electric Company for further testing of the T700-GE-700 turboshaft engine. The contract calls for engine maturity and engine flight testing. The T700 is to be used as the power source on the Utility Tactical Transport Aircraft System and the Advanced Attack Helicopter.

To Air Cav



Continued from page 7

vast territory. Five years were spent there, performing many of the same tasks as in Texas. The Apaches gave them plenty of action; in fact, it was during this time that the "Buffalo Soldiers" (a name given them by the Indians of the southwest) earned seven of the 13 Medals of Honor awarded them during the Indian Wars.

In 1881 the regiment was moved to Kansas, and after four years moved again to the Department of the Platte, which encompassed the future states of Nebraska and Wyoming. By the close of the Indian Wars the 9th Cavalry had proven itself to the American public, by example and by deed. The regiment had seen action on all parts of the frontier and emerged a competent fighting force.

The 9th Cavalry went to Cuba during the Spanish-American War as part of a dismounted cavalry division commanded by Major General Joseph Wheeler of Civil War fame. Armed with carbines and pistols, fighting as infantrymen, they won a victory at La Guasima on 24 June 1898. A week later they participated in the historic storming of San Juan Hill with Teddy Roosevelt and his "Rough Riders."

The war with Spain soon was over, but trouble was brewing elsewhere. In March 1900, the 9th was sent to the Philippines to aid the island government. A revolution inspired and led by Emilio Aguinaldo was in the making. He headed the rebellion against U.S. occupying forces until his capture in March 1901. Though Aguinaldo was finally captured in 1901, small groups of insurgents continued to fight. In the jungle it was the .45-caliber pistol against the Filipino knives and bolos. Sixty-five years later the 9th Cavalry, the "Real Cav," would again see action in jungles and rice paddies.

Following the Philippine Insurrection the 9th Cavalry returned to the United States. In 1910 internal conditions in Mexico resulted in the overthrow of its government, causing the United States to concentrate most of its Army strength in the southwest. The 9th and 10th Cavalry Regiments formed a separate cavalry brigade. Then, on 8 March 1916, Francisco "Pancho" Villa raided and burned the town of Columbus, NM, killing 16 civilians. President Woodrow Wilson ordered immediate retaliation and sent General "Black Jack" Pershing into Mexico to capture Villa and his men. The 9th Cavalry was there, joining in the last major horse cavalry operation. It marked the beginning of gasoline-powered vehicles to perform the duties of horses and mules.

The Punitive Expedition into Mexico was the beginning of the end for horse-mounted cavalry.

The 9th Cavalry was mustered in Louisiana and trained for duty on the frontier. It was by law composed of "Black Troopers"

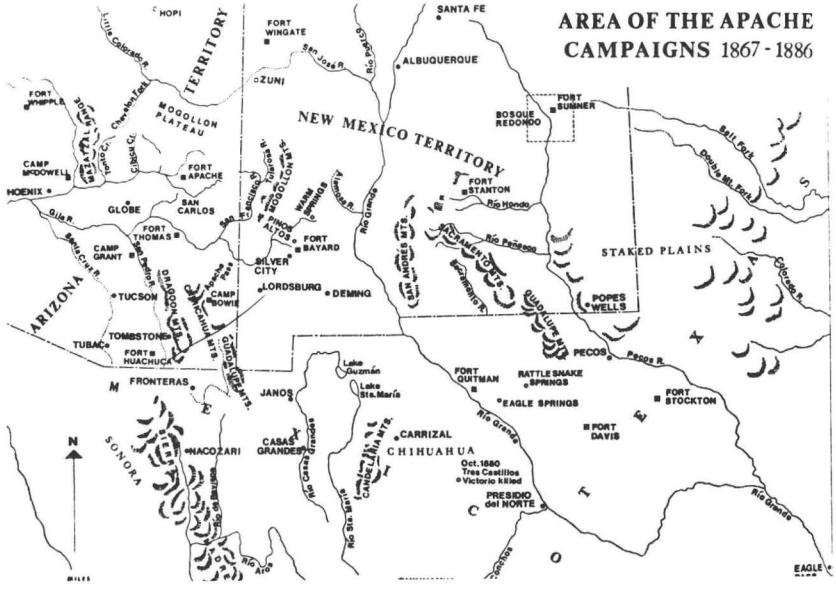
When World War I erupted, the 9th Cavalry was sent overseas without its horses—the reasoning was that it would be too expensive and impractical to care for and feed them. The dawn of armored cavalry was at hand. Fighting in tanks and on motorcycles, the 9th continued to distinguish itself during World War I.

On 1 March 1933, the 9th Cavalry was assigned to the 3rd Cavalry Division and served with it until just before World War II. On 10 October 1940, the 9th was assigned to the 2nd Cavalry Division. During World War II, 1941 to 1945, the 9th served again as armored cavalry and was credited with participating in the European-African and Middle Eastern Theaters. It also saw action in New Guinea, the Bismarck Archipelago, Leyte and Luzon.

On 20 October 1950, the regiment was converted and redesignated as the 509th Tank Battalion. The 509th saw action in several Korean campaigns, beginning with the U.S. Defensive and ending with the second Korean Winter Campaign. In 1957 the 9th Cavalry was reactivated and consolidated in Korea with the 16th Reconnaissance Company, 1st Cavalry Division, and designated 1st Reconnaissance Squadron, 9th Cavalry. In July 1965 the 9th's colors were transferred to Fort Benning, GA, where it joined the newly formed 1st Cavalry Division (Airmobile), the modern-day cavalry. The bulk of the assets would come from the 11th Air Assault Division (Test) which had tested and proven the airmobile concept.

Although most of the 1st Squadron, 9th Cavalry did not deploy to the Republic of Vietnam until late August 1965, an advance party had landed earlier in August to begin the search for the enemy. On 17 August 1965, the squadron's executive officer became the 1st Cavalry Division's first casualty. Major Donald G. Radcliff was

The 12 troops of the 9th Cavalry Regiment were scattered over the territory indicated by the top map. During the Apache Campaigns (map below) the "Buffalo Soldiers" earned seven Medals of Honor



The 9th U.S. Cavalry on parade at Fort Robinson, 1889

killed on an aviation mission. The division base camp at An Khe was later named in his honor. From 1965 until May 1971, when the 9th Cavalry returned to the United States with the First Team, the squadron participated in many campaigns and countless operations that earned it two Presidential Unit Citations and one Valorous Unit Award.

Back in the United States, at Fort Hood, TX, the 9th Cavalry was about to embark on still another chapter in its history. The 1st Cavalry Division (Airmobile) was reorganized into a TRICAP division. TRICAP stood for the triple capability offered by the division's three distinctly different brigades. Among the three were an armored brigade, and airmobile infantry brigade, and the 9th's new home, an experimental Air Cavalry Combat Brigade (ACCB). The "Real Cav" was committed to extensive testing, innovations and developing equipment and tactics for deployment in a mid-intensity (high threat) environment. In 1974 the 1st Squadron, 9th Cavalry was redesignated the 4th Squadron, 9th Cavalry in preparation for 1975 when the 1st Cavalry Division would reorganize into an armored division and a new separate brigade, the 6th Cavalry Brigade (Air Combat) was created. The 4th Squadron, 9th Cavalry became the "Air Cavalry" arm of that new brigade.

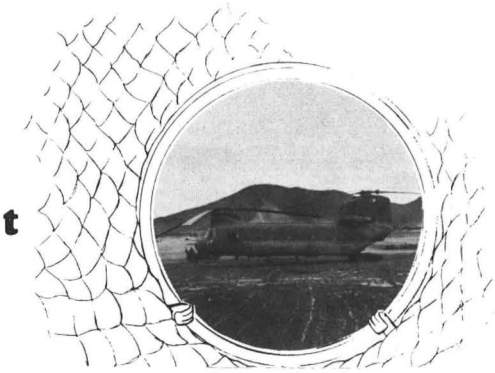
On 29 February 1975, in historic ceremonies at Fort Hood, the Army acquired its first independent air cavalry brigade. The "Real Cav," ever mindful of its rich and glorious past, is again filling pages in the military history books. Retaining the traditions inherited from the "Buffalo Soldiers" of old, with the technology of today, the "Real Cav" is shaping the future of Air Cavalry.

Photograph of the painting "Forgotten Heroes," by Fletcher Ransom, depicts Troop C of the 9th Cavalry charging up San Juan Hill

LTC Burrow was commissioned from OCS in 1958. From 1962-65 he was assigned to the evaluation group which studied the 11th Air Assault Division. In 1967 the author served in Vietnam with the 1st Cavalry Division. He has attended C&GSC and is a senior Army aviator. LTC Burrow assumed command of the 4th Squadron, 9th Cavalry in February 1974

Continued from page 6

The 34th Support Battalion



Assault Support Helicopter as depicted on page 21. Without augmentations, the 34th is authorized 52 officers, 53 warrant officers and 964 enlisted men for a total of 1,069. It is envisioned that it will be augmented with an administrative company consisting of 17 officers, 3 warrant officers, and 119 enlisted men and a medical company consisting of 14 officers, 5 warrant officers and 90 enlisted men when committed to a theater of operations. Major functions performed by each unit of the 34th are as follows:

The Headquarters and Headquarters Company provides personnel and equipment to command and control the 34th. It includes a brigade materiel management center (BMMC) that provides brigade level supply, field service, maintenance and movement management. As a separate entity within the company, it also affords personnel services, finance and SIDPERS (Standard Installation/Division Personnel System) interface branches for limited administrative, personnel and finance support, and a brigade data center (BDC) which lends ADP (automatic data processing) support for all logistics functions. Corps area data centers handle personnel and finance computer support for the brigade. Rear area protection activities are a function of this company.

The Supply and Transport Company (S & T) is a unique organization in its own right. It provides all the functions performed by a division S&T battalion, resupplying Class I, II, III, IV, V and VII and unclassified maps, minus aircraft, COMSEC (communications security) and air drop equipment. It provides and operates the ground transportation necessary for unit distribution of all supplies, maintaining and moving brigade reserves and disposing of unserviceable equipment. It has the added feature of limited engineer support; and, when augmented, clothing exchange, bath, and graves registration services normally provided by corps field service organizations.

The Ground Maintenance Company is a standard direct support maintenance company. It also is responsible for supplying repair parts minus medical, photographic, COMSEC, aircraft, avionics and aircraft armament, ADPE (automatic data processing equipment), EAM (electronic accounting machine), air drop and light textile items. It has a limited vehicle recovery capability, operates DX (direct exchange) service and an operational readiness float as well as providing technical assistance in all its mission areas.

The Transportation Aircraft Maintenance Company (TAM) is also standard in configuration. It provides aircraft direct support maintenance, including avionics and aircraft armament maintenance, and repair parts supply support for organic aircraft. It also operates a DX service and maintains an operational readiness and repair cycle float as well as technical assistance in all its mission areas.

As with the Ground and TAM Companies, ***The Assault Support Helicopter Company*** also is of standard configuration but unique in that it is organic to a support battalion, in this case the 34th Support Battalion. Its inclusion definitely enhances the support reaction time of the 34th. It is geared to provide air transport for personnel, supplies and equipment required to accomplish the combat service support mission. Its primary role is logistical, but assets can be committed to transport tactical mission personnel and to supplement aeromedical evacuation capabilities of the 6th Brigade. Assets include 16 CH-47 helicopters.

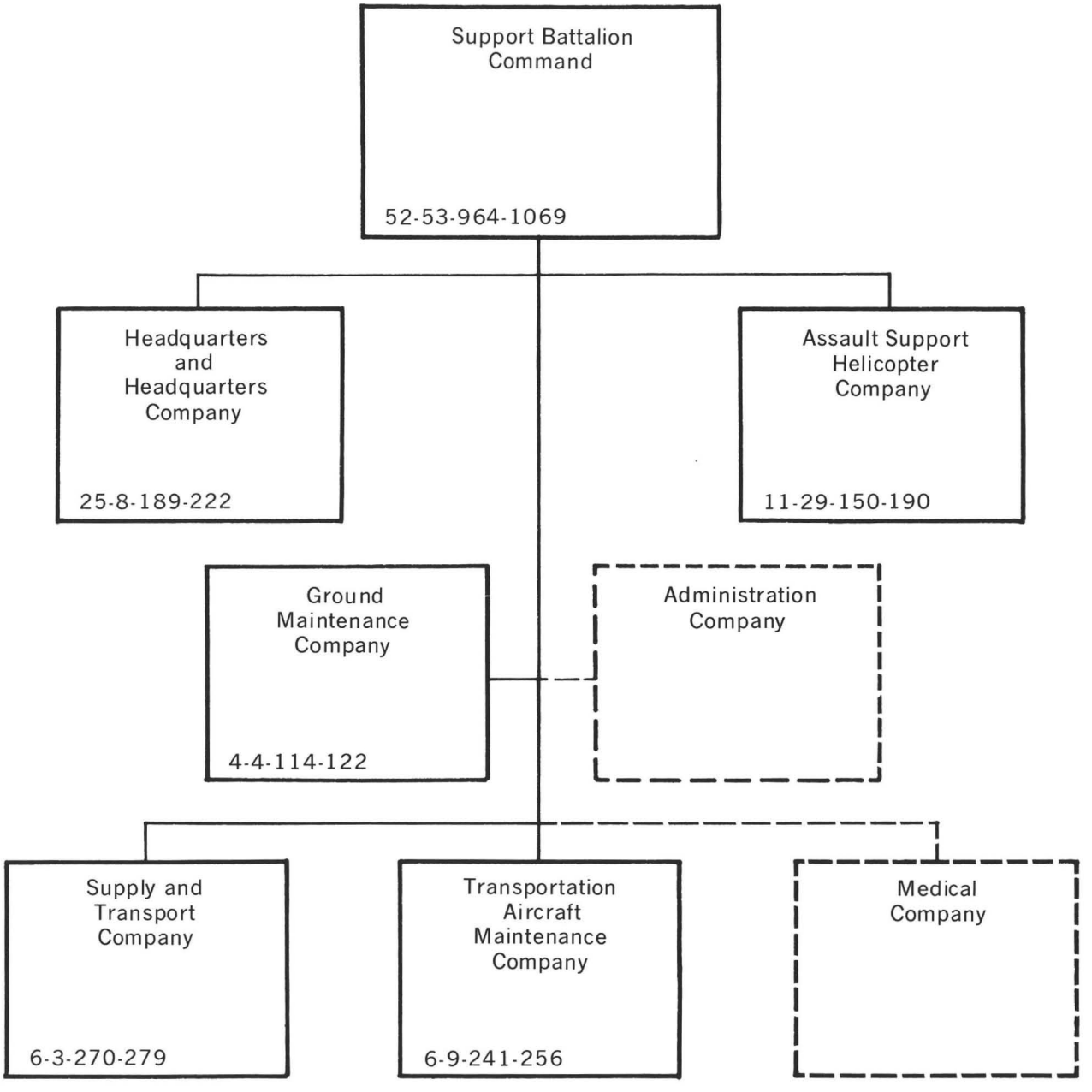
Some prime features of the 34th Support Battalion are illustrated in the capabilities vested in the brigade materiel management center; the flexibility of the S&T; ground aviation maintenance company mission execution; and the presence of an organic assault helicopter company. Past and current experience, technological advances and anticipated future tactical environments continue to be the triumvirate of factors influencing the structure of the 34th.

The brigade materiel management center is staffed and equipped to manage all logistical assets for meeting unit, area and task force employment of brigade combat equipment. In unit and task support situations, composite support elements consisting of petroleum, ammunition, transport, air and ground maintenance equipment, and specialists derived from organic units of the 34th, are sent forward as required by the duration and size of the mission. It is immediately apparent that the consumption rate of ammunition and POL (petroleum, oils and lubricants) would be extremely different in type and quantity from any other brigade type organization in existence. Line-haul frequency and distance further modify the conceptual scenario of critical item resupply. It also is logical that

maintenance services would be faced with the same operational facts faced in an area of operation of up to 80 kilometers. The inherent mission administration problem is divided between the BMMC which fields materiel asset coordination and the SP&O (security plans and operations) which fields the tactical aspects of coordination. Conceptual employment of the fighting squadrons in conjunction with friendly ground troop activities under most—if not all—circumstances remains a necessity.

The S&T Company is most heavily influenced by the support distances. It incorporates an operational control office in addition to expanded manpower and equipment inventory. The ground maintenance company has an enlarged transport capability to handle its Class IX tech supply mission, as

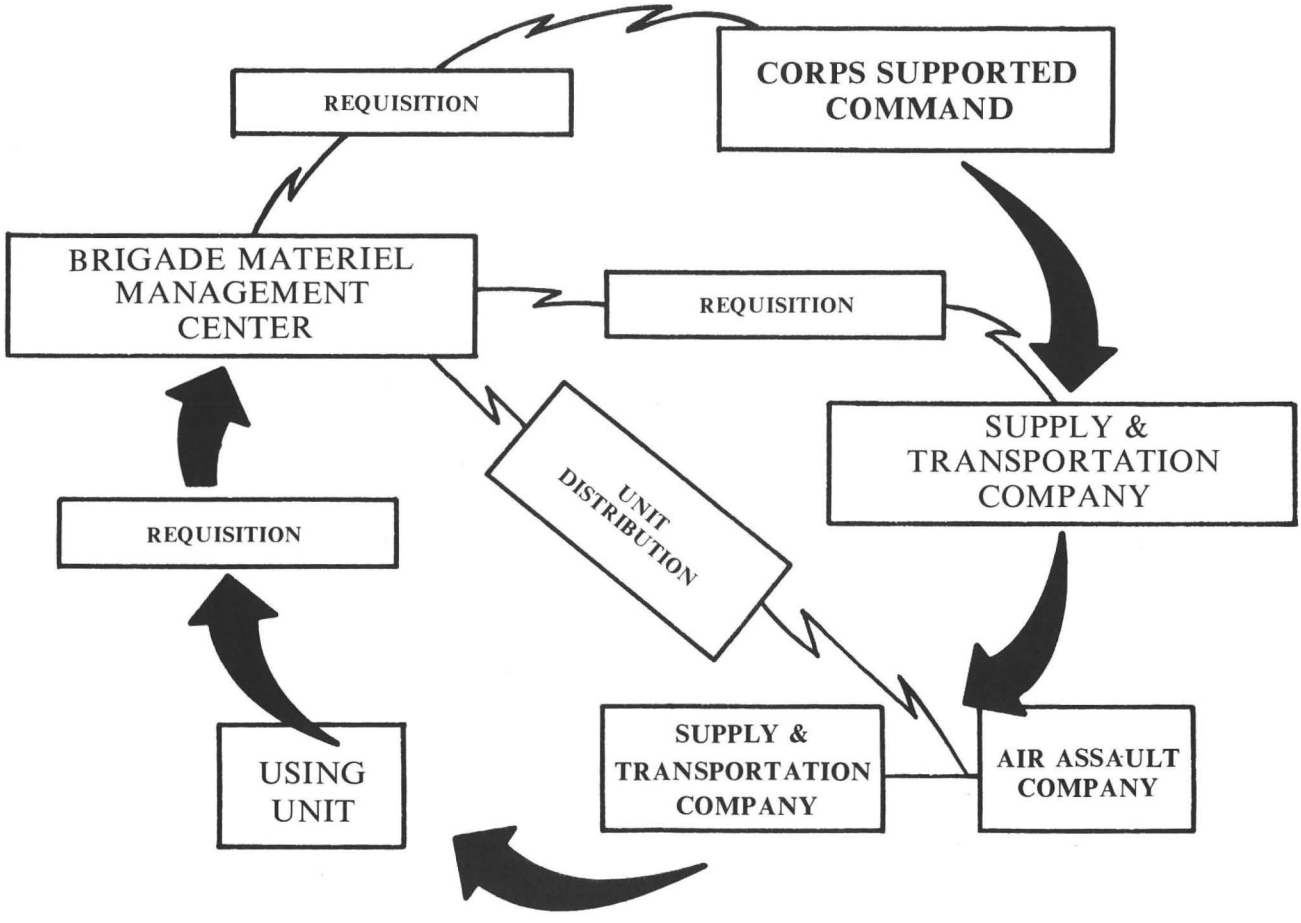
THE 34TH SUPPORT BATTALION



Support procedures in the ACCB are streamlined and simplified to support highly mobile and widely dispersed operations

SUPPLY

Distribution. The primary method for distributing supplies is unit distribution, using air or ground means. The supply sources may be in the brigade support area or the corps support area.



Requisitioning. Requisitioning is the normal method of obtaining nonscheduled class II, IV and VII supplies. Battalion S-4s and supply officers of separate companies submit requests directly to the brigade materiel management center (BMMC) where they are processed for appropriate action. The BMMC either directs the supply and transport company to make the required issue or requisitions the items from the supporting COSCOM (corps support command). Requisitions for regulated and command controlled items may be required to go through command channels at all levels for appropriate approval before issue is made. Using units obtain scheduled items such as soap, paper and cleaning materials merely by placing a demand on the distributing point that supports them.

does the aviation maintenance company. In its standard deployment configuration, critical item resupply (aviation parts, ammunition and petroleum) would be deployed with each squadron in the following formats:

- Aviation parts would be stocked by squadron integrated direct support maintenance in the form of about 500 non-bulky, demand supported lines in its prescribed load list (PLL). The PLL would be supported by the aviation ASL (authorized stock listing) maintained by the TAM Company. ASL target is no more than 2,000 lines.
- Ammunition supply points (ASPs) to include two mobile ASPs located in the squadron support area and a base ASP in the brigade support area both operated by the S&T Company. The mobile ASPs stock a computed 191 short tons each or two mission uploads. With the establishment of forward area refuelding and rearming points (FARRPs), up to three uploads daily would be moved in support of combat operations. One upload remains vehicle mounted and is dispatched at the time a mission is initiated. An additional 8.58 short tons for ground, individual and crew-served weapons is handled by the base and mobile ASPs.
- Petroleum resupply requirements are the same in number of uploads. The resupply cycle from FSSP (fuel stock supply point) to FARRP is accomplished by organic elements of the S&T Company including 5,000 gallon semi-trailers; 2,500 gallon GOER vehicles; and cargo trucks and trailers convertible to tank and pump or 500 gallon bladder transporters. Each of the fuel system supply points is capable of storing 60,000 gallons of fuel. Two would be located at the rear boundary of the squadron support areas and one in the brigade support area.

LTC Vaughan is commanding officer of the 34th Support Battalion. He attended flight school in 1956 and is now a master Army aviator. He has received his Master's degree in Transportation and Industrial Management

Air transport by CH-47 Chinook helicopter remains a flexible constant to augment all delivery as dictated by time, distance and terrain.

The 34th Support Battalion continues to be modified in structure and organization as well as equipment allocation and authorization. Although the line troops have FARRP systems in their TOE (table of organization and equipment), at the discretion of the brigade commander, refueling operations are performed at the S&T Company. Prime considerations were in the area of mobility and simplification of operational command and control.

The aviation on-site repair and contact team type maintenance support is not a new concept. But the TAM Company TOE reflects a first in organizing forward support detachments that are specifically designed to operate in the same area as the squadron integrated direct support maintenance (IDSM) or in the rear as determined by any situation. A breakout of the aviation tech supply stock into forward support packets currently is being considered. This added to the aviation repair parts system would establish a small, easily displaced tech supply operation in close support to squadron IDSMs managed and operated by assets of the TAM Company.

The basic mission of the 34th Support Battalion is amply put forth in its motto: *Provisus Vires* (We Support). Providing support in a manner that is responsive and effective for a fighting unit such as the 6th Cavalry Brigade (Air Combat) stimulates the imaginative resources of its logistical commanders and operators. Experimentation with and development of new ways and means of getting the job done are part and parcel of the 34th's day-to-day operation. In its final form, the 6th Cavalry and its resident support activity could easily be the ultimate expression of the axiom, "Let the fighting unit fight and the support units support."

MAST Milestone

MAST (Military Assistance to Safety and Traffic) crew members from Fort Sam Houston's 507th Medical Company (Air Ambulance) aided by nurses from the Santa Rosa Medical Center in San Antonio, TX, rush a premature baby in an incubator inside the hospital after landing on the hospital's rooftop helipad. The baby, suffering from hyline membrane disease, is the 600th MAST patient taken to the Santa Rosa Medical Center. The Center has one of the few Neo-Natal Intensive Care Units in the country.

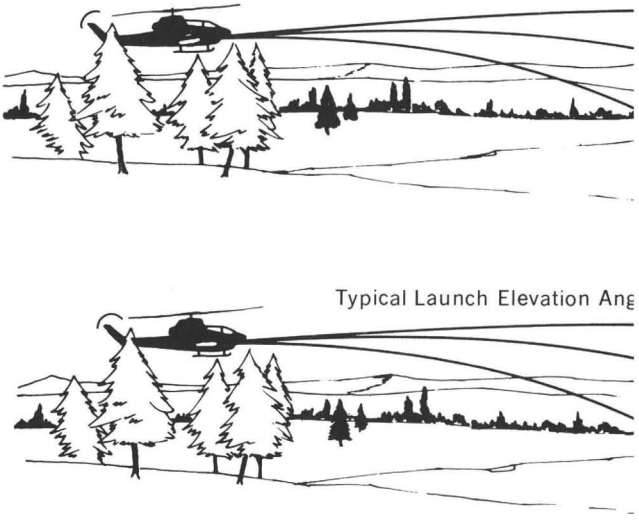


Figure 1—Multipurpose Submunition Wall-In-Space

ZEE EGG VERS

YOU KILL ZEE TANK wiz zee egg?

With rising inflection, the question came resounding from the audience during a recent briefing to a group of North Atlantic Treaty Organization senior officers in Brussels, Belguim. This was the immediate reaction to "The-Egg-On-The-Wall" concept of employing multipurpose submunitions (MPSM) against armor/infantry formations.

To begin with, there is nothing new or unique about the idea. There is a long history of development efforts in this technology area. What is unique, is the integration of this technology into free-flight rockets and the employment from nap-of-the-earth, terrian flight or by indirect fire from highly mobile helicopter gunships. The normal free-flight rocket trajectory from low altitude results in a large range dispersion pattern on the ground, as shown in the top half of figure 1. The submunition concept dispenses high-drag kill mechanisms from rocket warheads with a precise time for "broadcast" set on an electronic setable fuze. This principle of employment virtually lifts the target area 90 degrees from the horizontal presenting it as a vertical wall-in-space, as seen in the bottom half of figure 1.

The high-drag submunition concept is analogous to hitting a wall with eggs. If you throw raw eggs at a wall, what does it matter at what height the eggs hit the wall—they splatter and trickle straight down to the ground. Whether you hit the wall 10 feet or 100 feet from the ground, the egg will follow a vertical descent to the target area (figure 2). If conditions are controlled and with proper programing of events, this phenomenon can be applied to weaponry. Let me expand a bit on this alternative to expensive weapons systems, which many appear wishful, considering our recent history of exotic, extravagant excursions into weapons systems development. But, remember, the entire concept revolves around a weapon that symbolizes

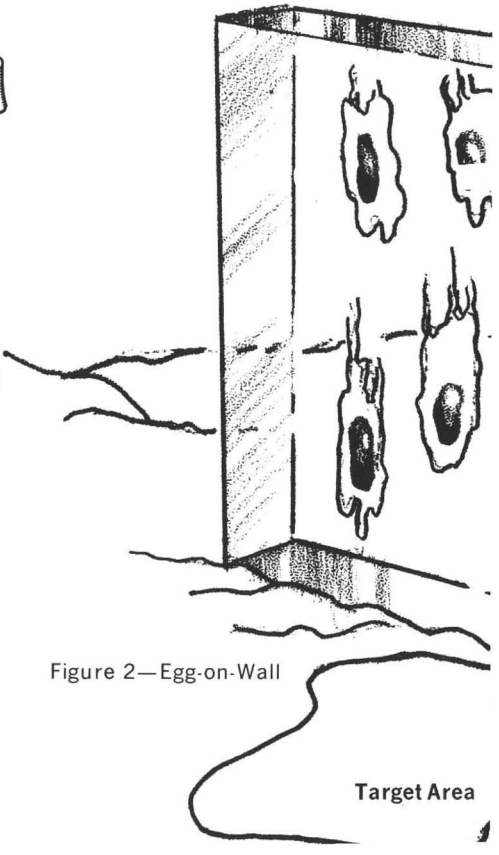
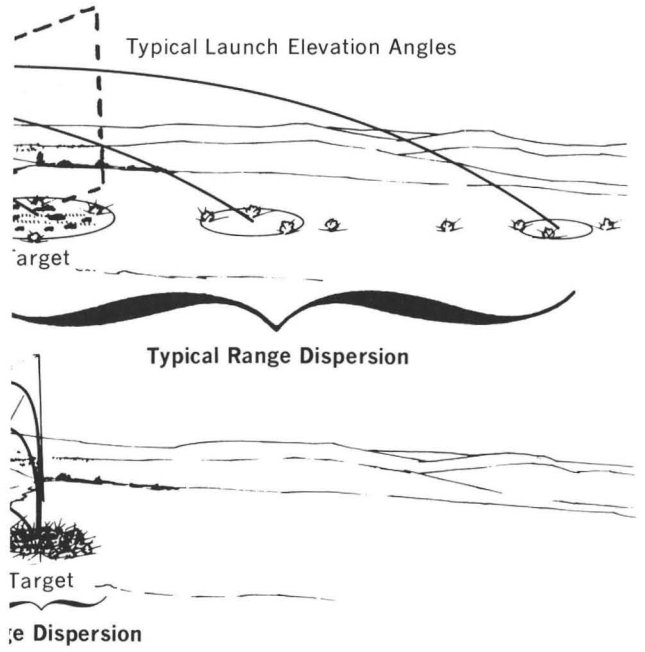


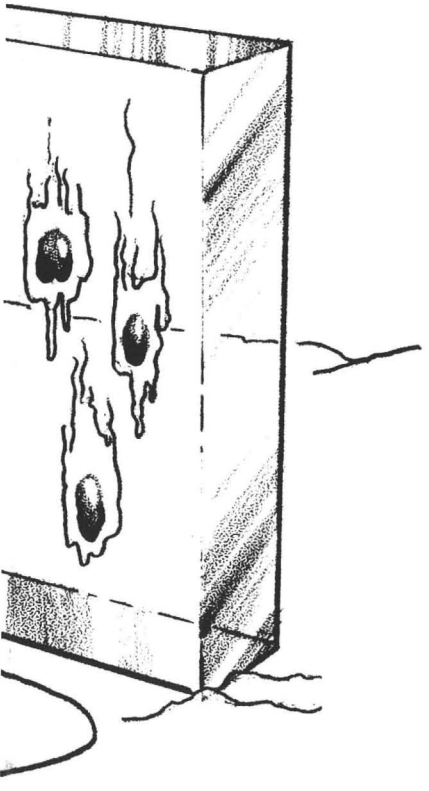
Figure 2—Egg-on-Wall



US ZEE TANK

Colonel Frank P. "Rags" Ragano

Project Manager
2.75 Inch Rocket System
Redstone Arsenal, AL



the true essence of "evolutionary" development—the free-flight rocket.

Rockets go back in history many centuries to the time of the early Chinese dynasties. Speaking candidly, dollar-for-dollar, bang-for-bang, it is nigh impossible to find a more effective weapon system than a free-flight rocket. A quick look at the history of the current tri-service rocket, the 2.75 inch rocket system, substantiates this claim. The graph in figure 3 displays the unit cost by fiscal year and projects that cost, inflated by an average percentage throughout the life of the system. Looking at the data, if you draw an imaginary line across the graph from the unit cost in fiscal year 1969 to the present fiscal year 1975 unit cost, you can see little change in the unit cost. What makes this even more impressive is the fact that the monthly production in 1969 was four times that of 1975.

Future conflicts, particularly the mid-intensity variety, will present a sophisticated enemy in terms of personnel, materiel and armor. Moreover, enemy targets will be more complex and brash than those engaged in the recent low-intensity conflict. Major battles will be fought in cities, in builtup areas or on plains (of one sort or another) with armor as one of the primary threats.

There are many diverse firepower methods of stopping armor/infantry formations, individual and crew-served weapons, artillery, other tanks, helicopters and close air or close-in air support weapons. What these weapons have in common is that ideally they must see the formation. It follows that the formation can see them. Thus, survivability becomes a driving issue. For the past several years this project office has been studying methods of firing rockets at and defeating massed enemy armor/infantry formations in a "true" launch-and-leave mode, and alternatively, through the use of indirect fire methods.

It appears the mechanism that makes these goals achievable is the

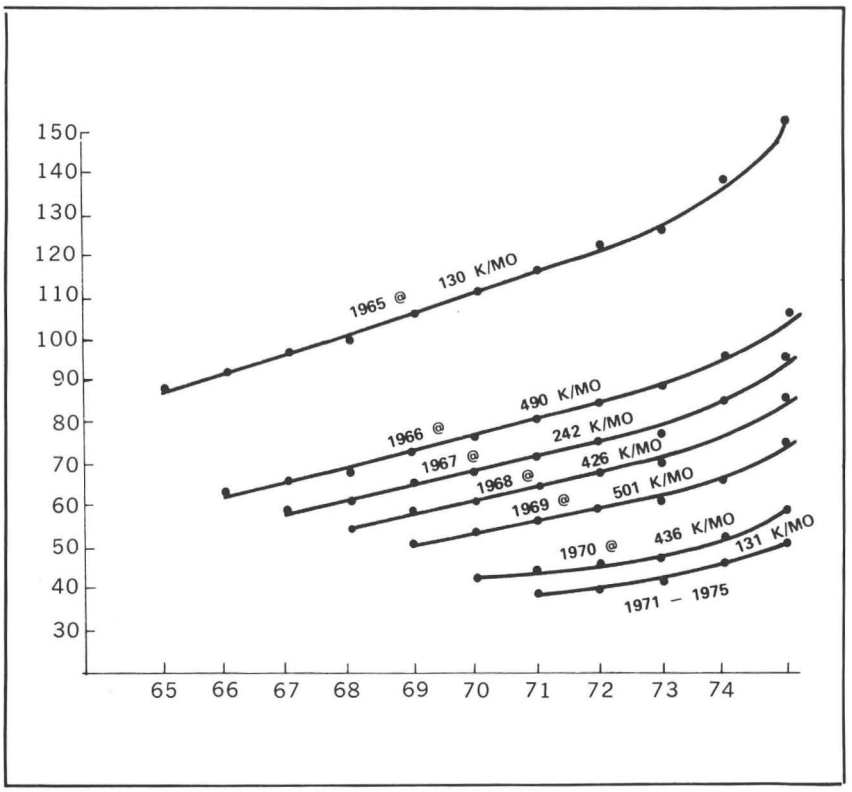


Figure 3—Program Year vs Unit Costs

multipurpose submunition. The employment concept calls for firing, from low altitude, ripples of rockets loaded with submunitions at the computed point in space and broadcasting the "lethal rain" upon the invading forces (figure 4).

True, you cannot do it with submunitions alone and achieve significant improvements in effectiveness over the current capability. But, if the gunship is equipped with a rangefinder device which could provide range to center-of-enemy formation and this data can be transferred on line – in real-time (with hard wiring) to a variable range electronic fuze – then the onboard rocket stores become potential "lethal rain" for cascading upon an unsuspecting enemy in the vicinity of "the-wall-in-space." The basic components of this fire control system are available off-the-shelf for near-term integration and adoption.

Once you think about killing an enemy's armor/infantry formation, it becomes a matter of taking one bright idea and adapting it to another. As mentioned earlier, the concept of "The-Egg-On-The-Wall" begins with the individual submunition depicted in figure 5.

Each submunition is fuzed separately and activates upon contact with a target or the ground. The multipurpose "kill effect" can provide a 4 to 5 inch penetration through the top surface of hard targets *plus* the anti-personnel/materiel fragmentation effects of a 6 pound high explosive warhead when configured as illustrated in figures 6 and 7. At first glance this may not appear impressive, but, multiply this one submunition by 760 times, which is the number of full caliber (2½ inch) submunitions that one Cobra gunship can carry. We achieve this quantity by configuring the gunship with a normal complement of 76 rockets, each containing 10 submunitions in the rocket warhead (figure 8).

The helicopter/rocket system represents a "true" launch-and-leave system, since once you press the pickle button firing the rockets there is nothing you can do to alter or terminate the flight path of the rocket. So, you can quickly "leave" your launch location and thus increase your chance of survival.

Figure 4

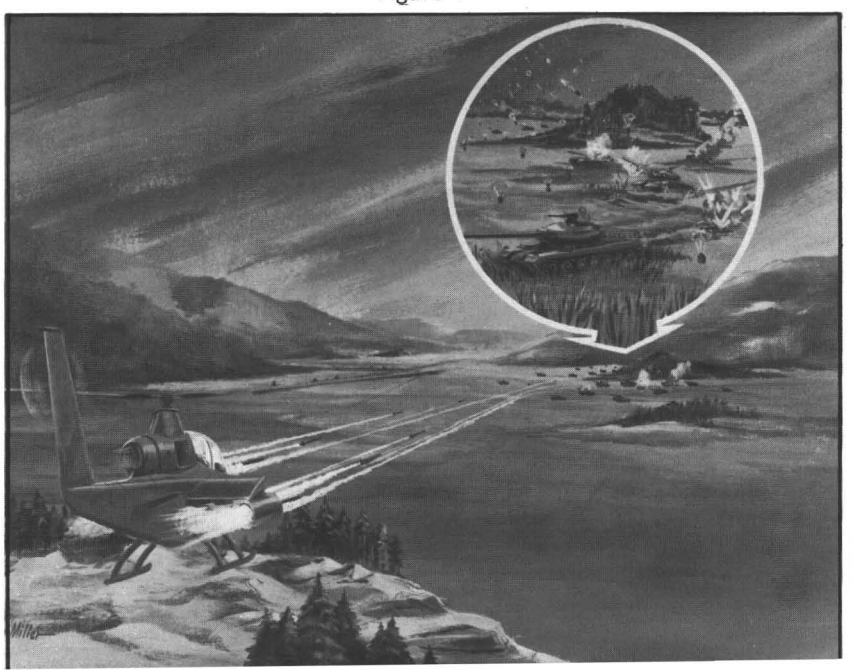
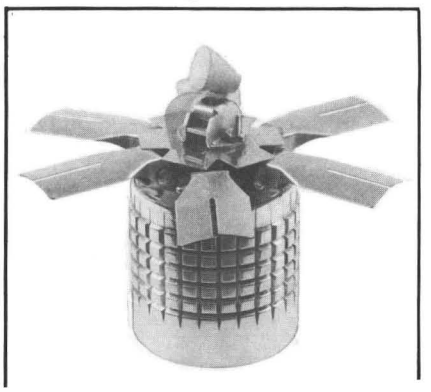


Figure 5



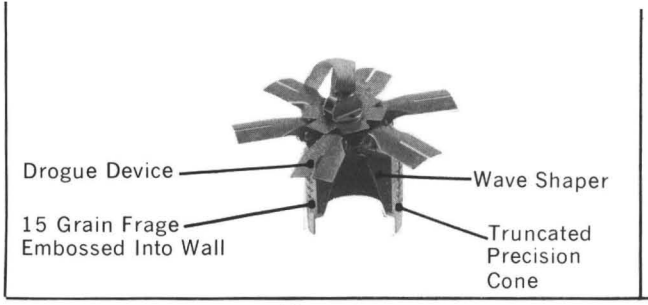


Figure 6

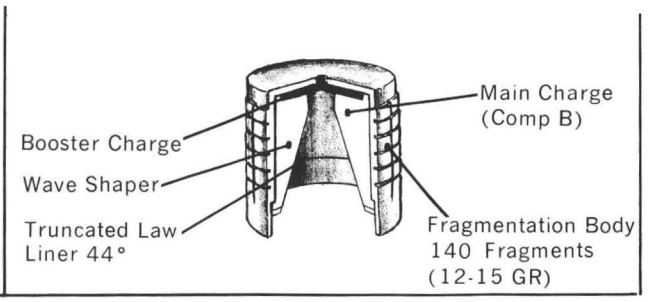


Figure 7

This represents the kind of far-reaching effects that can cause reassessment of old biases.

To further pursue the concept, we must come to grips with two fundamental problems which are (first) *to truncate* [shorten or cut off] *the usual ballistic trajectory* of a projectile, creating the "wall-in-space," causing the warhead to broadcast its payload and (second) to endow the "lethal rain" that occurs at the "wall-in-space" with kill mechanisms that gain the enemy's attention. Let's consider these two problems one at a time:

Truncate The Ballistic Trajectory. Unless subjected to outside forces (either random or programed), a projectile will follow a curvilinear trajectory from the launch point to impact. Thus, errors in elevation carry a high potential for large dispersions in range at the desired impact area. We can alter this characteristic by using a high drogue device that will truncate the typical ballistic trajectory at the prescribed point and disperse the payload vertically on the enemy formation (figure 9). The endearing attribute of this concept is that we release a large quantity of submunitions (lethal rain) to fall upon the target using delivery tactics insenstive to angle of attack and other fire control problems.

To review, *when* the rocket warhead is set to function at the desired range (after the fuze has been set on line by the rangefinder) . . . *and* the submunition payload (lethal rain) is dispersed (a la, the-egg-on-the-wall) . . . *and* the 760 individual submunitions function . . . *then* the target engagement effort is virtually insensitive to launch elevation errors. We have taken elevation angle almost completely out of the gunnery problem and suffer very little in range dispersion.

Kill mechanisms is the second important element in our problem. The efficiency and effectiveness of the submunition payloads as an improvement over unitary conventional ammunition is common knowledge. The submunitions can be designed to maximize penetration of mature targets from many directions *plus* yield the fragmentation effects so lethal to personnel and other soft targets.

Preliminary analytical studies performed by the United States Army Materiel Systems Analysis Agency, Aberdeen, MD, indicate a 9- to 10-fold gain in system capability against all targets. Actual firings of prototype submunitioned warheads at Hawthorne Naval Ammunition Depot, NV, have confirmed the feasibility of "truncating the trajectory" and the vertical deployment concept. Laboratory firing of full caliber (2½ inch diameter) submunitions at Picatinny Arsenal, NJ, yielded penetrations in excess of 5 inches against Birnell Hardness 269 armor plate.

The design objective of the test was to achieve a 3-inch penetration, which is more than adequate to defeat the top protective surface of armor vehicles. The test setup consisted of two 3-inch wit-

Figure 8—Multipurpose Submunition Warhead

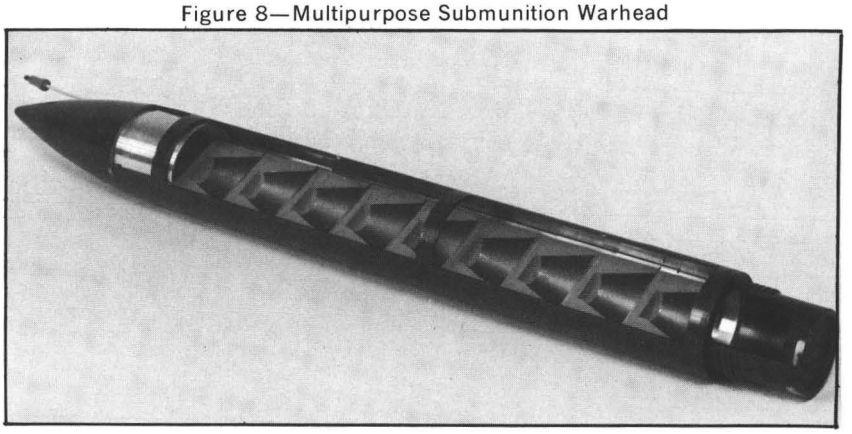
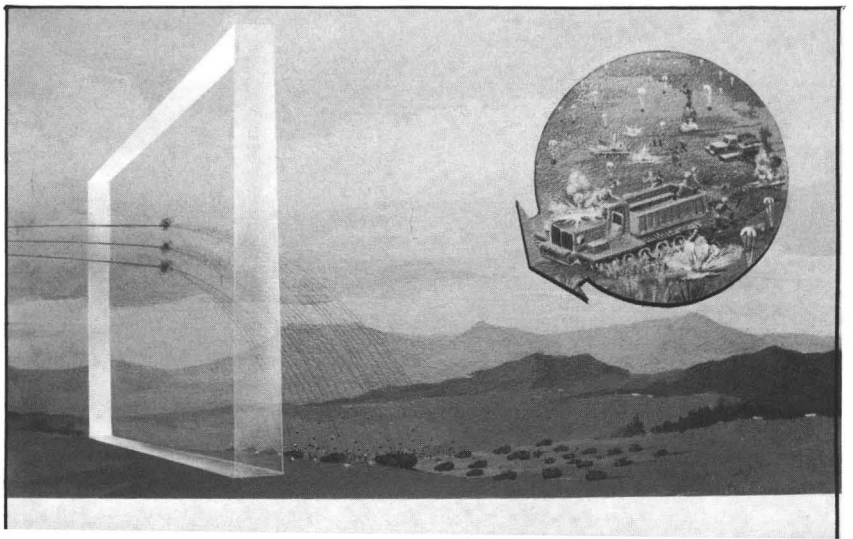


Figure 9



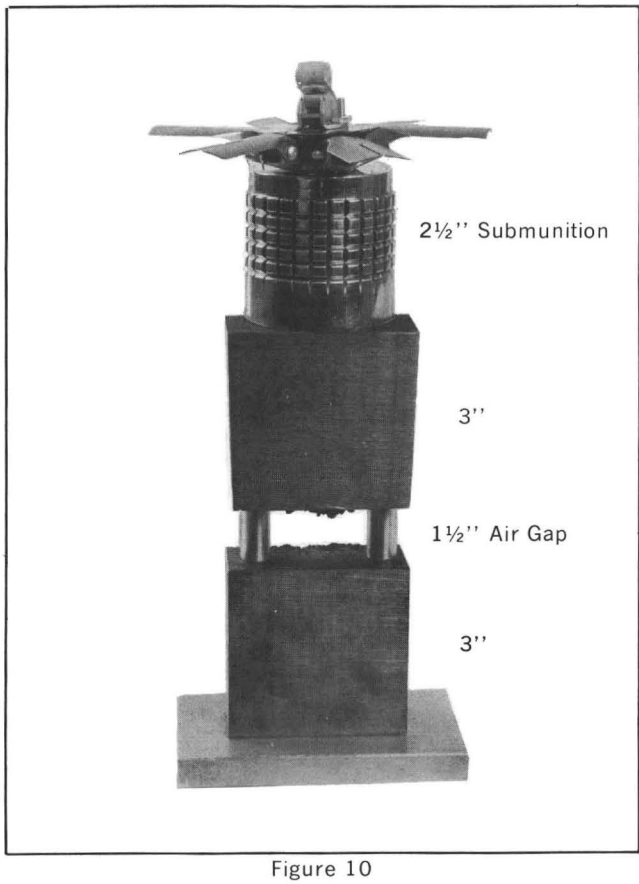


Figure 10

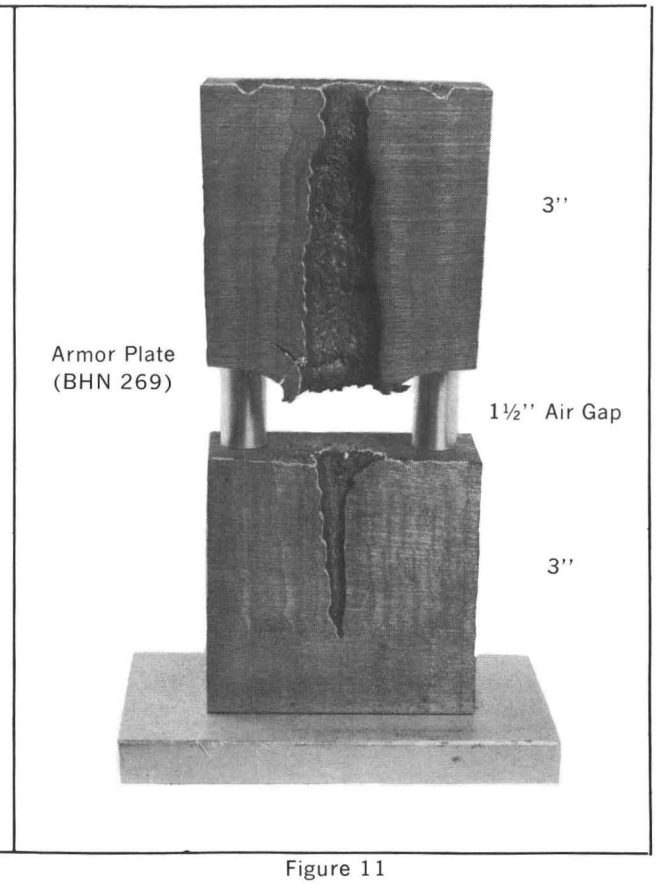


Figure 11

ness plates separated by a 1½-inch air gap. The submunition was placed directly on top of the witness plates as in figure 10. The air gap was used to reveal the fragmentation effects of the penetration – which were significant. As can be seen in figure 11, the penetration expanded in diameter as it proceeded through the top 3-inch plate; then distributed significant fragmentation on the top of the bottom witness plate and finally spent itself after penetrating two more inches of armor in the bottom plate. *All, with one-each 2½-inch submunition.*

Recognizing that the objective is to provide for the maximum number of submunitions per warhead and yet maintain a high killing potential, the truncated precision cone, coupled with a waveshaper, was exploited and proved to be highly suitable. This approach made it possible to reduce the overall height of each submunition without sacrificing armor penetration capability, which also facilitates stacking the submunitions in the warhead.

To recap, there is little question as to the feasibility of disrupting armor/infantry formations with cheap and sufficient kill mechanisms such as MPSM. To achieve this end, it is merely a question of setting priorities and integrating the components of this "shotgun" method into an operational weapons system.

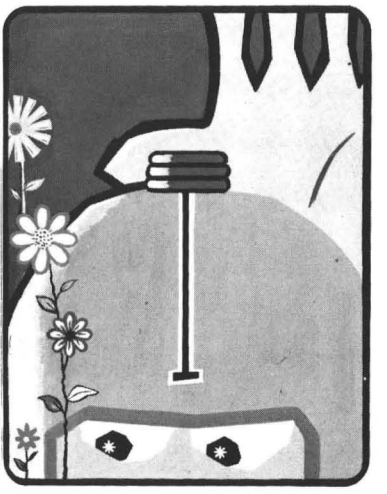
This project office is proceeding rapidly to develop the submunitions and supportive system hardware so that the bottom line of the balance sheet will show in our favor.

"You wanna disrupt an enemy formation?" Do it "shotgun style" with "lethal rain"...or...better yet ..."wiz zee egg"!

Arctic Test Team Returns

The U.S. Army Aviation Test Board arctic test team has returned to Ft. Rucker after a long, cold helicopter expedition which included a two-month test in the frozen region around Ft. Wainwright, Alaska.

VIEWS FROM READERS



Sir:

The inclosed photograph is of my brother who was in the Yugoslav resistance in World War II and was killed by the Communists in 1944. I would appreciate your printing the photograph in hopes of locating any survivors of nine American pilots he rescued from German capture.

CAN YOU RECOGNIZE YOUR RESCUER?

In July 1944, in the village of Kloka (area Topola-Oplenac, where the tombs of Yugoslav kings are) in Serbia, Yugoslavia, an American plane, model "Liberator," was shot down by the Germans. My brother, Miodrag Jesic, the local commander of the Chetnik forces, saved all nine crew members from German captivity and took them to "Ravna Gora," General Draza Mihajlovic's Chetnik headquarters. From there they were taken safely to Italy. For this herioc act, my brother was cited for an award by the main headquarters of Ravna Gora. The citation was signed by a Captain Raskovic, staff officer of the First Ravna Gora Brigade. Later, the American pilots sent my brother as presents a pistol, binoculars and a pilot's uniform. The conversations between him and the pilots were conducted in German.

Any help you could give me in locating any possible survivors out of these men would be greatly appreciated. I would be happy if we learned that all nine men are alive and well.

In November 1944, the Communists shot my brother as a "people's enemy." I am a refugee from Yugoslavia and now an American citizen. I have been living in this country for nine years. At the time my brother was shot, I was also in a Communist prison but was later released because of my economic expertise which was needed by the State.

Bob Jesic
1032 N.E. 10th Avenue
Fort Lauderdale, FL 33304

The DIGEST apologizes to Betty Goodson of the Ft. Rucker information office. Betty was the author of "Horning In" (March 1975) and was not credited.

STANDARDIZATION CORNER

WHILE THIS ARTICLE may not contribute directly to the standardization of flight and related procedures per se, this simple suggestion in regard to completing DA Forms 2028 (Recommended Change to Publication), will directly and ultimately be reflected in the responses to these forms by proponent agencies.

Guidance in the preparation of DA Forms 2028 may be found in AR 310-3. While these instructions are brief and concise, one important guideline is often ignored: "A reason for the recommended change will be given following the recommendation." This guidance also appears on the DA Form 2028 itself.

Always justify and give a sound, logical reason for the recommended change. Reviewers of these forms are often misled or do not understand the intent of the recommendation because of incomplete justification and logic. A few more minutes spent in the preparation of these forms, with particular emphasis on your reasons for the recommendations, will have a significant impact on the evaluation and disposition of your suggested change.

same old tune?

FAULTLESS maintenance is the backbone of any aviation safety program; carelessness, its greatest enemy. And carelessness manifests itself in a multitude of ways: Failure to recover dropped safety wire and hardware or to account for all tools after completing maintenance; performing cursory inspections or hurry-up maintenance; and installing look-alike hardware items without ensuring they are of the correct type are just a few. These oversights have caused such problems as in-flight engine failures, premature gear retractions and collapsing of gear assemblies during landings. End results have varied from incident damage to loss of aircraft. Yet, analysis of these and other maintenance-related mishaps has consistently produced the same recommendations: Provide personnel with proper training and ample supervision to ensure all maintenance and inspections are performed BY THE BOOK.

This month, we decided to see how others are faring in this area. The following article concerning flight safety and training of aviation maintenance personnel in Russia was selected from the Translations on U.S.S.R. Military Affairs prepared by the U.S. Joint Publications Research Serv., Arlington, VA.

RUSSIAN SAFETY

Engineer-Colonel Yu. Bardin

WITH RESPECT to its operational features, modern aviation equipment is distinguished by a high level of reliability. The correct use of this equipment makes it possible to successfully carry out any sort of flight missions. Why is it that in certain sub-units [podrazdeleniya] the equipment frequently breaks down? At times this almost leads to flight accidents. Upon analyzing these cases, one most frequently comes to the conclusion that the primary reason for such breakdowns is the result of violations of the rules for operating the aircraft and its armaments. And this is not so much the result of lack of training on the part of the aviation specialists as it is a result of their carelessness.

A reliable barrier to these shortcomings is strict engineer control over the observance of established rules for handling the equipment and the timely implementation of preventive measures. The aviation engineer has an important role in this.

About 18 months ago Engineer-Major V. Logvinov was assigned to the post of deputy commander of the regiment for airforce engineer service. At that time there were many complaints about the aircraft specialists. The new engineer took on the job with great enthusiasm. He carefully analyzed the shortcomings in the use of aircraft equipment. Applying regulation requirements to the work of each aircraft specialist, he set up a system of keeping strict account of each type of breakdown and introduced the rule that the work of the technical personnel would be analyzed daily. All of this made it possible to evaluate the result of the subordinates' work objectively, and, what is more important, to predict possible defects and take the appropriate preventive measures.

Strict operational control over the preparation of the aircraft equipment was introduced in the units [chasti]. Technical bulletins and immediate reports published on all malfunctions are used to train the young specialists. Along with this, extensive use is made of the method of instrument control over the working order of the aircraft equipment. Transportable stands with control and checking equipment, the required tools and technical documentation have been set up for this purpose in the servicing groups.

Many factors influence the quality of aircraft preparation. They include the caliber of work prepared by the aircraft specialists and even the equipment at the work positions. The new engineer also turned his attention to this circumstance. At his recommendation, the sub-unit in which officer Yu. Sobol serves as deputy commander of the Airforce Engineer Service Squadron reequipped the work premises, taking into consideration the requirements of scientific organization of labor. This sub-unit was followed by others.

There is no need to list in detail all of the organizational-preventive measures undertaken by Engineer-Major Logvinov. I shall only say that all of this had an immediate effect on the flight preparations of combat aircraft: Failures of the equipment have long since been eliminated in the unit. The regiment's Airforce Engineer Service now firmly retains first place in socialist competition in all of the basic areas.

Young aircraft specialists join the units every year. Experience has shown that a graduate of a school does not acquire firm professional and organizational skills immediately. He acquires them in the process of performing his practical work. And it is important that this be taken into consideration. After all, it sometimes happens that an officer is immediately assigned to the position of engineer of a regiment in his specialty, and that the job is beyond his capabilities. I feel that a young engineer should work for a certain period of time as a chief of a servicing or regulation group, let us say, and then be moved to an engineer post with a broader range of duties.

What are the conclusions? They are in favor of this approach to the development of young specialists. In the first place, beginning with the things of lesser importance, the engineer is able to more rapidly acquire experience in organizational and educational work among the men. In the second place, since he is personally responsible for the outcome of each flight, such practical on-the-job training will serve as a good incentive to improve his professional skills. And there is one more circumstance. The young officer performs a certain amount of the work personally, which helps him to strengthen his engineer skills.

Of course, the essence does not lie in excessive

tutelage or super-concern for the graduates of higher educational institutions. An individual approach is required in each case. One thing is indisputable, however: It is more difficult for a young engineer who has never experienced "physical labor" to solve problems connected with the training and indoctrination of his subordinates while taking into consideration the specific features of the highly varied work of a large collective of aircraft specialists.

Assistance from experienced first-class specialists is especially essential in the professional development of young engineering personnel. In our opinion, this assistance should essentially consist of teaching the young officer to objectively evaluate the technical condition and flight readiness of equipment. This does not mean, of course, that it is enough to point out to him the reason for this or that failure. It is important that the engineer acquire independent work habits and know how to exercise complete control over the quality of preparation of the combat aircraft and the airborne equipment.

It would be difficult to overestimate the importance of engineering control for an objective analysis of malfunctions occurring in the air. Just consider the following example.

During a flight the pilot noticed that the oil pressure was falling. After landing, it was explained that a break had developed in the line. The engineer had issued instructions to change the line, eliminate the air locks and then send the aircraft on its regular flight. It might appear at first glance that the engineer had good intentions, that he had not wanted the aircraft to stand idle. The trouble is that engineer control over the working order of the aircraft equipment was only a formality in this case. After all, the engineer did not even bother to find out how the hydraulic system was functioning or why the malfunction had occurred, and he should have given some thought to this. After all, just exactly what happened? Because of the oil loss the pump gears had been partially damaged. As a result, metal shavings had entered the oil line and certain parts of the hydraulic system.

There is another reason why this case can serve as a very good lesson. After the defect was eliminated, the aircraft taxied out for the takeoff. When the pilot began the takeoff, however, the afterburner would not work. What was the matter? After the aircraft returned to the parking lot, a group of technical personnel led by Engineer-Captain O. Yetsenko immediately began to look for the reason. Once again, however, no one made a preliminary analysis nor compiled a troubleshooting chart, and the aircraft specialists, with the participation of Engineer-Lieutenant Yu. Zavadskiy, were essentially working by trial and error, without a system. They removed first one part and then another, checked them and then removed them again. Everyone was perspiring from the work. Finally, they managed to establish the fact that the afterburner switch had not been correctly adjusted when the preliminary adjustment work had been done.

This is what happens when elementary rules of engineering control are ignored. And it obviously happened because, in this case, officers Yetsenko and Zavadskiy had an irresponsible attitude toward their functional duties.

The aircraft engineer is entrusted with an important part of the work of ensuring the operational reliability of the equipment. He is obligated to thoroughly evaluate its operational capability and to thoroughly analyze even the smallest malfunction. It is obvious that each malfunction is an accident, but it is also obvious that there is a reason for each malfunction. So-called "unexpected" malfunctions cease to be unexpected as soon as we recognize the reasons for their occurrence. Each aviation engineer must regard his mission as that of predicting possible failures in equipment and taking appropriate measures to prevent them.

Well, there you have it. Despite some variation in the lyrics, it's still the same old tune. While we can find no consolation in that maintenance problems appear to be universal, we can find hope; for the cure is likewise universal and unchanged: Provide personnel with proper training and ample supervision to ensure all maintenance and inspections are performed BY THE BOOK!

USAAAVS

This article is reprinted from APPROACH magazine with minor editing to include Army terminology

THE POSITIVE APPROACH TO SAFETY

Commander H. L. Fremd

YEARS AGO, the local witch doctor would conjure up brews and far-out dances (with proper accouterments) to drive away evil spirits and cure other assorted ills. By and large, the primary ingredient in any such cure was fear—either the direct type (scare hell out of 'em) or the indirect type (fear of the unknown).

We know that for the most part medical science has advanced beyond this type of treatment (except for the flu shot), but can the science of aviation safety make a similar claim? We see pictures of aircraft crashes, damaged facilities, etc., promoting (?) safety, but is it valid in this enlightened age to resort to such tactics to get people to really believe?

Some individuals may heed nothing less in the way of warning. We tend to think of safety in the same way some people think of religion: It's here and it's difficult to object to the idea of it, but we don't want to be bothered with it all the time. Nevertheless, a rational appeal to reason undoubtedly offers the greatest potential for improved safety.

Fortunately, there are many who are willing to give the idea of accident prevention—positive safety—more than just lip service. Just how are you and I exposed to the idea of positive safety? First and perhaps most well-known are our TMs. This series of publications assures continuity and standardization of all phases of aviation and serves as the current reference for the young and old pro alike. Yet, from time to time, we still hear those who say, "You can't operate by the book." If so, maybe the book is inadequate, but has anyone taken the time to prepare and submit the changes necessary to update the book?

It's easier to say that the system is inadequate than to offer a positive plan for improvement. If you really believe in a positive safety program, take the time and make the effort to recommend improvements in the system whenever you see the need.

Another area of positive safety is the Equipment Improvement Recommendation (EIR) system. Sure, it's troublesome to change our concepts and ways of doing things; but as this program becomes more productive, we see our equipment problems diminish, problem areas being pinpointed earlier, and funds permitting, corrective action being initiated. Here again is a positive approach to safety.

The aviation safety officer who is fully supported by the commander is a positive force for safety. And the commander who believes in the positive approach to safety will do well to ponder these questions:

- Is your ASO selected from the best qualified and most highly motivated officers in the unit? He should be, as he represents you in matters of safety.
- Is he selected for all the "good deals" that come along, i.e., fund drives, courts and boards, etc.? He shouldn't be; safety is a full-time job.
- Is he given active support at all officers' meetings?
- Do you have periodic talks with your ASO and provide positive guidelines for your safety program?
- Do you ensure the wholehearted cooperation of all other sections in the company.

This is by no means a complete list of pertinent questions, only a starter—food for thought.

Now that we have considered the command element in the positive approach to safety, how about you, Mr. Pilot and Mr. Maintenance Officer—and you, Mr. Crew Chief? Give these questions some thought:

- Have you thought about ways to do your job more effectively and more safely? If so, have you discussed your thoughts with your ASO? If not, why not?
- Are you reporting your experiences to help others—Operational Hazard Reports?
- Do you help the ASO in his safety surveys, or are you always trying to cover yourself? If you're wrong, do you admit it and strive to improve?
- Do you try to beat the system? You shouldn't. If the system does not provide the framework for correct and safe operations, recommend the needed changes.

The positive approach dictates that safety be regarded as a way of life to be cultivated, not only in your assigned field, but in all aspects of everyday life. It will pay great dividends in the long run, especially for those of us active in the field of Army aviation.

Ted Kontos
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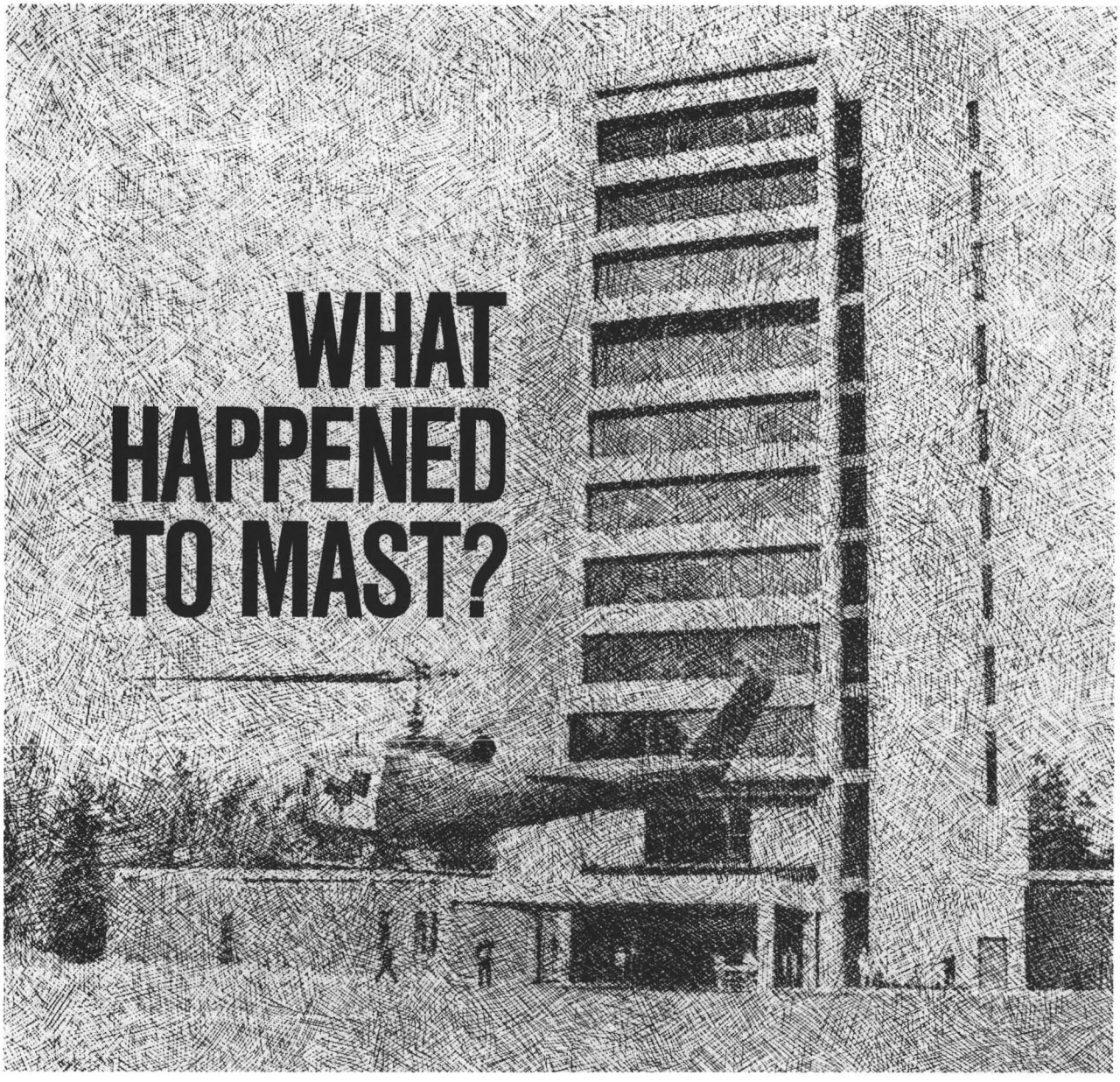
USAAAVS

WHAT HAPPENED TO MAST?



CONCEIVED IN 1969 and approved for trial use in 1970, the Military Assistance to Safety and Traffic (MAST) program became operational at three Army and two Air Force sites. During the following 5½ months, MAST pilots flew 182 missions and evacuated 249 persons, 131 of whom were in critical condition. The results attained by MAST crews were so gratifying that residents of areas surrounding test sites made strong appeals for the program to be continued. They got their wish.

By October 1973 pilots at the five sites had flown nearly 4,750 hours, completed more than 2,325 missions, and assisted nearly 2,650 persons. With consent of Congress, the MAST program was expanded to include 16 Army and 4 Air Force units. In 1974, pilots from these units completed 1,335 missions, transported 1,329 patients in addition to doctors and special equipment, and logged more than 3,320 hours of flight.

While these statistics are impressive and serve as

one means of measuring the progress of MAST, they cannot tell the whole story—the personal sacrifices made by crewmen, the effect MAST has had on their lives, the problems encountered, the solutions developed, or the valuable experience gained by the military. Similarly, they are incapable of expressing such intangibles as anxiety, fear, worry, relief, joy and sometimes, heartbreak. Yet, a mixture of some of these human emotions is invariably present during every MAST mission.

Take, for example, a flight conducted late in 1974 by the 3rd Platoon, 507th Medical Company, Ft. Hood, TX, as told by the copilot, WO1 Roy Rogers:

"In the early morning hours of 31 October 1974, the alarm sounded, calling our primary crew to aid in rescuing flood victims in the local area. It had been raining hard for 2 days, and during the previous night the rain came down even harder, causing rivers and streams around Fort Hood to overflow. The standby crew was called in. CW2 Hank Murray, pilot in command, arrived first and was notified of a request for a MAST mission. After checking the weather, he phoned for additional information concerning the patient before informing our platoon leader, CPT Merle Snyder. It was a life and death situation. The patient, a woman, was reported to be in critical condition, and was to be transferred from a hospital in Bryan, TX, to another in Houston. Once again CW2 Murray checked the weather. The forecast called for intermittent heavy rain with scattered thunderstorms. But while the weather was far from ideal, it was still good enough that we could go VFR.

"We departed at 0130 hours. SP4 Robert Corbett was the crew chief and SP4 Glen Roberson, the medic. Approximately halfway to Bryan, we spotted a heavy rainshower ahead and thunderstorms to our left. We detoured and finally arrived at the hospital at 0230. Two police cars marked the landing area. With the patient, her husband and a doctor on board, we left for Houston.Shortly after takeoff, the doctor told us that speed was not as important as a smooth ride. Since the weather was turbulent, we cruised at 65 to 70 knots to reduce aircraft vibrations as much as possible.

"When we were about 45 minutes from Houston, the patient's condition worsened, and the doctor told us if we didn't get there soon, she might die. So we increased our cruise speed to 85 knots, still hoping to hold down the helicopter vibrations. About that time, the weather deteriorated and we were forced to go IFR. However, we were vectored to Houston, and on arrival, we descended into VFR conditions. At 0430 hours, we landed at the hospital.

"Later, while we were having coffee, the patient's husband and the doctor joined us. CW2 Murray was on the phone at the time. The patient's husband walked up to me, and with tears in his eyes, took my hand and said, 'Thank you.' The doctor then added: 'I think you saved her life.'

"Is MAST really worth the effort? Yes, it sure is!"

Unfortunately not all missions end as happily. Of the 131 critically ill or injured patients evacuated by MAST crews during the initial trial period in 1970, five died en route to hospitals and eight others, after they were admitted. Nevertheless, a 90 percent survival rate of critical cases remains a most impressive record that could not have been attained without MAST and the dedicated personnel who serve it.

Early in the program, participating parties, both military and civilian, realized that for MAST to be successful, effective coordination between civil and military authorities was essential. The problem of communications was one of the first that had to be solved. Crews had to validate requests for assistance; hospitals and doctors had to be notified; coordination between aircraft and ground ambulance vehicles had to be established; and in many instances, the need for open communications between aircrews and ground rescue parties was essential. In this day and age, establishing communications seems to be a simple matter. But standard radio equipment aboard military aircraft operates at different frequencies from that used by civil authorities. The best solution, of course, was to install needed radio equipment in MAST aircraft. However, no military funds were available for the purchase of this or any other special equipment. The problem was finally resolved when participating communities accepted the responsibility for providing radios and other special equipment required.

MAST has also taught us many lessons. Some have universal application; others are more relevant to specific MAST units. All are important. For example, during the early MAST operations, when critically injured or ill persons required special medical facilities or the services of medical specialists, they were invariably transferred to hospitals where these were available. Today, instead of moving the patient, MAST units, more often than not, will transport needed equipment or specialists to him.

Experience shows that to be effective in saving lives, MAST must be available 24 hours a day. And crews can expect a request for help an average of once a day per 1,000,000 population. While tactical units are quite capable of conducting missions as part of the MAST program, Army units most logically suited for supporting civilian medical emergencies are

WHAT HAPPENED TO MAST?

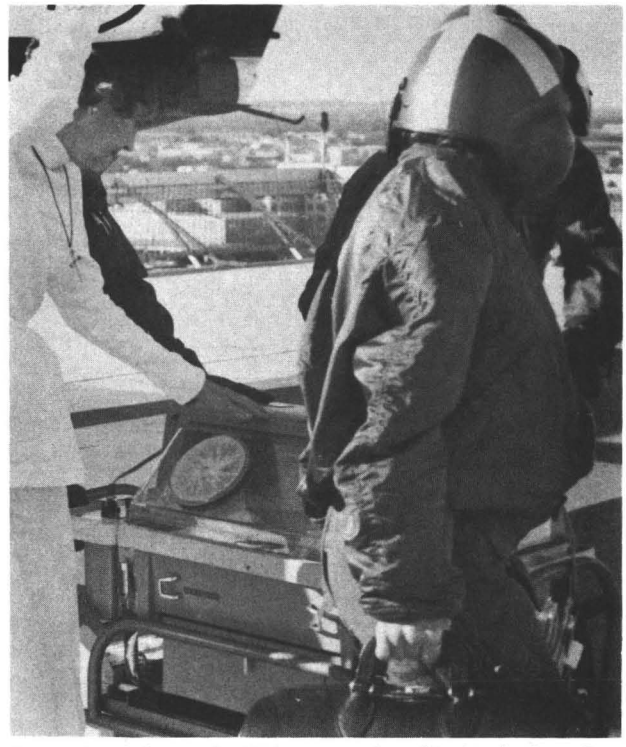
medical air ambulance companies and detachments. These units are sufficiently self-supporting to be stationed independently of their larger parent unit, and can accept MAST assignments with little or no disruption to normal peacetime schedules and training. Further, they are organized and equipped to fly MAST missions, and crews are already trained to handle medical emergencies. Many other lessons have been learned. From the 54th Medical Detachment (Helicopter Ambulance), Ft. Lewis, WA, come the following:

"Before any unit becomes active in the MAST program, the Civilian MAST Coordinating Committee should be fully operational and should present the MAST unit most of the additional medical and communication equipment required. Any remaining medical or radio equipment should be programed for presentation to the unit by a specific date—not just sometime in the future. Funds from the MAST committee should be available for unit use to cover additional expenses such as telephone calls, gas and out-of-pocket motel and meal expenses incurred by personnel presenting the MAST program at various conventions, conferences and training sessions.

"Complete air-ground radio communications with both transferring and receiving hospitals is essential. The capability of communicating with all MAST using activities (state patrol, county sheriffs, department of emergency services, search and rescue operations, mountain rescue, national ski patrols, U.S. Coast Guard, national park services [three in Washington], national forests [six in Washington], outlying fire departments—these coordinate many island evacuations—and select business corporations such as timber companies trained to use MAST) is essential.

"Standard air ambulance TOE medical equipment is not adequate for evacuation of the aged, cardiac patients, prematurely born infants, or individuals suffering from certain types of trauma. It must be supplemented with cardiac monitors, infant transport incubators, special back and leg splints, oxygen and suction equipment.

"Public awareness of the MAST program and the requirements it places on civilian communities for equipment and support must be constantly stressed. After 4 years, much of our operational area here in Washington still does not know about the program. Officials in areas that use the service must be periodically visited and reacquainted with it to prevent the emergence of problems that could cause delays in mission responses. Numerous demonstrations, speaking engagements, and classroom instruction sessions are required to keep civilian communities aware of the MAST program and of the services available to them.



A premature baby was the 600th patient to be airlifted to the Santa Rosa Medical Center by a MAST helicopter

"Establishing a uniform map reference system to be used by all rescue agencies—military, state and volunteer—is essential for rapid plotting of mission location. This unit has overprinted the National Search and Rescue grid squares on the local sectional aviation map and on the official state highway map for use by all appropriate agencies. This has worked exceptionally well for us and as new agencies join in the MAST effort, they are provided with updated maps of this type.

"Personnel assigned to our unit are capable of working without supervision amidst the confusion at an accident site where trauma exists. The training these men have received will enable them to function effectively in saving lives anywhere they may be needed, in time of peace or war.

"Personnel assigned to a MAST unit must be highly motivated and willing to give freely of their time. For married personnel, MAST must be a family venture with the wife's full support. If this is not possible, family separation and even divorce may result. Because personnel are assigned to a MAST unit does not relieve them from other military responsibilities and obligations, including field training exercises. Nor do they receive TDY pay when they are on a MAST assignment away from home. MAST

owes its success, in great measure, to the assigned personnel who are not only well trained and qualified, but also dedicated to their jobs of saving lives.

"These are but a few of the lessons we have learned here in Washington. And we are learning more almost every day."

Briefs of MAST missions conducted by the 571st Medical Detachment, Ft. Carson, CO, point out a different set of lessons learned.

In one instance, an elk hunter became delirious, had difficulty in breathing, and complained of paralysis of his legs. While one companion remained with him at the camp site that was located in an extremely mountainous area, the others hiked for approximately 8 hours to get help. MAST was called for assistance and a crew departed at dusk. After rendezvousing with the ill man's companions, the mission commander decided not to attempt the rescue at that time because of darkness, difficult terrain, lack of communications and the absence of any landing zone markings. This decision was made despite the pressure to evacuate the man immediately. It was the right decision. Early the following morning, the patient was successfully evacuated without incident and with minimum risk to him, the crew and aircraft.

In another instance, a light plane crashed on mountainous terrain at approximately 12,000 feet msl. The Civil Air Patrol (CAP) located the wreckage and sighted survivors. Because of the rugged terrain, it would have taken a ground rescue party several hours to have reached the site; so MAST was called. Since the crash site was situated in a densely wooded area, the pilot requested a rescue hoist and an experienced crew to man it. Coordinating with CAP, the aircrew located the wrecked aircraft and reconnoitered the area. After determining the survivors were not critically injured, the mission commander ruled out the use of the hoist because of existing high winds and moderate turbulence. Instead, he selected a suitable landing area approximately a quarter of a mile away, landed and brought the survivors to the aircraft for evacuation.

Once again professionalism was displayed in both preparation and execution of the mission. Although the pilot had requested a hoist and an experienced crew to operate it, he declined its use when the situation did not demand it. In addition, the crew came prepared with special equipment and supplies that could have been dropped to the survivors had unforeseen events precluded their immediate rescue. Items included a first aid kit, sleeping bags, food and water, and signalling devices.

In a third instance, a night hoist mission was requested to evacuate an automobile accident victim whose car had left the road on the rim of a canyon. The individual had sustained severe back and internal injuries and was suffering from exposure. When the aircraft reached the accident site, the crew noted antitorque control was marginal. Rather than risk further injury to the patient or jeopardize the aircraft and crew, the mission commander elected to assist ground rescuers by providing illumination until they could move the patient to a suitable area for pickup and evacuation.

Although these briefs are just a sampling of the different types of MAST missions flown by the 571st, they show some of the problems encountered and point out a few of the decisions that have to be made—decisions that crews must arrive at on the basis of knowledge and experience, without permitting any false sense of urgency to influence their judgment. And while crews may be prepared to cope with virtually any situation they might encounter, special equipment and specialists are not pressed into service simply because they are available.

The 571st has performed many rescue missions in mountainous areas, often flying at altitudes of 16,000 feet msl. One outgrowth of this experience was the development and use of an oxygen system aboard UH-1 rescue aircraft. When the need for such a system became obvious and no standard one was available, the 571st worked closely with the Air Force to design a nonstandard system that provides the crew with approximately a 4-hour supply of oxygen. Use of this system has greatly increased this unit's effectiveness in performing its present mission as well as making it capable of coping with any other high altitude operations it might be called on to perform.

Another outgrowth of high altitude operations is the recently established mountain training program conducted by the 571st and monitored by the Fort Carson Standardization Board. This program consists of a ground school portion coupled with approximately 10 hours of flight instruction. Mountain weather and approaches to unprepared areas at altitudes of 10,000 to 14,000 feel msl are two of the important areas covered. This training is essential for the safe performance of this unit's present mission and helps make the 571st one of the best prepared medevac units available for supporting high altitude operations anywhere in the world.

What has happened to MAST? A lot. It has grown and matured. It is benefiting both the civilian communities it serves and the military services, and it is rapidly establishing a new kind of rapport between the two. Yes, MAST is well, thriving and helping to save more lives than ever before. And what is even more important, it is working because of you!

PROFESSIONALISM-

What Is It? Where Is It?

Captain John S. Martin, ARNG

HEY, ARMY AVIATORS, let's talk about professionalism—professionalism in Army aviation. All too often we hear people say, "Let's be professional" or read about ways to "make aviation more professional," but what does this really mean? What are they talking about? What is professionalism?

Most textbooks refer to professionals as people who have extensive knowledge in a branch of science or the liberal arts. But there's more to it than this. How about entry standards? Some type of review board must be set up to establish entry standards and pass judgment on applications into the profession. There is still one more requirement. A profession must be self-policing. What does this mean? It means you have to have a way to throw out the undesirables—those who don't or won't measure up to the standards.

The Bar Association establishes entry standards for lawyers and certainly eliminates the undesirables. The same holds true for doctors. They get a thorough education in a specialized field. The entry standards for the medical profession are so tough few can meet them. But how do we, in Army aviation, measure up to these requirements for professionalism?

Let's see. We do have entry standards—you know, eyes, arms, ears and some basic level of intelligence. We also have to pass a few tests and checkrides while in flight school. And then one day we pin on wings and aviate away. But there is more! How about an education in our specialized field? Well, yes, there is a great deal to learn about aviation and there's more every day. The FAA and the Army just keep piling on new requirements. We get a good aviation education in flight school, so that requirement is satisfied. (Ever wonder what happens to all that knowledge when we leave flight school? Do we let it wither away, or do we make it grow and expand?) But there's that last requirement—the self-policing bit. Do we police ourselves? Who does it and how do we eliminate those who don't measure up to standards?

Instructor pilots, we're the policemen. We're the ones who continually ensure that our aviators measure up to standards. We identify the undesirables and set the machinery in motion to eliminate them. If Army aviators are to be professionals, we must do our jobs thoroughly and properly.

So, we have applied all the requirements for professionalism to Army aviation, and I don't think there is any doubt that we meet the prerequisites. We can be professionals! But are we? Well, that's hard to say—some of us are and some of us aren't. How can that be? Well, it's that way because we instructor pilots aren't consistent in the way we do our policing. Do we all use the same high standards? Do we all try to remove the undesirables—those who can't or don't measure up? If we aren't doing the job in policing ourselves, we aren't totally professional, are we?

Now that I've gotten your dander up a little there, IPs, stay with me a few more minutes before you throw this article down. Let me bring up several more questions for your consideration. Will the system we operate under really let us do our job of self-policing? How can we work around the system if it hinders accomplishment of our jobs?

I'm a part of Army aviation and I want to be thought of as a professional. And I want us to do our jobs as IPs in the best possible manner. So let's talk about a few problems that exist in Army aviation and see what we need to do to solve them. Let's see if we can operate effectively as IPs within the system. Because if we can do our jobs the right way, we will ensure that Army aviators—all Army aviators—are professionals.

Let's talk about knowledge. We agreed earlier that a person can't be a professional if he doesn't possess a thorough knowledge of his specialized field. How do you check to see if your aviators have at least some minimum level of knowledge? Do you question them extensively during their annual standardization check? Do you question them in all the areas with which they should be familiar—the airspace, regulations (FAA and Army), the Operator's Manual, aircraft capabilities, etc., etc.? Do you require your aviators to have an extensive knowledge in all these areas?

I like to ask aviators I talk with certain questions concerning the airspace in which we fly. I might ask,

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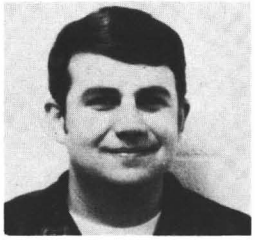


CPT John S. Martin is presently a full-time instructor pilot with the Ohio National Guard. From 1969 through 1970, he was an instrument instructor pilot with the U.S. Army Aviation School at Ft. Rucker, AL. He is a school-trained instrument flight examiner and instructor pilot, a UH-1 and OH-58 instructor pilot and a helicopter gunnery instructor pilot. CPT Martin holds FAA certificates with ratings as a multi-engine airline transport pilot, as a multi-engine land and single-engine land instrument flight instructor, and as an airplane and helicopter flight instructor.

"I've got a free minute or two and I need a standardization ride. Let's go around the pattern a few times and get it over with."

for example, "What are the cloud clearance and visibility requirements for flight above 10,000 feet?" Can you guess what answer I get? It usually goes like this. "Why should I care about what you need up there in that high airspace? I never fly up there!" Now, what did this guy really say? Didn't he say, "I'm not totally professional because I don't know much about the airspace I don't fly in and I really don't care. I'm only concerned about my little area of operation. I don't need a total knowledge of aviation." Well, would you let him get away with this answer? Are you going to let him be less than professional?

Here's a question you might ask the next aviator you fly with. "What type of navigational equipment do you need to fly in a Class II Terminal Control Area (TCA)?" Oh boy, here we go! Can't you just hear this guy say, "Hey, I don't fly into any of those places. I only fly here at Fort Nowhere. I don't have any need to know about TCAs!" Now what did he really say? "I'm not really professional because I don't have a total knowledge of aviation. I just care about my own little area." What does this guy have—a guarantee that his commander will never send him on a mission that will require flight into a TCA? Why shouldn't Army aviators have a complete knowledge of all airspace and regulations concerning flight in that airspace? Why should we tolerate a partial knowledge that makes us something less than completely professional?

Well, how are we going to treat these folks who are holding us back from being a completely professional outfit? Will we require them to grow professionally and expand their knowledge, or will we let them get by with just minimal knowledge? Remember, we set the standard—and we must also do the policing.

As an IP, how would you handle this situation? Old Colonel Halfwing comes rushing into flight operations and in front of half the unit's aviators says, "Hey, I've got a minute or two free and I

"Why should I care? I never fly up there."

need a standardization ride. Let's go around the pattern a few times and get this thing over." You had better have the right answer ready, because half the unit is standing there listening. Can you see the ugly head of the old double standard popping up? Are you going to treat this guy any differently than the rest of the aviators you fly with? Can you justify "going around the pattern a few times" while you require a full 4-hour standardization ride with the rest of the aviators? If you give in, you will blow all the respect the aviators have for you as an instructor. They will cut corners and expect you to look the other way if you cut corners for this colonel. Where is professionalism then?

When I run into this type of problem, I usually use a line like this: "Colonel, I think we should take more than a few minutes. I would like to show you how I give a standardization ride to your aviators, and see what you think of my technique." What I'm really saying is, "Look, Colonel, I'm not compromising my standards for you, and we are going to do this the right way or not at all." Above all, avoid the double standard. Don't let the aviators in the unit see you treat any aviator differently. Applying a double standard will reduce your effectiveness as an instructor like nothing else. Set your standards high and stay with them, come colonel or WO1.

What do you do when Major Rotortail completes a transition into the OH-58, but never seems to get the dash 10 test done? Yep, you guessed it. Ninety, then 100 days come and go, and still no dash 10 test. And there goes the major rotoring, illegally, off into the sunset, because TC 1-34 says the transition must be completed (including the dash 10 test) within 90 days. Your name is on the transition records and Major Rotortail is flying illegally. What are you going to do? Will you let him backdate the dash 10 test so it will look like it was done in the 90-day period? Would you do the same for WO1 Newboy? Or will you cancel the transition and not let the major fly the OH-58 until he completes a new transition that complies with TC 1-34?

Does your commander encourage his aviators to obtain FAA ratings? Do you encourage him to do so? I sure hope so. I can think of many good reasons to do so, but not one good reason not to. The FAA endorses and requires safety in flight, proficiency in aircraft control and intelligent reasoning during all flight operations. These are all qualities vitally desirable in any aviation operation.

But the individual aviator also has to contribute something toward professionalism. All the responsibility doesn't rest with the IP. The aviator must police himself. He leaves flight school with a good basic knowledge and is periodically checked by the IP. But what does he do in between? Does he have the initiative to strive to expand his aviation knowledge? Does he really wear a hood to maintain his instrument proficiency? Does he really make an effort to read and know the operator's manual? Does he make an individual effort to grow professionally?

How would you categorize a doctor who graduated from medical school 25 years ago and hasn't done one thing to keep his knowledge updated? Would you patronize him? Is he really professional? Are you updating yourself, Mr. Army Aviator? Are you making an individual effort and policing yourself? It is a necessary part of being professional.

We have a great deal of pride in the wings we wear and I'm certain we want to be thought of as highly professional aviators. How do we get there? Well, IPs, we must lead the way. We must establish the guideposts along the road. We set the standards and we have to constantly check to see that they are set high enough. And we must never let an aviator's performance continually fall below these standards.

IPs must ensure that each aviator acquires and maintains an adequate level of knowledge that encompasses the entire area of aviation and is not restricted or limited. We must recognize that total knowledge is a prerequisite for total professionalism.

Finally, we as IPs must do our job as enforcers. We must identify those aviators who don't or can't measure up to our professional standards, and initiate the actions required to either bring them up to standard or eliminate them. As Army aviators, we can't afford to accept or be satisfied with anything less than total and absolute professionalism. IPs, let's get to work.

THE ARMY AVIATION Broken Wing Award recognizes aviators and crews who demonstrate exceptional skill, knowledge and judgment in recovering Army-owned or leased aircraft from in-flight emergencies.

Since its initiation in 1967, the Broken Wing Award has been given to 427 aviators. Several National Guard, Reserve and Department of the Army civilian aviators are included in this total. CW2 Thomas B. Smith, Aviation Division, Ft. McClellan, and CW2 Michael J. Galloway, 3rd Armored Cavalry Regiment, Ft. Bliss, have each received two Broken Wing Awards.

Our safety theme for January through June is "Army Aviation Professionals Do It Right," and we want to recognize these Broken Wing Award recipients. Names of aviators who received the award for 1967 through 1971 were published in the April 1972 AVIATION DIGEST. The following list is an update through 1974. One asterisk denotes ARNG and two asterisks denote Army Reserve.

All nominations for the award should be submitted to the Commander, U.S. Army Agency for Aviation Safety, ATTN: Chairman, Broken Wing Award Committee, Ft. Rucker, AL 36360. Specific requirements for the award are covered in change 3, chapter 7, AR 385-10, dated 25 April 1973.

CALENDAR YEAR 1972

Allphin, Edward W., CW2
Anderson, James R., CW3
Ayers, James A., 1LT
Baker, Elias B., CPT
Barber, David L., WO1
Beavers, Michael L., MAJ
Blad, Hjalmer R., CW2
Bloyer, Howard E., WO1
Bodelson, Patrick J., CPT
Buie, Ralph M., 2LT
*Burns, James H., MAJ
Causey, Billy H., CPT
Champion, Walter W., WO1
Cocherell, McDade, CW2
Compagner, John, CW2
Daw, Roy C., CW2
Dickson, Henry G., CW3
Eltgroth, Jerome J., CW2
Fleming, Fredrick C., CPT
Fritz, Charles W., CPT
Galloway, James F., 1LT
Gold, William M., CPT
Goodnight, John F. Jr., CPT
Gregory, Gerald L., CW2
Habitzruether, Thomas, CW2
Hadder, Marion D., CPT
Hale, Ronald E., 1LT
Hanscom, Richard G., WO1
Hartwick, Dwain, D., WO1
*Hengeveld, Cecil B., 2LT
Henrich, Timothy L., CW2
Hepler, Leslie J., MAJ
Herbert, David A., CW2
Hill, Arthur J., CW2
Hodder, Allen J., CW2
Holford, Roger C., CPT

USAAAVS

COL Raymond F. Spinks (left), commander, Headquarters Command, Ft. Polk, LA, presents the Broken Wing Award to CPT Richard R. Beauchemin, 36th Medical Detachment (HA), while his commander, MAJ Don Poe, looks on. CPT Beauchemin was on a UH-1H medical evacuation mission at about 1,200 feet over densely forested terrain when his engine failed. He flew to the edge of the forest to a sparsely vegetated area and glided the UH-1 to an emergency landing without damage or injury to his passengers

Hubble, Hartwell H., WOC
Johnson, Thomas A., CPT
Kelley, Steven P., CW2
Kennedy, Joseph C., MAJ
Koehler, Joseph R., LTC
Korsbeck, John W., CW2
Kurabieski, Robert R., WO1
Lemen, Clifford W., WOC
Loesch, Wayne M., WO1
Lyons, Rocklin D., CW2
Lyons, Stanley M., 1LT
*McBeath, Thomas A., CW2
*McCormick, William, CPT
*McCrady, Jesse L., MAJ
Meeks, William, CPT
Miller, Dan S., WO1
Odom, Lonnie J., CW2
Page, Wesley D., CW3
Pluim, Richard G., 1LT
Porter, Jesse J., CW2
*Pruitt, Kenneth R., CW3
Pryor, Joseph F. Jr., WO1
Reynolds, Marvin L., CW2
Rosebeary, Michael L., CPT
Russo, Alan M., CPT

This photograph shows why CW2 Philenom Canfield, 3rd Squadron, 3rd Armored Cavalry Regiment, Ft. Bliss, TX, was given the Broken Wing Award. CW2 Canfield was attempting to terminate his flight at a hover during an approach over rolling desert with sparse vegetation when he lost tail rotor thrust and the UH-1H spun 360 degrees. CW2 Canfield made a hovering autorotation to the sand dune area with no further damage to the aircraft

BROKEN WING AWARD

MAJ Vernon J. Mathern (left), commander of the 180th Aviation Company, presents the Broken Wing Award to CW2 Nathan G. Vidrine. CW2 Vidrine was on a CH-47C training mission in the vicinity of Schwaebisch Hall, Germany. During level flight at 500 feet in the traffic pattern, he simulated No. 2 engine failure. About 30 seconds later, the No. 1 engine failed, accompanied by an explosion, shuddering of the aircraft and rapid loss of rotor rpm. The No. 2 engine condition lever was placed in the flight position to regain rpm. Before regaining power, CW2 Vidrine autorotated to a plowed field without damaging the aircraft

Scarborough, Thomas E., CW2
Scott, Robert L., CW2
Smyth, Peter H., CPT
Spalding, John W., MAJ
Strickland, Hartwell, WO1
Tapp, Jack C., CPT
Taylor, Robert E., WO1
*Tiffany, Harrold E. III, CW2
Tisdale, Basil D., CPT
Toms, Russell D., CW2
Utley, Steven L., CW2
Wade, Melvin G. Jr., CW2
*Wagner, William J., CW2
Wallace, Kenneth C., CW2
Waller, Luther O., CPT
*Wardell, Thomas G., CPT
Warren, Richard E., CW2
Watson, Richard W., CW2
Williams, Charles L., CW3
*Williams, Richard J., CPT
Willis, John C., WO1
Wilson, John M., CW2

Under Secretary of the Army for Reserve Affairs, William D. Clark (left), congratulates CW2 Charles O. Delp on receipt of the Broken Wing Award. CW2 Delp is assigned to Detachment 1 of the 81st Infantry Brigade, Spokane, WA. At the time of his OH-58A in-flight emergency, CW2 Delp was in cruise flight at about 1,200 feet agl over extremely rugged terrain. An engine oil line ruptured, oil pressure dropped to zero and CW2 Delp entered autorotation. He maneuvered the aircraft to a very narrow logging road littered with hazardous obstacles and landed without damage

This is the area in which CW2 Jacob A. Hansen landed his NU-8G without damage when he was confronted with No. 1 engine failure. CW2 Hansen was climbing out from a takeoff over rolling hills and was at 50 feet when the failure occurred. At the time of this emergency, CW2 Hansen (then a WO1) was assigned to the U.S. Army Foreign Science and Technology Center

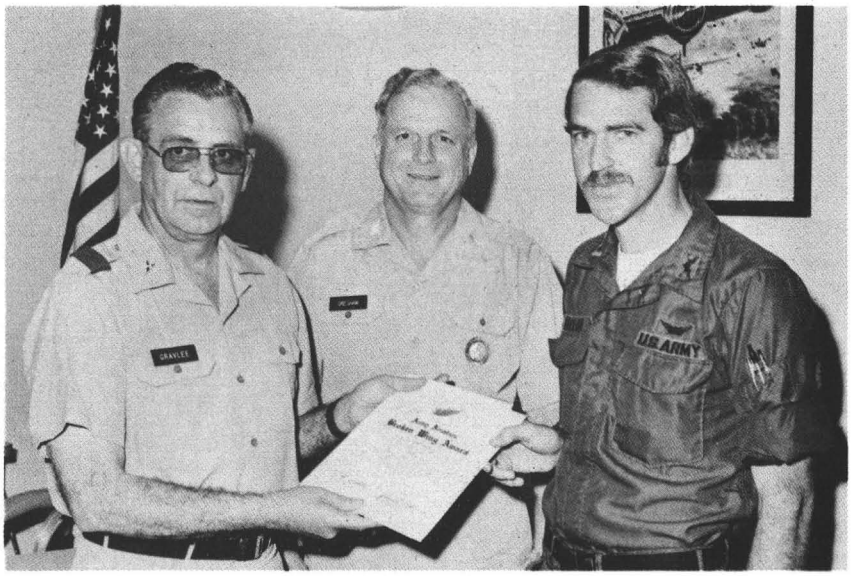
Woodrum, Gary L., CW2
Yacovitch, Paul N., CPT
Young, Robert L., LTC
Zogg, Theodore M., CW2

CALENDAR YEAR 1973

Anthony, John M., CPT
Athan, George, CW2
Bell, William D., CW3
*Berry, Wade H., CPT
*Billman, Barry R., 2LT
Booth, Mac E., DAC
*Brown, John M., CW2
Brown, Michael J., CPT
Clemens, Fred K., CW2
Cobb, Jerry L., CW3
*Coleman, James M., LTC
Dawson, Burle M., CW2
Dickie, Thomas R., CW2
Eldridge, Benton D., CW2
Franklin, Curtis L. Jr., CW2
*Freeman, John E., MAJ
*Freeman, Ronald R., CW2
Galloway, Michael J., CW2
Gaylor, William A., CPT
Hamel, Claude B., CW2
Hatcher, Paul M., CW2
Hill, Ross N., CW2
Hogue, William G., CW2
Hoover, Dean L., CW3
Kelley, Charles E. Jr., CW2
Kern, Carrol T., WO1
King, Charles L., 1LT
King, Marvin C., CW2
Klarner, Robert D., CW3
Krofchek, James M., CPT
Laas, James H., CW3
Lemaster, Robert E., CPT
Linker, Billy R., CW2
McGwin, Michael D., CW3
McKissack, Thomas M., CW2
McWaters, John D., CW2
Milbauer, Wayne N., CW2
*Musick, Conley C., CW2
Neill, Andrew L., CW2
Novetzke, Theodore L., CW2
Rosencrans, James F., 1LT
Scholl, Michael J., CW2
Smith, Carrol A., CW2
Smith, Thomas B., CW2
Strickland, Robert M., CPT
Teaford, Freddie A., CW2
Vaughn, John F., CW3
Vidrine, Nathan G., CW2
Voss, William T., CW2
Waltz, Gregory A., CW3
*Wright, Timothy J., CW2
Zetelski, Alan J., WOC
Zibilski, Edward L., CPT

CALENDAR YEAR 1974

Baginski, George J., CW2
Barney, Mitchell, CW2
Beauchemin, Richard R., CPT
Beck, Marvin D., CW2
Bergeron, George, 1LT
Boswell, Michael R., CW2
*Bryant, Asa Jr., MAJ
Campbell, Gary L., CW2
Canfield, Philenom, WO1
Clark, Nathaniel J., CW2
Cook, Henry W., CW2
*Delp, Charles O., CW2
Eckhoff, Karl F., CW2
Ford, Gary M., WO1
Galloway, Michael J., CW2
Hale, Paul S., CW2
Hansen, Jacob A., CW2
Hanzelka, John T., CW2
Harper, Charles L., CW2
*Haynes, James H., CW2
**Hensinger, William, CW2
Hogan, Bobby W., DAC
Holland, John C., CW2
Howell, Ernie, WO1
Kennedy, George H. III, CW3
King, Raymond D., DAC
King, Ronald L., CPT
Knight, Walter J. Jr., CW2
Lang, Albert G., CPT
Lester, Richard A., CPT
MacCallum, John A., Civ
McKnight, Matt D., CPT
Mockler, Thomas J., CW2
Moench, Frederick J., 1LT
Moody, Dick O., CPT
Moore, Claude J., DAC
Nestor, Mark L., 2LT
*Obert, Joseph A., CPT
Olive, Mervil, CW2
Pepin, William L., CW3
*Schaum, Paul L., CW3
Schimke, Frederick R., CW2
Schmidt, Marlo S., WO1
Schobe, William P. Jr., CW2
Sheppard, Frederick, CW2
Smith, Thomas B., CW2
Spodeck, Walter D., 1LT
Steele, William R., CW2
Stone, Jeffrey L., CW2
*Taylor, Jimmy D., CPT
Tiffany, William A., CW3
Watkins, Roger K., CW2
Wifholm, Martin H., CW2
**Winter, Steven E., CW2
Wise, John T., CW2
Woodard, Larry H., MAJ
Yarlett, William A., CW2



BG Guy J. Gravlee (left), commander of the 155th Armored Brigade, Mississippi National Guard, presents the Broken Wing Award to CPT Jimmy D. Taylor (right) as COL Bill Gresham, deputy commander, looks on. CPT Taylor was flying at 850 feet agl over a residential area in the vicinity of Tupelo, MS, when his engine failed. He autorotated his OH-6A to a 600- by 800-foot muddy plowed field and landed without damage

Marking of SPH-4 Helmets

The PEARL article in the September 1974 edition on marking the SPH-4 flight helmet with orange reflective tape lists the manufacturer's code as being 96381. This particular code identifies the Precision Drawn Steel Co., 3900 River Road, Pennsaucken, NJ 08110. Department of the Army Supply Bulletin 708-42, dated October 1973, lists manufacturer's code 76381, which is the Minnesota Mining & Mfg. Co., 3M Center, St. Paul, MN 55101.

However, the Reflective Products Division of 3M has apparently been changed to, or consolidated with, the Traffic Control Products Division of 3M. The manufacturer's code for the Traffic Control Products Division is listed as 94960.

The error in the September AVIATION DIGEST may cause a lot of problems for units and activities who are attempting to requisition orange reflective tape for marking SPH-4 flight helmets for their aviators.

Your comments concerning the manufacturer's code are correct. USAAAVS regrets any inconvenience the incorrect manufacturing code number caused your unit. The Minnesota Mining and Manufacturing Company has assured this Agency that orders received for orange tape, color 3483, will be shipped promptly.

Hot Weather Survival Kit

As a maintenance test pilot for a military direct support contract with Dynalectron Corporation, we are called on frequently to recover downed aircraft. My company is interested in procuring some type of survival equipment for this mission.

Our flying area centers around El Paso, TX, including all of New Mexico, the eastern half of Arizona and West Texas, so we would require a desert type kit. We are interested in a kit that would sustain two or three people for no more than two days. The kit should include as a minimum radio, strobe light, pen flares, first-aid kit and enough food and water for the above requirement.

My question is, does the Army have such a kit or must each item be ordered individually? Would you please furnish information concerning any survival equipment that would fulfill this requirement? Also, I would like to have the federal stock number, common table of allowance number and the number of any technical manual that would cover this equipment.

To determine the exact procedures to procure life support and survival equipment, contact your support activity property book officer. The survival kits authorized for issue and use by U.S. Army aviation crewmembers are listed in Common Table of Allowances 50-900, pages II-68 and 69, dated 15 November 1973. These kits are provided on an individual basis for each crewmember and/or passenger. Each kit is shipped complete.

For your geographical area, USAAAVS recommends you consider the Survival Kit, Individual, Hot Climate, NSN 1680-00-973-1861. This kit contains a variety of survival items plus food and water for two days for one person. The Survival Kit, Individual: Vest Type (SRU-21/P), NSN 8465-00-177-4819, might serve your needs but, like the above-mentioned kit, it does not include a survival radio. The survival radio is not issued as a component of survival kits. Change 5, Army Regulation 310-34, dated 1 February 1973, gives the basis of issue for survival radios. Technical Manual 55-8465-206-23, dated September 1972, covers organizational and direct support maintenance (inspection) of Army aircraft survival kits.

Helicopter Redesign

I would like to know where I could submit ideas concerning helicopter redesign or new ideas.

The Directorate for Research, Development and Engineering, U.S. Army Aviation Systems Command, 12th and Spruce Streets, St. Louis, MO 63166, is responsible for evaluating and incorporating new design ideas in Army aircraft. After the equipment becomes operational, the Army has a program for what you want to do. It uses equipment improvement recommendations (EIRs), DA Form 2407, outlined in Technical Manual 38-750, "The Army Maintenance Management System (TAMMS)."

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

USAAAVS

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

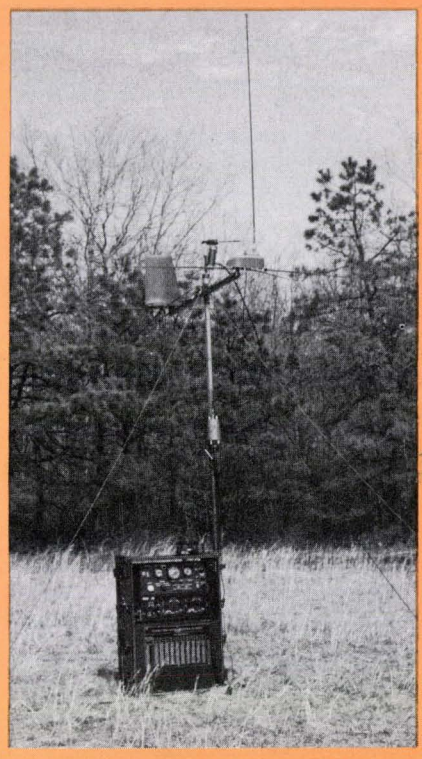
USAASO Sez

The U. S. Army Aeronautical Services Office discusses

New Tactical Control Equipment

WHAT'S NEW PUSSYCAT? You remember the tactical control towers we had in the Republic of Vietnam? Well, we've got a couple of new items coming down the road to replace those old cabs. The first item is the AN/TSQ-97 air traffic control facility. It is intended to give us an ATC capability up where the action is: brigade airfields. This baby folds up into a neat package that can be carried much like a stretcher by two GIs. Set up on a forward airfield or heliport it provides a single tower operator with one channel each of FM, VHF and UHF. It also provides him with windspeed and direction, altimeter setting, time and density altitude information. It comes with a built-in 8-hour battery and can run off a 24 volt direct current (vdc) source. The 97 has been type classified "standard" and we expect to see it being issued to tactical units starting in July 1976.

That 97's O.K., but where we've got a lot of aircraft operating, as division and corps main airfields, it's a bit much to ask the little guy to carry the load. For these type airfields there is the AN/TSW-7A air traffic control tower facility. The Army picked up the basic U.S. Air Force AN/TSW-7 tower cab and added our standard items of radio equipment. The 7A has positions for three control tower operators plus a supervisor; has three channels each of FM, VHF and UHF plus one channel of HF/SSB. A full meterological package (barometer, windspeed, etc.) and a fair-sized telephone capability are included. Right now the 7A is being tested at Fort Huachuca, AZ, and at Fort Rucker (would you believe TAC Runkle?). The latest information is that Army tactical units will receive the 7A sometime around June 1978.



Man Portable AN/TSQ-97 gives FM, VHF and UHF

New air traffic control tower AN/TSW-7A

the R and S mystery

Major Thomas E. Murray II
Deputy for Developments
Materiel Developments Department
Systems Division

SINCE MIDWAY through the Republic of Vietnam conflict, the term AH-1G brings to mind a particular attack helicopter configuration that is well known to both aviators and infantrymen. In recent years, the Army community has been introduced to and become familiar with the AH-1Q helicopter, which is basically the AH-1G HueyCobra with the tubed-launched, optically-tracked, wire-guided (TOW) missile. The Cobra TOW, AH-1Q, is programed for an antiarmor role on the high threat battlefield of tomorrow. The Q models are scheduled to reach the field next month.

Now, in this era of the acronym, two new AH-1 designations, the R and S models, are emerging amid some confusion as to just what goes into an AH-1R or an AH-1S. There really should be no mystery concerning the R and S model Cobras.

The October 1973 Mideast War added to Army aviation's lessons learned in the latter stages of the Vietnam encounter. We have determined that survival in the high threat environment will require new tactics and new equipment. No longer will there be safety in altitude. The battlefield of the future will require terrain flying, hover firing and "sneak and peek" tactics. The AH-1G and Q model Cobras, with a reasonable armament load, simply do not have the power capabilities to perform these high agility maneuvers in a satisfactory manner. Thus, a deficiency was noted and a requirement initiated for the AH-1R and AH-1S helicopters.

The AH-1R is the AH-1G with the improved Cobra agility and maneuverability (ICAM) product improvement applied. The AH-1S is merely the AH-1Q which has undergone the same ICAM modification. The next question is, what does the ICAM improvement include?

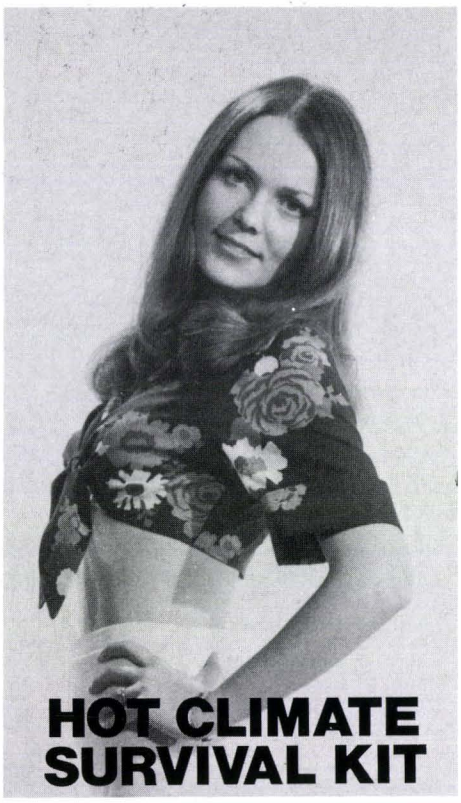
The ICAM increases the maximum gross weight of the helicopter from 9,500 pounds to 10,000 pounds. This increased gross weight capability and the much needed extra agility/maneuverability are gained by incorporating uprated drive system components from the AH-1J SeaCobra, a Bell Helicopter Model 212 tail rotor and the Lycoming T-53-L-703 engine. The new engine has an uninstalled thermal rating of 1,800 shaft horsepower (shp) but due to a limitation of the main transmission the engine is downrated to 1,290 shp for 30 minutes. To accommodate these power additions, the helicopters will require some strength modifications to the fuselage, tailboom and vertical fin. The diagram at right assists in remembering the solution to the R and S model "mystery."

The S model improvement has been approved and funded. Initially 290 AH-1G aircraft were to be modified to AH-1Qs between June 1975 through July 1977. That planning has been altered to accommodate the ICAM improvement. The first 92 aircraft leaving the line will be AH-1Q models which later will be modified to the S configuration. The remaining 198 aircraft will have the ICAM applied, in plant, and come to the field as the AH-1S. In addition to the 290-aircraft modification, 305 new AH-1S helicopters will be purchased and delivered from April 1977 through March of 1981.

The AH-1R configuration has not yet been funded. TRADOC (U.S. Army Training and Doctrine Command) has recommended to Department of the Army that the modification be approved. The DA staff has included a planning wedge in the fiscal year 1977 budget and is awaiting the results of the priority aircraft subsystem suitability intensive review to provide rationale for the modification (see "Pass In Review," April 1975 DIGEST).

That explains the mystery of the AH-1 R and S models and brings the program up-to-date. Hopefully, in the future we will all become as familiar with the new models as we are with the old ones.

AH-1G + TOW =	AH-1Q
+	+
ICAM	ICAM
‖	‖
AH-1R	AH-1S



HOT CLIMATE SURVIVAL KIT

1. Operator's Manual, TM 55-8465-213-10
2. Compass, magnetic, unmounted, pocket type, NSN 6605-00-515-5637
3. Fuel, compressed trioxane (3), NSN 9110-00-263-9865
4. Survival Manual, FM 21-76
5. Insect net, head, NSN 8415-00-935-3130
6. Tarpaulin, nylon, NSN 8340-00-485-3012
7. Pan, frying, aluminum, NSN 7330-00-082-2398
8. Case, individual survival, NSN 1680-00-082-2514
   Complete assembly, NSN 1680-00-973-1861
9. Hat, sun, NSN 8415-00-270-0229
10. Tool kit, survival, NSN 8465-00-973-4807
11. Knife, pocket, NSN 5110-00-162-2205
12. Bag, drinking water storage, NSN 8465-00-485-3034
13. First aid kit, individual, NSN 6545-00-823-8165
14. Sunburn, preventive preparation, NSN 8510-00-162-5658
15. Box, match, plastic, waterproof, NSN 8465-00-265-4925
16. Wire, nonelectrical, copper (20 ft.), NSN 9525-00-596-3498
17. Signal, smoke and illumination, marine (2), NSN 1370-00-309-5028
18. Whistle, ball, NSN 8465-00-254-8803
19. Mirror, emergency signaling, NSN 6350-00-261-9772
20. Water, drinking, canned (12), NSN 8960-00-243-2103
21. Spoon, picnic, plastic, NSN 7340-00-170-8374
22. Food, packet, survival (6), NSN 8970-00-082-5665
23. Fishing tackle kit, survival type, NSN 7810-00-558-2685
24. Match, nonsafety, wood (3), NSN 9920-00-985-6891

The Hot Climate Survival Kit weighs 29 pounds and is 5½ inches high, 15 inches wide, and 19 inches long. Preventive maintenance checks and services of the kit are outlined in TM 55-8465-206-23, dated 26 September 1972.

This is the ninth of 12 back covers designed to show personal survival, rescue and protective equipment. Detach this cover for your bulletin board display of the more important survival and protective equipment available to crewmembers.

9 USAAAVS OF 12